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NASA STI Program ... in Profile

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Introduction

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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

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NASA Center for AeroSpace Information (CASI)

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

Each citation in *STAR* indicates a 'Source of Availability.' When CASI is indicated, the user can order this information directly from CASI using the STI Online Order Form, e-mail to help@sti.nasa.gov, or telephone the STI Help Desk at 443-757-5802. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

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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.

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

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

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Subject Term Index

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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.

20090001264 NASA Dryden Flight Research Center, Edwards, CA, USA

NASA Global Hawk: Project Update and Future Missions

Naftel, J. Chris; November 20, 2008; 14 pp.; In English; 17th William T. Pecora Memorial Remote Sensing Symposium, 16-20 Nov. 2008, Denver, CO, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001264

The USAF transferred ownership of two pre-production Global Hawk aircraft to NASA Dryden in September 2007. Both aircraft have low flight hours and they were transferred to NASA with most of the equipment required for flight. NASA Dryden and Northrop Grumman have developed a partnership for standing up the capability over 1 year, operating the system for 4 years, and sharing use of the assets. The agreement was signed in April 2008. NASA Dryden will focus on Earth Science missions and Northrop Grumman will focus on DoD and internal company payload and system developments.

Author

Synthetic Aperture Radar; Payloads; Pods (External Stores); Wings; Command and Control; Flight Operations; Communication Satellites; Air Traffic Control

20090001307 NASA Glenn Research Center, Cleveland, OH, USA

An Assessment of Current Fan Noise Prediction Capability

Envia, Edmane; Woodward, Richard P.; Elliott, David M.; Fite, E. Brian; Hughes, Christopher E.; Podboy, Gary G.; Sutliff, Daniel L.; October 2008; 53 pp.; In English; 14th Aeroacoustics Conference, 5 - 7 May 2008, Vancouver, Canada; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2008-215415; E-16579; Copyright; Avail.: CASI: A04, Hardcopy

In this paper, the results of an extensive assessment exercise carried out to establish the current state of the art for predicting fan noise at NASA are presented. Representative codes in the empirical, analytical, and computational categories were exercised and assessed against a set of benchmark acoustic data obtained from wind tunnel tests of three model scale fans. The chosen codes were ANOPP, representing an empirical capability, RSI, representing an analytical capability, and LINFLUX, representing a computational aeroacoustics capability. The selected benchmark fans cover a wide range of fan pressure ratios and fan tip speeds, and are representative of modern turbofan engine designs. The assessment results indicate that the ANOPP code can predict fan noise spectrum to within 4 dB of the measurement uncertainty band on a third-octave basis for the low and moderate tip speed fans except at extreme aft emission angles. The RSI code can predict fan broadband noise spectrum to within 1.5 dB of experimental uncertainty band provided the rotor-only contribution is taken into account. The LINFLUX code can predict interaction tone power levels to within experimental uncertainties at low and moderate fan tip speeds, but could deviate by as much as 6.5 dB outside the experimental uncertainty band at the highest tip speeds in some case.

Author

Acoustic Properties; Aerodynamic Noise; Noise Prediction; Turbofan Engines; Reusable Heat Shielding; Fan Blades

20090001903 NASA Marshall Space Flight Center, Huntsville, AL, USA

Learning About Ares I from Monte Carlo Simulation

Hanson, John M.; Hall, Charlie E.; August 18, 2008; 19 pp.; In English; 2008 AIAA Guidance, Navigation and Control Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001903

This paper addresses Monte Carlo simulation analyses that are being conducted to understand the behavior of the Ares I launch vehicle, and to assist with its design. After describing the simulation and modeling of Ares I, the paper addresses the process used to determine what simulations are necessary, and the parameters that are varied in order to understand how the Ares I vehicle will behave in flight. Outputs of these simulations furnish a significant group of design customers with data needed for the development of Ares I and of the Orion spacecraft that will ride atop Ares I. After listing the customers, examples of many of the outputs are described. Products discussed in this paper include those that support structural loads analysis, aerothermal analysis, flight control design, failure/abort analysis, determination of flight performance reserve, examination of orbit insertion accuracy, determination of the Upper Stage impact footprint, analysis of stage separation, analysis of launch probability, analysis of first stage recovery, thrust vector control and reaction control system design, liftoff drift analysis, communications analysis, umbilical release, acoustics, and design of jettison systems.

Author

Aerothermodynamics; Monte Carlo Method; Ares 1 Launch Vehicle; Thrust Vector Control; Structural Analysis; Failure Analysis; Flight Characteristics

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.

20090001311 NASA Glenn Research Center, Cleveland, OH, USA; Jacobs Technology Inc., USA

Models of Lift and Drag Coefficients of Stalled and Unstalled Airfoils in Wind Turbines and Wind Tunnels

Spera, David A.; October 2008; 42 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNC05CA95C

Report No.(s): NASA/CR-2008-215434; E-16599; Copyright; Avail.: CASI: A03, Hardcopy

Equations are developed with which to calculate lift and drag coefficients along the spans of torsionally-stiff rotating airfoils of the type used in wind turbine rotors and wind tunnel fans, at angles of attack in both the unstalled and stalled aerodynamic regimes. Explicit adjustments are made for the effects of aspect ratio (length to chord width) and airfoil thickness ratio. Calculated lift and drag parameters are compared to measured parameters for 55 airfoil data sets including 585 test points. Mean deviation was found to be -0.4 percent and standard deviation was 4.8 percent. When the proposed equations were applied to the calculation of power from a stall-controlled wind turbine tested in a NASA wind tunnel, mean deviation from 54 data points was -1.3 percent and standard deviation was 4.0 percent. Pressure-rise calculations for a large wind tunnel fan deviated by 2.7 percent (mean) and 4.4 percent (standard). The assumption that a single set of lift and drag coefficient equations can represent the stalled aerodynamic behavior of a wide variety of airfoils was found to be satisfactory.

Author

Aerodynamic Drag; Lift; Aerodynamic Stalling; Aerodynamic Characteristics

20090001781 Air Force Research Lab., Wright-Patterson AFB, OH USA

Initial Characterization of Three-Dimensional Flow Separation in a Compressor Stator (Preprint)

Bailie, S T; Hile, Grant A; Puterbaugh, Steven L; Jun 2008; 16 pp.; In English

Contract(s)/Grant(s): Proj-3066

Report No.(s): AD-A486375; AFRL-RZ-WP-TP-2008-2174; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A research program is underway seeking to effect a net decrease in aerodynamic loss of a moderately loaded axial compressor stator passage across varying operating conditions. Three dimensional boundary layer separation, typical at the suction surface corners, can differ greatly from classical two dimensional separation, and is the dominant loss and blockage generating feature in the diffusing flowfield of compressor stators. The initial research phase is presently described, wherein

a typical modern stator configuration has been designed, and numerical simulations have been used to characterize the aerodynamic performance and key flow features of the baseline stator configuration. The evaluation has been conducted at the high subsonic inlet Mach design condition as well as off-design conditions, including varying incidence angle and inlet Mach number. Refinement and analysis of the baseline configuration is on-going, but the design's performance suggests it is a typical modern stator, providing a good benchmark for the planned competitive approaches towards performance improvement.
DTIC
Boundary Layer Separation; Compressors; Separated Flow; Stators; Three Dimensional Flow

03
AIR TRANSPORTATION AND SAFETY

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

20090000987 Bureau of Transportation Statistics, Washington, DC USA
U.S.-International Travel and Transportation Trends: 2006 Update
Sep. 2006; 63 pp.; In English
Report No.(s): PB2009-103176; No Copyright; Avail.: CASI: A04, Hardcopy

This report presents data on international travel to and from the USA. It combines data from a variety of sources to provide a more complete picture of U.S.-international travel than is available from individual sources. This report breaks out travel trends (inbound and outbound) with overseas (noncontiguous) countries and our North American neighbors, Canada and Mexico, which account for the greatest number of foreign travelers to the USA. A large number of people travel to and from the USA each year, making use of U.S. and foreign transportation carriers and infrastructure and generating a large amount of economic activity. The magnitude of this travel, involving nearly 340 million visits into and out of the USA in 2004, has far-reaching implications for planning transportation infrastructure, for tourism-related economic development, and for security, both in terms of terrorism concerns and planning for a possible global pandemic. The majority of the travel data in the report covers the period 2000 through 2004, allowing for comparison of international travel in the year immediately preceding and three years following the September 11, 2001 terrorist attacks. Compared to 2000, there were notably fewer U.S.-international trips taken from 2001 to 2004. The lowest period of international travel was in 2003. A prior RITA/BTS report in this series focuses on the travel trends between 1990 and 2000; however, for the convenience of the reader an appendix has been included to show trends from 1990 through 2004.
NTIS
Security; Terrorism; Transportation

20090001188 Army Research Lab., White Sands Missile Range, NM USA
Aviation Weather Routing Tool: A Decision Aid for Manned/Unmanned Aircraft Routing
Shirkey, Richard; Jameson, Terry; Jun 2008; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490137; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Requirements: What the User Must Decide: *Are the mission waypoints/altitudes OK? *How might the weather situation change? *How will the vehicle and its sensors be affected? *What the User Needs: An automated route optimization system.
DTIC
Decision Support Systems; Flight Conditions; Optimization; Pilotless Aircraft; Routes

20090001336 Civil Aerospace Medical Inst., Oklahoma City, OK, USA; Hendrix and Hendrix, Roswell, NM, USA
Pilot English Language Proficiency and the Prevalence of Communication Problems at Five U.S. Air Route Traffic Control Centers
Prinzo, O. V.; Hendrix, A. M.; Hendrix, R.; October 2008; 35 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): AM-B-05-HRR-516
Report No.(s): DOT/FAA/AM-08/21; Copyright; Avail.: CASI: A03, Hardcopy

Air traffic control (ATC) voice communication is built upon a readback-hearback loop: Controllers send messages to pilots who listen and then recite back their contents. Successful communication requires participants to conduct and understand ATC radiotelephony in the same language. Since inadequate language proficiency was involved in some aviation accidents (e.g.,

1996 Charkhi Dadri; 1995 Cali; 1977 Tenerife), the International Civil Aviation Organization (ICAO) is requiring its contracting states to ensure that ATC personnel and flight crews are proficient communicators of the English language when operating in airspace where the English language is required. Within the U.S., data are lacking concerning the prevalence of ATC communication problems attributable to the production and comprehension of English. This report presents communication problems involving readback errors, breakdowns in communication, and requests for repetition by commercial airline pilots. An analysis was performed on 50 hrs of air-ground transmissions provided by five ARTCCs. Each controller transmission was paired with its readback. Each readback was scored for accuracy (Prinzo, Hendrix, & Hendrix, 2007). The ICAO Language Proficiency Rating Scale guided encoding English language proficiency. Aircraft call signs were used to classify transmissions by aircraft registry (U.S., Foreign) and language (English, Other), forming three groups: Foreign-English, Foreign-Other, and US. English. Communications were analyzed from 832 aircraft (74% U.S., 26% Foreign) for 4,816 pilot transmissions (78% English, 22% Other). Of these aircraft transactions, 23% contained one or more communication MANOVA and ANOVA revealed that when English was the primary language or pilots flew U.S. aircraft, there were fewer communication problems, less time was spent on frequency, and fewer messages were transmitted than when pilots flew foreign aircraft or the primary language was not English. A chi-square analysis of 276 communication problems revealed that English language proficiency was a factor for 75% communication problems among the Foreign-Other aircraft and 29% involving U.S. English aircraft. The communication problems of the Foreign-English aircraft were excluded because of their joint classification with aircraft registry and language. Using the ICAO language proficiency scales as a guide revealed pronunciation (pilot accent) and fluency as contributing to communication problems among pilots of Foreign-Other registry aircraft. Among the US.-English flights, although fluency was a factor, it signaled uneasiness with an ATC instruction. The location of pauses, 'AHs' and 'Ums,' might differentiate less proficient speakers (markers appear within a phrase or cause) from more proficient speakers (markers appear before and after a phrase or clause). ICAO required that its language proficiency standards be implemented in March 2008. Being able to speak 'Aviation English' may be necessary, but it may not be sufficient in limiting communication problems. Language proficiency requirements beyond the minimum specified by ICAO must be realized if communication problems are to decline.

Author

Air Traffic Control; Civil Aviation; English Language; Voice Communication; Commercial Aircraft; Aircraft Pilots

20090001536 North Carolina State Univ., Raleigh, NC USA

The Interaction of Jet/Front Systems and Mountain Waves: Implications for Lower Stratospheric Aviation Turbulence

Vollmer, David R; Jan 2008; 217 pp.; In English

Contract(s)/Grant(s): FA8718-04-C-0011

Report No.(s): AD-A486101; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The role of jet streaks and their associated upper-level structures (fronts, troughs, thermal fields, etc.) in enhancing orographically-induced aviation turbulence near and above the tropopause is investigated. The primary hypothesis for this research suggests that there is an optimal configuration for the positioning of upper-level circulations leading to vertically confluent flow and differential thermal advection, forming an intense inversion. Such a configuration may be associated with vertically-intersecting ageostrophic jet circulations or trough-induced differential vertical motions leading to cold air undercutting a warm layer aloft, and compression of the warm layer in the presence of jet-induced shear. This structure is then perturbed by mountain waves, leading to a downscale cascade of kinetic energy, eventually leading to potential aviation turbulence. Two cases of clear-air turbulence (CAT) are examined using mesoscale numerical simulations. The first case involved a DC-8 attempting to cross the Colorado Front Range when it encountered extreme CAT resulting in loss of part of one wing and an engine. In this case the superposition of two distinct jet features was hypothesized to have established an unusually strong inversion just above the tropopause which allowed strong buoyancy-driven motions to enhance the horizontal shear and turbulent eddies, eventually leading to the turbulent downburst hypothesized to have played a role in damaging the aircraft. The second study used data from the Terrain-Induced Rotor Experiment (T-REX) and examined a turbulent wave-breaking event recorded by a research aircraft in the lower stratosphere. A different jet regime was found in this case, with and a strong lower stratospheric inversion. The vertical variation of static stability in the lower stratosphere was found to create a favorable environment for amplification and breaking of the mountain wave in this case.

DTIC

Atmospheric Circulation; Clear Air Turbulence; Mountains; Stratosphere; Streams; Turbulence

20090001574 Armstrong Lab., Mesa, AZ USA

Tools for Assessing Situational Awareness in an Operational Fighter Environment

Waag, Wayne L; Houck, Michael R; Jan 1994; 8 pp.; In English

Contract(s)/Grant(s): Proj-1123

Report No.(s): AD-A486172; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Three Situational Awareness Rating Scales (SARS) were developed to measure pilot performance in an operational fighter environment. These instruments rated situational awareness (SA) from three perspectives: supervisors, peers, and self-report. SARS data were gathered from 205 mission-ready USAF F-15C pilots from eight operational squadrons. Reliabilities of the SARS were quite high, as measured by their internal consistence (0.95 to 0.99) and inter-rater agreement (0.88 to 0.97). Correlations between the supervisory and peer SARS were strongly positive (0.89 to 0.92), while correlations with the self-report SARS were positive, but smaller (0.45 to 0.57). a composite SA score was developed from the supervisory and peer SARS using a principal components analysis. The resulting score was found to be highly related to previous flight experience and current flight qualification. A prediction equation derived from available background and experience factors accounted for 73% of its variance. Implications for use of the composite SA score as a criterion measure are discussed.

DTIC

Fighter Aircraft; Flight Tests; Jet Aircraft; Pilots; Situational Awareness

20090001851 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Documentation of Sensory Information in the Operation of Unmanned Aircraft Systems

Williams, Kevin W.; October 2008; 58 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): AHRR52

Report No.(s): DOT/FAA/AM-08/23; No Copyright; Avail.: CASI: A04, Hardcopy

For manned aircraft, the presence of multi-sensory inputs is a given. Pilots of manned aircraft might not even be aware of the availability of several different types of sensory inputs occurring at the same time. However, it is likely that each type of input has a reinforcing effect on the others that allows for a rapid diagnosis and response of both normal and unusual events in the cockpit. The situation for the pilot of an Unmanned Aircraft System (UAS) is much different. UAS pilots receive information regarding the state and health of their aircraft solely through electronic displays. This report includes a comparison of manned sensory information to sensory information available to the unmanned aircraft pilot, a review of remediations for sensory deficiencies from the current UAS inventory, a review of human factors research related to enhancing sensory information available to the UAS pilot, and a review of current FAA regulations related to sensory information requirements. Analyses demonstrated that UAS pilots receive less and fewer types of sensory information, compared with manned aircraft pilots. One consequence is the enhanced difficulty for UAS pilots to recognize and diagnose anomalous flight events that could endanger the safety of the flight. Recommendations include the incorporation of multisensory alert and warning systems into UAS control stations.

Author

Human Factors Engineering; Pilotless Aircraft; Display Devices; Sensory Perception; Aerospace Medicine

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.

20090001144 NASA Dryden Flight Research Center, Edwards, CA, USA

F-15 IFCS Intelligent Flight Control System

Bosworth, John T.; October 23, 2008; 33 pp.; In English; Workshop on Adaptive Controls Technology Assessment, 23-24 Oct. 2008, Denver, CO, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001144

This viewgraph presentation gives a detailed description of the F-15 aircraft, flight tests, aircraft performance and overall advanced neural network based flight control technologies for aerospace systems designs.

CASI

Aerospace Systems; F-15 Aircraft; Flight Control; Control Systems Design; Neural Nets; Full Scale Tests

20090001528 Pennsylvania State Univ., University Park, PA USA

High Performance Piezoelectric Airframes for Nano Air Vehicles

Kommepalli, H; Hirsh, A; Rahn, C; Tadigadapa, S; Jun 30, 2008; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-07-1-0367

Report No.(s): AD-A486087; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Currently, Unmanned Air Vehicles (UAVs) are too large to penetrate buildings for situational awareness and reconnaissance, emplace important sensors, and sample and return material. While a variety of Micro Air Vehicles have been built and flown that use propellers and flapping wings for lift generation, Nano Air Vehicles (NAVs), defined as weighing less than 10 grams with wingspans less than 7.5 cm, have yet to be flown. NAV-scale actuators and wings with the requisite range of motion, power, and efficiency do not exist. In this project, we used a newly developed micromachining process based on Inductively Coupled Plasma Reactive Ion Etching (ICP-RIE), for PZT chips to fabricate novel, high performance actuators for NAVs. A novel T-beam actuator was fabricated using ICP-RIE etching from the front of a bulk PZT chip. Masked electrode deposition created active and passive regions in the PZT structure. With a T-shaped cross section, and bottom and top flange and web electrodes, a cantilevered beam can bend in-plane and out-of-plane with bimorph actuation in both directions. One of these T-beam actuators was fabricated and experimentally tested. An experimentally validated model predicted that the cross-section geometry can be optimized to produce higher displacement and blocking force.

DTIC

Actuators; Airframes; Lead Zirconate Titanates; Microelectromechanical Systems; Micromachining; Piezoelectricity; Plasma Etching; Reactivity

20090001603 Library of Congress, Washington, DC USA

F-22A Raptor

Bolkcom, Christopher; Aug 13, 2008; 24 pp.; In English

Report No.(s): AD-A486253; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The F-22A Raptor is a next-generation fighter/attack aircraft that features the latest stealth technology to reduce detection by radar. Using more advanced engines and avionics than the current F-15 Eagle, the F-22A is intended to maintain U.S. Air Force capabilities against more sophisticated enemy aircraft and air defenses in the 21st century. This report examines the Air Force's F-22A raptor program, including costs and schedule; considers several key issues, and concludes with a synopsis of recent legislative activity on the program. In 1986, two contractors were selected to build competing prototypes, Lockheed's YF-22 and Northrop's YF-23, which were flight tested in late 1990. In April 1991, the Air Force selected Lockheed's YF-22 design for full-scale development, now termed System Development and Demonstration (SDD). The aircraft is powered by Pratt & Whitney's F119 engine, selected in competition with General Electric's F120 engine. In December 2005, the Air Force announced that the 12 F-22 aircraft with the 27th Fighter Squadron, 1st Fighter Wing, Langley Air Force Base, had reached initial operational capability (IOC).

DTIC

Aircraft Detection; Fighter Aircraft; Jet Aircraft; Radar Equipment; Stealth Technology

20090001608 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Quadrotor Sensor Platform

Stepaniak, Michael; Aug 2008; 114 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486264; CL09-0024; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Global Positioning System (GPS) has become the de facto standard for precision navigation for many applications. However, the line-of-sight signals required by the GPS receiver are not always accessible in a cluttered environment, such as mountainous terrain or an urban setting. In addition, the satellite signals operate at a low power level making GPS susceptible to interference and jamming. Scenarios such as these require an alternate means of providing high level accuracy. To that end, the Avionics Engineering Center (AEC) at Ohio University (OU) has begun to investigate the ability of a scanning laser range finder, or LADAR, to augment GPS. One scenario under consideration is that of a small unmanned aerial vehicle (UAV) which has been navigating using GPS but then descends into a city for the next phase of its mission. Inside this 'urban canyon,' access to the GPS satellite signals is blocked by towering buildings and an alternate means of navigation is required to maintain precise positioning. A tactical grade inertial navigation system (INS) would satisfy the requirement, but the cost is prohibitive for an unmanned system. Instead, a line scanning LADAR updates the vehicle's position and attitude using range data collected from planar surfaces. The quadrotor sensor platform is especially well suited for the scanning LADAR since the vehicle itself can be used to 'gimbal' the sensor. In other words, small rolling and pitching motions, either commanded or incidental, will generate multiple LADAR line scans across each flat surface. A minimum of three separate scans is required

for each planar surface to obtain a three-dimensional solution, but multiple scans are not possible without some means of gimbaling the LADAR.
DTIC
Detectors; Drone Vehicles; Lasers; Pilotless Aircraft; Rotors

20090001844 Army Aeromedical Research Lab., Fort Rucker, AL USA
Evaluation of a Gentex (registered trademark) ORO-NASAL Oxygen Mask for Integration with the Aqualung (registered trademark) Personal Helicopter Oxygen Delivery System (PHODS)
Roller, Richard A; Curry, Ian P; Jul 13, 2008; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485763; USAARL-2008-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485763

In current U. S. Army operations, rotary-wing aircrew can be repeatedly exposed to moderately high altitude (up to 18,000 feet pressure altitude), making hypoxia, and its performance effects, a real hazard. The USA Army Aeromedical Research Laboratory (USAARL) was tasked by the Product Manager Air Warrior to evaluate an oxygen mask for use with the Personal Helicopter Oxygen Delivery System (PHODS) for potential use by U. S. Army helicopter aircrew. The mask was tested on pilot volunteers at altitude to determine efficacy. The mask and PHODS was able to maintain aircrew blood oxygen at acceptable levels up to and including 18,000 feet.
DTIC
Evaluation; Helicopters; Oxygen Masks; Oxygen Supply Equipment; System Effectiveness

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.

20090001334 United Space Alliance, Houston, TX, USA
Space Shuttle Usage of z/OS
Green, Jan; March 2009; 51 pp.; In English; SHARE (Session 2819), 1-6 Mar. 2009, Austin, TX, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS9-20000; NNJ06VA01C; Copyright; Avail.: CASI: A04, Hardcopy

This viewgraph presentation gives a detailed description of the avionics associated with the Space Shuttle's data processing system and its usage of z/OS. The contents include: 1) Mission, Products, and Customers; 2) Facility Overview; 3) Shuttle Data Processing System; 4) Languages and Compilers; 5) Application Tools; 6) Shuttle Flight Software Simulator; 7) Software Development and Build Tools; and 8) Fun Facts and Acronyms.
CASI
Avionics; Data Processing Equipment; Space Shuttles; Airborne/Spaceborne Computers; Software Engineering; Space Shuttle Boosters; Operating Systems (Computers); Computerized Simulation

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)*.

20090001147 NASA Dryden Flight Research Center, Edwards, CA, USA
Western Aeronautical Test Range
Sakahara, Robert D.; November 18, 2008; 17 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001147

This viewgraph presentation reviews the work of the Western Aeronautical Test Range (WATR). NASA's Western Aeronautical Test Range is a network of facilities used to support aeronautical research, science missions, exploration system concepts, and space operations. The WATR resides at NASA's Dryden Flight Research Center located at Edwards Air Force

Base, California. The WATR is a part of NASA's Corporate Management of Aeronautical Facilities and funded by the Strategic Capability Asset Program (SCAP). Maps show the general location of the WATR area that is used for aeronautical testing and evaluation. The products, services and facilities of WATR are discussed,
CASI
Organizations; Test Ranges; Aeronautics; NASA Programs

20090001854 Applied Research Associates, Inc., Tyndall AFB, FL USA
USA Air Force Research on Airfield Pavement Repairs Using Precast Portland Cement Concrete (PCC) Slabs (BRIEFING SLIDES)
Saeed, Athar; Aug 28, 2008; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4915
Report No.(s): AD-A485711; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485711

AFRL is developing a method for contingency rigid pavement Portland cement concrete (PCC) slab repairs using precast PCC slab panels. AFRL is leading the technology development by critically reviewing the research conducted to date in this arena by the Air Force and the highway and civil aviation agencies and adopting the techniques for Air Force needs. The repairs must be made at off-peak traffic times (often at night), and the airfield must be ready for aircraft operations by the time of next high operations tempo which might be within six to eight hours. The research objective is to critically review the pre-cast slab repair research conducted to-date by AFRL and to optimize the equipment, materials, and techniques for precast slab repair including technology transfer activities including, but not limited to, training, reports and preparation of ETLs.
DTIC
Airports; Cements; Chutes; Concretes; Landing Sites; Maintenance; Military Technology; Pavements; Research and Development; Slabs; United States

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*.

20090001047 National Academy of Sciences - National Research Council, Washington, DC, USA
Satellite Observations to Benefit Science and Society: Recommended Missions for the Next Decade
January 2008; 40 pp.; In English
Report No.(s): PB2009-102296; Copyright; Avail.: National Technical Information Service (NTIS)

Satellite Observations to Benefit Science and Society: Recommended Missions for the Next Decade brings the next ten years into focus for the Earth and environmental science community with a prioritized agenda of space programs, missions, and supporting activities that will best serve scientists in the next decade. These missions will address a broad range of societal needs, such as more reliable weather forecasts, early earthquake warnings, and improved pollution management, benefiting both scientific discovery and the health and well-being of society. Based on the 2007 book, Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond, this book explores each of the seventeen recommended missions in detail, identifying launch dates, responsible agencies, estimated cost, scientific and public benefits, and more. Printed entirely in color, the book features rich photographs and illustrations, tables, and graphs that will keep the attention of scientists and non-scientists alike.
NTIS
Earth Sciences; Satellite Observation; Satellite-Borne Photography

20090001063 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Interactive Exploration and Modeling of Large Data Sets: A Case Study with Venus Light Scattering Data
Van Wijk, J. J.; Spoelder, H. J. W.; Knibbe, W. J. J.; Shahroudi, K. E.; Aug. 31, 1997; 10 pp.; In English
Report No.(s): PB2009-102320; SEN-R9719; Copyright; Avail.: National Technical Information Service (NTIS)

We present a system where visualization and the control of the simulation are integrated to facilitate interactive exploration and modeling of large data sets. The system was developed to estimate properties of the atmosphere of Venus from

comparison between measured and simulated data. Reuse of results, distributed computing, and multiple views on the data were the major ingredients to create an effective environment.
NTIS
Light Scattering; Control Simulation; Venus Atmosphere

20090001420 Army War Coll., Carlisle Barracks, PA USA
Operationally Responsive Space: A New Defense Business Model
Cebrowski, Arthur K; Raymond, John W; Jan 2005; 12 pp.; In English
Report No.(s): AD-A485888; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485888

Space capabilities are a prominent element within the collection of global advantages the USA enjoys today. Space is one of the 'commons,' along with the sea and cyberspace, that constitute the triad of capabilities on which America's global power rests. But several ominous trends now compel a reassessment of the current business model for meeting the nation's needs for military space capabilities. While the existing model has served the nation well, a new business model is at hand and can now be readily grasped to propel us into the future. Trends compelling this reassessment include: falling barriers to competitive entry into the commons of space, an increasing dependency on space capabilities, and emerging vulnerabilities in current space systems. In addition, there are systemic issues emerging across the spectrum that require a reexamination of how the nation acquires these precious assets. Such issues include: the fact that important space programs are in trouble for reasons either financial or technical; the growing need to recapitalize space capabilities; decreasing industrial base viability; reduced science and technology funding; and the need to develop space professionals. The current business model for space is unable to support, by itself, the combined weight of these accumulating pressures.
DTIC
Aerospace Systems; Commerce

20090001472 McGill Univ., Montreal, Quebec Canada
Implementing International Standards for 'Continuing Supervision'
Spencer, Jr, Ronald L; Jun 2008; 117 pp.; In English
Report No.(s): AD-A486089; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486089

The Outer Space Treaty established the obligation to provide continuing supervision of its national space activities by the appropriate state. The implementation of this obligation remains a matter of state discretion. Since this Treaty came into force the world has evolved to become reliant on space based utilities to enable the global economy and state governance. Today, space faring states are increasingly dependent upon the supervision practices of other states to assure its space interests as the attribution of state responsibility becomes more difficult to ascribe. Therefore, the absence of binding supervision standards may become an impediment to future space applications due to three identified trends. First, the trend towards space commercialization requires active state supervision. Second, the rise in environmental hazards requires minimal safety standards to decrease the harmful effects on space applications. Third, space security requires identification of intentional acts and prudent measures to safeguard vital space applications.
DTIC
Extraterrestrial Environments; Outer Space Treaty; Personnel Management

20090001624 RAND Corp., Santa Monica, CA USA
Improving the Cost Estimation of Space Systems. Past Lessons and Future Recommendations
Younossi, Obaid; Lorell, Mark A; Brancato, Kevin; Cook, Cynthia R; Eisman, Mel; Fox, Bernard; Graser, John C; Kim, Yool; Leonard, Robert S; Pfleeger, Shari L; Sollinger, Jerry M; Jan 2008; 242 pp.; In English
Contract(s)/Grant(s): FA7014-06-C-0001
Report No.(s): AD-A486329; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In response to historically high cost growth in the acquisition of space systems, the Under Secretary of the Air Force, in accordance with National Security Space (NSS) Acquisition Policy, directed the Air Force acquisition community to support the development of independent, accurate, and timely cost analyses to make the acquisition of NSS systems more realistic in terms of estimated costs. In turn, the former commander of Air Force Space Command (AFSPC), Gen Lance W. Lord, and the former commander of the Air Force Space and Missile Systems Center (SMC), Lt Gen Michael Hamel, asked RAND Project AIR FORCE to assess cost-estimating requirements and capabilities of SMC cost-estimating organizations as well as

their resources, tools, methods and processes and to recommend an enhanced approach to cost analysis aimed at improving cost-estimating for space systems and increasing the understanding of factors that influence their cost. The study was sponsored by the former commander of SMC, General Hamel. The project technical monitor was Col Delane Aguilar, SMC/FMC. The research was conducted within the Resource Management Program of RAND Project AIR FORCE as part of a multiyear study entitled Air Force Space Systems Costs. The initial data collection was completed in May of 2006 and the final update was provided in February of 2007, with frequent updates in between. The final briefing was presented to General Hamel on March 13, 2007, and to Gen Kevin P. Chilton, the former commander of Air Force Space Command, on March 21, 2007. This monograph should interest government personnel involved in cost estimation and acquisition of defense systems, the military space acquisition communities, and those concerned with current and future acquisition policies.
DTIC
Aerospace Systems; Cost Estimates

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

20090001269 NASA Stennis Space Center, Stennis Space Center, MS, USA
Activation of the E1 Ultra High Pressure Propulsion Test Facility at Stennis Space Center
Messer, Bradley; Messer, Elisabeth; Sewell, Dale; Sass, Jared; Lott, Jeff; Dutreix, Lionel, III; [2001]; 7 pp.; In English; 37th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 8-11 Jul. 2001, Salt Lake City, UT, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 2001-3380; SE-2001-04-00015-SSC; Copyright; Avail.: CASI: A02, Hardcopy

After a decade of construction and a year of activation the El Ultra High Pressure Propulsion Test Facility at NASA's Stennis Space Center is fully operational. The El UHP Propulsion Test Facility is a multi-cell, multi-purpose component and engine test facility . The facility is capable of delivering cryogenic propellants at low, high, and ultra high pressures with flow rates ranging from a few pounds per second up to two thousand pounds per second. Facility activation is defined as a series of tasks required to transition between completion of construction and facility operational readiness. Activating the El UHP Propulsion Test Facility involved independent system checkouts, propellant system leak checks, fluid and gas sampling, gaseous system blow downs, pressurization and vent system checkouts, valve stability testing, valve tuning cryogenic cold flows, and functional readiness tests.
Author
Test Facilities; Cryogenic Rocket Propellants; Engine Tests; Systems Engineering; Stability Tests; Propulsion; Flow Velocity; High Pressure; Activation

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*.

20090000977 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares Launch Vehicles Lean Practices Case Study
Doreswamy, Rajiv, N.; Self, Timothy A.; March 2008; 12 pp.; In English; IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090000977

This viewgraph presentation describes test strategies and lean philisophies and practices that are applied to Ares Launch Vehicles. The topics include: 1) Testing strategy; 2) Lean Practices in Ares I-X; 3) Lean Practices Applied to Ares I-X Schedule; 4) Lean Event Results; 5) Lean, Six Sigma, and Kaizen Practices in the Ares Projects Office; 6) Lean and Kaizen Success Stories; and 7) Ares Six Sigma Practices.
CASI
Ares 1 Launch Vehicle; Project Planning; Space Exploration; NASA Space Programs

20090000992 Commerce Dept., Washington, DC, USA

National Oceanic and Atmospheric Administration: Follow-up Audit Inspection Report OSE-15676 'Acquisition of NEXRAD Transition Power Source Marred by Management, Technical, and Contractural Problems.' Audit Report No. BSD-17613-5-0001

Sep. 2005; 7 pp.; In English

Report No.(s): PB2009-102700; No Copyright; Avail.: CASI: A02, Hardcopy

Both Congresswoman Constance Morella and Representative Chris Van Hollen expressed concerns about a contract the National Oceanographic and Atmospheric Administration (NOAA) issued for acquisition of NEXRAD transitiion power sources and a subsequent modification of that contract. Specifically, they wanted to know if: (1) the National Weather Service paid for defective equipment, and (2) the actions of the NOAA contracting officer with regard to the contract modification that changed t a different transition power source received proper review and oversight. The OIG found that the National Weather Service did in fact pay for defective equipment. Other details are given in the report.

NTIS

Contract Management; Inspection; Meteorological Radar

20090000993 Commerce Dept., Washington, DC, USA

National Oceanic and Atmospheric Administration: Satellite Memorandums of Agreement Should be Improved by Using New Guidance. Inspection Report No. BSD-16927-0001

Mar. 2005; 26 pp.; In English

Report No.(s): PB2009-102702; No Copyright; Avail.: CASI: A03, Hardcopy

This report discusses our review of two MOAs used by the National Oceanic and Atmospheric Administration's (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS) to acquire environmental satrellites through the National Aeronautics and Space Administration (NASA).

NTIS

Inspection; Oceans; Agreements

20090000994 Commerce Dept., Washington, DC, USA

National Oceanic and Atmospheric Administration: Progress Being Made in Certification and Accreditation Process, but Authorizing Officials Still Lack Adequate Decision-making Information. Final Report No. OSE-18019

Sep. 2006; 30 pp.; In English

Report No.(s): PB2009-102703; No Copyright; Avail.: CASI: A03, Hardcopy

This report presents the findings from our FY 2005 Federal Information Security Management Act (FISMA) review that relate to important parts of NOAAs certification and accreditation (C&A) process: (1) systemsecurity plans/risk assessments, and (2) security control assessments. System certification is the comprehensive assessment of security controls implemented in an information system. It determines the extent to which controls are implemented correctly, operating as intended, and meeting the security requirements for the system. Accreditation is managements formal authorization to allow a system to operate and includes an explicit acceptance of the risk posed by the identified remaining vulnerabilities. For FY 2005, we reviewed the C&A documentation for three NOAA systems: the Search and Rescue Satellite-aided Tracking system (SARSAT), the Polar Orbiting Operational Environmental Satellite Ground System (POES), and the Office of Response and Restoration Seattle Local Area Network (Seattle LAN). Each of these systems was certified and accredited as part of NOAAs C&A improvement effort.

NTIS

Certification; Computer Information Security; Decision Making; Security

20090001165 NASA Marshall Space Flight Center, Huntsville, AL, USA

Analysis and Design of Launch Vehicle Flight Control Systems

Wie, Bong; Du, Wei; Whorton, Mark; August 18, 2008; 11 pp.; In English; 2008 AIAA Guidance, Navigation and Control Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper describes the fundamental principles of launch vehicle flight control analysis and design. In particular, the classical concept of 'drift-minimum' and 'load-minimum' control principles is re-examined and its performance and stability robustness with respect to modeling uncertainties and a gimbal angle constraint is discussed. It is shown that an additional feedback of angle-of-attack or lateral acceleration can significantly improve the overall performance and robustness, especially

in the presence of unexpected large wind disturbance. Non-minimum-phase structural filtering of 'unstably interacting' bending modes of large flexible launch vehicles is also shown to be effective and robust.
Author
Launch Vehicles; Flight Control; Stability; Bending; Angle of Attack; Robustness (Mathematics)

20090001212 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Minimizing Secular J2 Perturbation Effects on Satellite Formations
Wright, Jonathan W; Mar 2008; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A489731; AFIT/GA/ENY/08-M08; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489731

The purpose of this thesis is to examine the secular effects of the J2 oblateness perturbation on close proximity satellites. The main objective is to analyze the deputy's position and velocity with respect to the chief and adjust the initial conditions of the deputy in an attempt to minimize the secular effects of J2 perturbations. Previous work has provided a method of obtaining a closed form solution for J2 invariance with co-planar orbits. Therefore, this work will primarily consider deputy orbits that experience motion outside of the chief's orbital plane Upon determining the required initial conditions, the invariance will be verified through numerical integration. The method will be considered successful when it is able to reduce secular effects to near numerical tolerances.
DTIC
Artificial Satellites; Long Term Effects; Orbits; Perturbation

20090001284 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares I-X Flight Test--The Future Begins Here
Davis, Stephan R.; Tuma, Margaret L.; Heitzman, Keith; May 14, 2007; 11 pp.; In English; Joint Army-Navy-NASA-Air Force (JANNAF) Conference, 14-17 May 2007, Denver, Co, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001284

In less than two years, the National Aeronautics and Space Administration (NASA) will launch the Ares I-X mission. This will be the first flight of the Ares I crew launch vehicle, which, together with the Ares V cargo launch vehicle, will eventually send humans to the Moon, Mars, and beyond. As the countdown to this first Ares mission continues, personnel from across the Ares I-X Mission Management Office (MMO) are finalizing designs and fabricating vehicle hardware for a 2009 launch. This paper will discuss the hardware and programmatic progress of the Ares I-X mission.
Author
Ares 1 Launch Vehicle; Flight Tests; Aerospace Engineering; Spacecraft Design; Spacecraft Components; NASA Programs

20090001387 Royal Observatory, Brussels, Belgium
Use of Geodetic Receivers for TAI
Defraigne, P; Petit, G; Bruyninx, C; Jan 2002; 9 pp.; In English
Report No.(s): AD-A485791; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485791

The classical time transfer method used to realize the TAI (International Atomic Time) is based on the common-view technique, with GPS observations collected by C/A code receivers. The resulting clock offsets between the laboratory clock and GPS time are obtained from a fixed procedure defined by the CCTF (Consultative Committee for Time and Frequency). A similar procedure can be applied on the RINEX observation files produced by geodetic receivers driven by a stable external frequency. We propose here to modify the CCTF procedure for the links between geodetic receivers, in order to take advantage of the P codes available on L1 and L2. This new procedure forms the ionosphere-free combination of the P1 and P2 codes as given by the 30-second RINEX observation files, the standard of the international GPS Service (IGS), and uses the satellite positions as deduced from the IGS rapid orbits. The procedure is tested using the Ashtech Z-XII3T geodetic receivers and the results are compared to those obtained with the classical CCTF procedure based on the C/A code. For short baselines, the Allan deviations up to 10 days are equivalent, while there is an improvement of a factor 2 for the transatlantic time link.
DTIC
Atomic Clocks; Atoms; Geodesy; Geodetic Satellites; Receivers

20090001445 McGill Univ., Montreal, Quebec Canada

The Law of Neutrality in Outer Space

Jarman, Robert W; Sep 2008; 125 pp.; In English; Original contains color illustrations

Report No.(s): AD-A485937; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485937

Satellite telecommunications, global navigation and remote sensing systems are key drivers in the ongoing transformation of an industrial based global economic order to one increasingly dominated by information services. A growing number of States are establishing an independent presence in outer space and all States (and indeed, individuals) can access a broad range of affordable space-related products and services (e.g., Google Earth imagery, GPS receivers, and global voice and data transmissions). Consistent with broad historical trends, these technologies are inevitably influencing the way States think about, plan for, and conduct warfare. Inspired by the prospect of seizing the ultimate 'high ground' of outer space and achieving 'information superiority' over an enemy, militaries around the world are rapidly pursuing independent space capabilities and adapting their strategies, doctrine and force structures to reflect these capabilities. These trends have prompted various political and legal efforts to ban the placement and/or use of weapons in outer space. As these efforts have failed to gain traction and seem unlikely to do so in the foreseeable future, this thesis argues that existing bodies of international law grounded in a pragmatic acceptance of armed conflict must be consulted if humankind wishes to mitigate the impact and spread of warfare conducted in, from and through outer space. In particular, this thesis will examine how the traditional customary principles underlying the law of neutrality may be reconceptualized by States to serve as a mechanism to mediate competing claims of belligerents and neutrals during armed conflict in outer space. After a brief introduction, Chapters One and Two will develop the economic and military trends discussed above. Chapter Three will provide an overview of the relevant international law governing military activities in outer space. Chapter four will analyze the law governing State responsibility for outer space.

DTIC

Extraterrestrial Environments; International Law; Space Law

20090001525 Library of Congress, Washington, DC USA

Extending NASA's Exemption from the Iran, North Korea, and Syria Nonproliferation Act

Behrens, Carl; Nikitin, Mary B; Jul 30, 2008; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486070; CRS-RL34477; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Iran Nonproliferation Act of 2000 (INA) was enacted to help stop foreign transfers to Iran of weapons of mass destruction, missile technology, and advanced conventional weapons technology, particularly from Russia. Section 6 of the INA banned U.S. payments to Russia in connection with the International Space Station (ISS) unless the U.S. President determined that Russia was taking steps to prevent such proliferation. When the President in 2004 announced that the Space Shuttle would be retired in 2010, the Russian Soyuz became the only vehicle available after that date to transport astronauts to and from the ISS. In 2005 Congress amended INA to exempt Soyuz flights to the ISS from the Section 6 ban through 2011. It also extended the provisions to Syria and North Korea, and renamed it the Iran, North Korea, and Syria Nonproliferation Act (INKSNA). NASA has now asked Congress to extend the exemption for the life of the ISS, or until U.S. crew transport vehicles become operational. As in 2005, an exemption would be needed before payments could be made to Russia since the President has not made a determination pursuant to Section 6(b) of the INKSNA regarding Russian nonproliferation policy or proliferation activities to Iran, North Korea or Syria. Since 2005, Russia has stepped up cooperation with the USA and countries over Iran's nuclear program. President Bush has praised Russian President Putin for his leadership in offering a solution to the Iranian nuclear negotiations.

DTIC

Iran; North Korea; Space Stations; Syria

20090001577 Surrey Univ., Guildford, UK

Very Small Satellite Design for Space Sensor Networks

Barnhart, David J; Jun 2008; 233 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486188; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An investigation of very small satellite miniaturisation techniques is presented, focusing on sub-kilogram technologies targeted at space sensor network applications. Distributed space mission concepts are emerging for scientific and remote sensing applications. This architecture will enable observation of real-time multi-point phenomena. Space economics and environmental concerns dictate a cost-effective mass-producible low-mass satellite for brief but essential missions in low Earth orbit. Very small satellite technologies have been investigated, assessed, and compared. Two novel design methodologies have

been developed, simulated, and verified through functional and environmental testing of hardware. SpaceChip is a monolithic heterogeneous system-on-a-chip integration approach that proves applicable to sensor networks in hostile environments which require simple sensors and sub-kilometre separations. Five prototype chips have been fabricated with promising results. A method has been investigated for on-chip series connection of solar cells yielding a 3.4% efficient system-on-a-chip power supply. Furthermore, a microprocessor design technique was developed that verifies the synergy of radiation hardening by design and asynchronous logic. PCBSat is proposed as a satellite-on-a-PCB miniaturisation approach focused on deriving the smallest practical satellite within context of space sensor networks and use of commercial components, processes, and deployment systems. The concept has been validated by flight model development and test for $10,000 to orbit in quantity. PCBSat emerges as an optimal tradeoff between cost and performance. A case study investigation of ionospheric plasma depletions, known to cause problematic navigation and communication outages, provided a comparison vehicle of all technologies considered in this effort. This research has provided new cost-effective miniaturisation approaches enabling sensor network architectures.
DTIC
Microinstrumentation; Satellite Constellations; Satellite Design; Sensors

20090001830 National Inst. of Standards and Technology, Boulder, CO USA
Sources of Instabilities in Two-Way Satellite Time Transfer
Parker, T E; Zhang, V; Aug 2005; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485912; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485912

Two-Way Satellite Time and Frequency Transfer 'TWSTFT' has become an important component in the international system for comparing time and frequency over long distances. In order to make further improvements in the stability of TWSTFT a more complete understanding of the sources of instabilities is required. This paper analyzes several sources of instabilities, including environmental factors, ionospheric delay, satellite motion and the satellite transponder.
DTIC
Artificial Satellites; Stability

20090001836 Air Force Research Lab., Edwards AFB, CA USA
Space Survivability of Main-Chain and Side-Chain POSS-Kapton Polyimides
Tomczak, Sandra J; Wright, Michael E; Guenthner, Andrew J; Pettys, Brian J; Brunsvold, Amy L; Knight, Casey; Minton, Timothy K; Vij, Vandana; McGrath, Laura M; Mabry, Joseph M; May 2008; 15 pp.; In English
Report No.(s): AD-A485804; AFRL-RZ-ED-TP-2008-202; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485804

Kapton polyimide (PI) is extensively used in solar arrays, spacecraft thermal blankets, and space inflatable structures. Upon exposure to atomic oxygen (AO) in low Earth orbit (LEO), Kapton is severely degraded. An effective approach to prevent this erosion is chemically bonding polyhedral oligomeric silsesquioxane (POSS) into the polyimide matrix by copolymerization of POSS-diamine with the polyimide monomers. POSS is a silicon and oxygen cage-like structure surrounded by organic groups and can be polymerizable. The copolymerization of POSS provides Si and O in the polymer matrix on the nano level. During POSS polyimide exposure to atomic oxygen, organic material is degraded and a silica passivation layer is formed. This silica layer protects the underlying polymer from further degradation. Ground-based studies and MISSE-1 and MISSE-5 flight results have shown that POSS polyimides are resistant to atomic-oxygen attack in LEO.
DTIC
Aerospace Environments; Kapton (Trademark); Plastics; Polyimides

20090001893 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares I Crew Launch Vehicle Upper Stage Avionics and Software Overview
Nola, Charles L.; July 20, 2008; 11 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 20-23 Jul. 2008, Hartford, CT, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001893

This viewgraph presentation gives an overall description of the avionics and software functions of the Ares I Upper Stage Crew Launch Vehicle. The contents include: 1) IUA Team - Development Approach Roadmap; 2) Ares I US Avionics and Software Development Approach; 3) NDT Responsibilities; 4) Ares I Upper Stage Avionics Locations; 5) Ares I Overall

Avionics & Software Functions; 6) Block Diagram Version of Avionics Architecture; 7) Instrument Unit Avionics Preliminary Design; and 8) Upper Stage Avionics External Interfaces.
CASI
Ares 1 Upper Stage; Software Engineering; General Overviews; Avionics; NASA Space Programs

20090001900 NASA Marshall Space Flight Center, Huntsville, AL, USA
Michoud Assembly Facility (MAF), 'Spray in Air' Overview
Albyn, Keith; Burns, DeWitt; August 28, 2008; 25 pp.; In English; Informational Briefing to Prospective Vendor, 29 Aug. 2008, New Orleans, LA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001900

A general overview of the Michoud Assembly Facility Spray in Air processing is presented. The possible areas of Spray in Air Processing at the Michoud Assembly Facility are also identified.
CASI
Test Facilities; General Overviews; Ares 1 Upper Stage; Spraying; Fabrication; External Tanks

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*.

20090001323 NASA Glenn Research Center, Cleveland, OH, USA
Orion Crew Member Injury Predictions during Land and Water Landings
Lawrence, Charles; Littell, Justin D.; Fasanella, Edwin L.; Tabiei, Ala; March 03, 2008; 16 pp.; In English; Earth and Space Conference 2008: 11th International Conference on Engineering, Science, Construction and Operations in Challenging Environments, 3-5 Mar. 2008, Long Beach, CA, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 896021.05.07.13; Copyright; Avail.: Other Sources

A review of astronaut whole body impact tolerance is discussed for land or water landings of the next generation manned space capsule named Orion. LS-DYNA simulations of Orion capsule landings are performed to produce a low, moderate, and high probability of injury. The paper evaluates finite element (FE) seat and occupant simulations for assessing injury risk for the Orion crew and compares these simulations to whole body injury models commonly referred to as the Brinkley criteria. The FE seat and crash dummy models allow for varying the occupant restraint systems, cushion materials, side constraints, flailing of limbs, and detailed seat/occupant interactions to minimize landing injuries to the crew. The FE crash test dummies used in conjunction with the Brinkley criteria provides a useful set of tools for predicting potential crew injuries during vehicle landings.
Author
Astronauts; Water Landing; Impact Tolerances; Crashes; Predictions; Space Capsules; Flight Crews

20090001917 NASA Johnson Space Center, Houston, TX, USA
Implications of Advanced Crew Escape Suit Transpiration for the Orion Program
Bue, Grant; Kuznetz, Lawrence; [2009]; 1 pp.; In English; 39th International Conference on Environmental Systems, 12 - 16 Jul. 2009, Georgia, USA; No Copyright; Avail.: Other Sources; Abstract Only

Human testing was conducted to more fully characterize the integrated performance of the Advanced Crew Escape Suit (ACES) with liquid cooling provide by an Individual Cooling Unit (ICU) across a broad range of environmental conditions and metabolic rates. Together with a correlation for the ACES Liquid Cooling Garment as a function of inlet temperature, metabolic rate, and crew size, a reasonably conservative correlation for core temperature was achieved for the human thermal model applied to the ACES with ICU cooling. A key observation for this correlation was accounting for transpiration of evaporated sweat through the Gortex(Registered TradeMark) liner of the ACES indicated by as much as 0.6 lbm of sweat evaporated over the course of the 1 hour test profile, most of which could not be attributed to respiration or head sweat evaporation of the crew. Historically it has been assumed that transpiration was not an important design feature of the ACES

suit. The correlated human thermal model will show transpiration to be highly useful in hot survival situations for the Orion Program when adequate liquid cooling is not available.
Author
Space Suits; Respiration; Liquid Cooling; Transpiration; Garments; Linings

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*.

20090001152 NASA Marshall Space Flight Center, Huntsville, AL, USA
'Built-In' Action/Issues Tracking and Post-Ops Analysis Tool for Realtime Console Operations
Scott, David W.; March 2008; 1 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 mar. 2008, Big Sky, MT, USA; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001152

Marshall Space Flight Center's (MSFC) Payload Operations Integration Center (POIC) for the International Space Station (ISS) uses a number of formal databases to manage and track flight plan changes, onboard and ground equipment anomalies, and other events. However, individual console positions encounter many action items and/or occurrences that don't fit neatly into the databases, and while console logs are comprehensive, manual or automated searches do not always yield consistent results. The Payload Communications Manager (PAYCOM) team, whose members speak directly with the ISS onboard crew with respect to NASA payload operations, has found a creative way to reformat a mandatory Daily Report to organize action items, standing reminders, significant events, and other comments. While the report keeps others appraised of PAYCOMs activities and issues of the moment, the format makes it easy to capture very brief summaries of the items in a 'Roll Off Matrix', including start and stop dates, resolution, and possible applicability to future ops. The matrix provides accountability for all action items, gives direct insight into the issues surrounding various payloads and methods of dealing with them, yields indirect information on PAYCOM priorities and processes, and provides a roadmap that makes it easier to get back to extensive details if needed. This paper describes how the ISS PAYCOM Daily Report and Roll Off Matrix are organized, used, and inter-related to each other and the PAYCOM operations log. While the application is for a manned vehicle, the concepts could apply in a wide spectrum of operational settings.
Author
Consoles; International Space Station; Payload Integration; Real Time Operation; Flight Operations; Spacecraft Communication

20090001306 NASA Goddard Space Flight Center, Greenbelt, MD, USA
STRS Compliant FPGA Waveform Development
Nappier, Jennifer; Downey, Joseph; Mortensen, Dale; October 2008; 13 pp.; In English; SDR Forum Technical Conference, 26 - 30 Oct. 2008, Washington, D.C., USA; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2008-215297; E-16566; Copyright; Avail.: CASI: A03, Hardcopy

The Space Telecommunications Radio System (STRS) Architecture Standard describes a standard for NASA space software defined radios (SDRs). It provides a common framework that can be used to develop and operate a space SDR in a reconfigurable and reprogrammable manner. One goal of the STRS Architecture is to promote waveform reuse among multiple software defined radios. Many space domain waveforms are designed to run in the special signal processing (SSP) hardware. However, the STRS Architecture is currently incomplete in defining a standard for designing waveforms in the SSP hardware. Therefore, the STRS Architecture needs to be extended to encompass waveform development in the SSP hardware. The extension of STRS to the SSP hardware will promote easier waveform reconfiguration and reuse. A transmit waveform for space applications was developed to determine ways to extend the STRS Architecture to a field programmable gate array (FPGA). These extensions include a standard hardware abstraction layer for FPGAs and a standard interface between waveform functions running inside a FPGA. A FPGA-based transmit waveform implementation of the proposed standard interfaces on a laboratory breadboard SDR will be discussed.
Author
Waveforms; Telecommunication; Space Communication; Radio Equipment; Signal Processing; Field-Programmable Gate Arrays

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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*.

20090001151 NASA Marshall Space Flight Center, Huntsville, AL, USA

Orbital Express Advanced Video Guidance Sensor

Howard, Ricky; Heaton, Andy; Pinson, Robin; Carrington, Connie; March 2008; 1 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001151

In May 2007 the first US fully autonomous rendezvous and capture was successfully performed by DARPA's Orbital Express (OE) mission. Since then, the Boeing ASTRO spacecraft and the Ball Aerospace NEXTSat have performed multiple rendezvous and docking maneuvers to demonstrate the technologies needed for satellite servicing. MSFC's Advanced Video Guidance Sensor (AVGS) is a primary near-field proximity operations sensor integrated into ASTRO's Autonomous Rendezvous and Capture Sensor System (ARCSS), which provides relative state knowledge to the ASTRO GN&C system. This paper provides an overview of the AVGS sensor flying on Orbital Express, and a summary of the ground testing and on-orbit performance of the AVGS for OE. The AVGS is a laser-based system that is capable of providing range and bearing at midrange distances and full six degree-of-freedom (6DOF) knowledge at near fields. The sensor fires lasers at two different frequencies to illuminate the Long Range Targets (LRTs) and the Short Range Targets (SRTs) on NEXTSat. Subtraction of one image from the other image removes extraneous light sources and reflections from anything other than the corner cubes on the LRTs and SRTs. This feature has played a significant role for Orbital Express in poor lighting conditions. The very bright spots that remain in the subtracted image are processed by the target recognition algorithms and the inverse-perspective algorithms, to provide 3DOF or 6DOF relative state information. Although Orbital Express has configured the ASTRO ARCSS system to only use AVGS at ranges of 120 m or less, some OE scenarios have provided opportunities for AVGS to acquire and track NEXTSat at greater distances. Orbital Express scenarios to date that have utilized AVGS include a berthing operation performed by the ASTRO robotic arm, sensor checkout maneuvers performed by the ASTRO robotic arm, 10-m unmated operations, 30-m unmated operations, and Scenario 3-1 anomaly recovery. The AVGS performed very well during the pre-unmated operations, effectively tracking beyond its 10-degree Pitch and Yaw limit-specifications, and did not require I-LOAD adjustments before unmated operations. AVGS provided excellent performance in the 10-m unmated operations, effectively tracking and maintaining lock for the duration of this scenario, and showing good agreement between the short and long range targets. During the 30-m unmated operations, the AVGS continuously tracked the SRT to 31.6 m, exceeding expectations, and continuously tracked the LRT from 8.8 m out to 31.6 m, with good agreement between these two target solutions. After this scenario was aborted at a 10-m separation during remate operations, the AVGS tracked the LRT out 54.3 m, until the relative attitude between the vehicles was too large. The vehicles remained apart for eight days, at ranges from 1 km to 6 km. During the approach to remate in this recovery operation, the AVGS began tracking the LRT at 150 m, well beyond the OE planned limits for AVGS ranges, and functioned as the primary sensor for the autonomous rendezvous and docking.

Author

Guidance Sensors; Orbital Rendezvous; Video Communication; Space Missions; Robotics; Autonomous Docking; Astro Vehicle

20090001221 NASA Johnson Space Center, Houston, TX, USA

International Space Station Solar Alpha Rotary Joint Failure Analysis: The Materials and Processes Perspective

Dasgupta, Rajib; Figert, John; Jerman, Greg; Wright, Clara; Basta, Erin A.; Golden, Johnny L.; [2009]; 1 pp.; In English; Aging Aircraft Conference, 4 - 7 May 2009, Missouri, USA; Copyright; Avail.: Other Sources; Abstract Only

This paper summarizes the on-orbit structural dynamic data and the related modal analysis, model validation and correlation performed for the ISS configurations spanning ISS Stage 12A. The objective of this analysis is to validate and correlate analytical models used to verify the ISS critical interface dynamic loads and improve its fatigue life prediction. On-Orbit dynamic responses were measured during the ISS configurations throughout ISS Stage 12A by the two main ISS instrumentation systems; Internal Wireless Instrumentation System (IWIS) and the Structural Dynamic Measurement System (SDMS). These nominal on-orbit events include Russian vehicle docking and undockings. Also, the ISS photogrammetric system recorded the movements of the 2A and 4A solar arrays during a modified ISS maneuver. Modal analyses were

performed on the measured data to extract modal parameters including frequency, damping and mode shapes. Correlation and comparisons between the test and analytical frequencies and mode shapes were performed to assess the accuracy of the analytical models for the ISS configurations under consideration.
Author
Fatigue Life; International Space Station; Dynamic Loads; Dynamic Response; Critical Loading; Failure

20090001232 CUBRC, Inc., Buffalo, NY, USA
Experimental Studies of the Aerothermal Characteristics of the Project Orion CEV heat Shield in High Speed Transitional and Turbulent Flows
Wadhams, T.P.; MacLean, M.; Holden, M.S.; Cassady, A.M.; [2009]; 29 pp.; In English; 47th AIAA Aerospace Sciences Meeting, 5 - 8 Jan. 2009, Florida, USA; Original contains color and black and white illustrations; Copyright; Avail.:
CASI: A03, Hardcopy

An experimental program has been completed by CUBRC exploring laminar, transitional, and turbulent flows over a 7.0% scale model of the Project ORION CEV geometry. This program was executed primarily to answer questions concerning the increase in heat transfer on the windward, or 'hot shoulder' of the CEV heat shield from laminar to turbulent flow. To answer these questions CUBRC constructed and instrumented a 14.0 inch diameter Project ORION CEV model and ran a range of Reynolds numbers based on diameter from 1.0 to over 40 million at a Mach number of 8.0. These Reynolds numbers were selected to cover laminar to turbulent heating data on the 'hot shoulder'. Data obtained during these runs will be used to guide design decisions as they apply to heat shield thickness and extent. Several experiments at higher enthalpies were achieved to obtain data for code validation with real gas effects and transition. CUBRC also performed computation studies of these experiments to aid in the data reduction process and study turbulence modeling.
Author
Turbulent Flow; Laminar Flow; High Speed; Heat Shielding; Crew Exploration Vehicle; Heat Transfer; Turbulence Models

20090001324 NASA Johnson Space Center, Houston, TX, USA
ISS Stage 12A Post-Flight Modal Analysis, Model Validation and Correlation
Fitzpatrick, Kristin; Grygier, Michael; Bartkowicz, Ted; [2009]; 31 pp.; In English; International Modal Analysis Conference, 9-12 Feb. 2009, Orlando, Fl, USA
Contract(s)/Grant(s): WBS 401769.06.01.01.01; Copyright; Avail.: Other Sources

This paper summarizes the on-orbit structural dynamic data and the related modal analysis, model validation and correlation performed for the ISS configurations spanning ISS Stage 12A. The objective of this analysis is to validate and correlate analytical models used to verify the ISS critical interface dynamic loads and improve its fatigue life prediction. On-Orbit dynamic responses were measured during the ISS configurations throughout ISS Stage 12A by the two main ISS instrumentation systems; Internal Wireless Instrumentation System (IWIS) and the Structural Dynamic Measurement System (SDMS). These nominal on-orbit events include Russian vehicle docking and undockings. Also, the ISS photogrammetric system recorded the movements of the 2A and 4A solar arrays during a modified ISS maneuver. Modal analyses were performed on the measured data to extract modal parameters including frequency, damping and mode shapes. Correlation and comparisons between the test and analytical frequencies and mode shapes were performed to assess the accuracy of the analytical models for the ISS configurations under consideration.
Author
Dynamic Loads; Postflight Analysis; Fatigue Life; Vibration Mode; Critical Loading; Dynamic Response

20090001904 NASA Marshall Space Flight Center, Huntsville, AL, USA
Orbital Express AVGS Validation and Calibration for Automated Rendezvous
Heaton, Andrew F.; Howard, Richard T.; Pinson, Robin M.; August 17, 2008; 18 pp.; In English; AIAA Astrodynamics Specialist Conference, 17-2 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001904

From March to July of 2007, the DARPA Orbital Express mission achieved a number of firsts in autonomous spacecraft operations. The NASA Advanced Video Guidance Sensor (AVGS) was the primary docking sensor during the first two dockings and was used in a blended mode three other automated captures. The AVGS performance exceeded its specification by approximately an order of magnitude. One reason that the AVGS functioned so well during the mission was that the validation and calibration of the sensor prior to the mission advanced the state-of-the-art for proximity sensors. Some factors

in this success were improvements in ground test equipment and truth data, the capability for ILOAD corrections for optical and other effects, and the development of a bias correction procedure. Several valuable lessons learned have applications to future proximity sensors.
Author
Guidance Sensors; Docking; Calibrating; Ground Tests; Autonomy

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*.

20090001871 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Parts Selection for Space Systems - An Overview and Radiation Perspective
LaBel, Kenneth A.; November 30, 2008; 35 pp.; In English; 4th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), 30 Nov. - 5 Dec. 2008, West Palm Beach, FL, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001871

This viewgraph presentation describes the selection of electronic parts for aerospace systems from a space radiation perspective. The topics include: 1) The Trade Space Involved with Part Selection; 2) Understanding Risk; 3) Technical/Design Aspects; 4) Programmatic Overview; 5) Radiation Perspective; 6) Reliability Considerations; 7) An Example Ad hoc Battle; and 8) Sources of Radiation Data.
CASI
Aerospace Systems; Extraterrestrial Radiation; Spacecraft Components; Mechanical Devices; Reliability Engineering; Astrionics

20090001886 NASA Marshall Space Flight Center, Huntsville, AL, USA
In-situ Observations of the Ionospheric F2-Region from the International Space Station
Coffey, Victoria N.; Wright, Kenneth H.; Minow, Joseph I.; Chandler, Michael O.; Parker, Linda N.; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The International Space Station orbit provides an ideal platform for in-situ studies of space weather effects on the mid and low latitude F-2 region ionosphere. The Floating Potential Measurement Unit (FPMU) operating on the ISS since Aug 2006, is a suite of plasma instruments: a Floating Potential Probe (FPP), a Plasma Impedance Probe (PIP), a Wide-sweep Langmuir Probe (WLP), and a Narrow-sweep Langmuir Probe (NLP). This instrument package provides a new opportunity for collaborative multi-instrument studies of the F-region ionosphere during both quiet and disturbed periods. This presentation first describes the operational parameters for each of the FPMU probes and shows examples of an intra-instrument validation. We then show comparisons with the plasma density and temperature measurements derived from the TIMED GUVI ultraviolet imager, the Millstone Hill ground based incoherent scatter radar, and DIAS digisondes, Finally we show one of several observations of night-time equatorial density holes demonstrating the capabilities of the probes for monitoring mid and low latitude plasma processes.
Derived from text
International Space Station; Space Weather; In Situ Measurement; Instrument Packages; F 2 Region; Ionosondes

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*.

20090001166 NASA Stennis Space Center, Stennis Space Center, MS, USA

Computational Analyses in Support of Sub-scale Diffuser Testing for the A-3 Facility, Part 2, Unsteady Analyses and Risk Assessment

Ahuja, Vineet; Hosangadi, Ashvin; Allgood, Daniel; [2008]; 4 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNX08CA36C

Report No.(s): SSTI-8080-0024; Copyright; Avail.: CASI: A01, Hardcopy

Simulation technology can play an important role in rocket engine test facility design and development by assessing risks, providing analysis of dynamic pressure and thermal loads, identifying failure modes and predicting anomalous behavior of critical systems. This is especially true for facilities such as the proposed A-3 facility at NASA SSC because of a challenging operating envelope linked to variable throttle conditions at relatively low chamber pressures. Design Support of the feasibility of operating conditions and procedures is critical in such cases due to the possibility of startup/shutdown transients, moving shock structures, unsteady shock-boundary layer interactions and engine and diffuser unstart modes that can result in catastrophic failure. Analyses of such systems is difficult due to resolution requirements needed to accurately capture moving shock structures, shock-boundary layer interactions, two-phase flow regimes and engine unstart modes. In a companion paper, we will demonstrate with the use of CFD, steady analyses advanced capability to evaluate supersonic diffuser and steam ejector performance in the sub-scale A-3 facility. In this paper we will address transient issues with the operation of the facility especially at startup and shutdown, and assess risks related to afterburning due to the interaction of a fuel rich plume with oxygen that is a by-product of the steam ejectors. The primary areas that will be addressed in this paper are: (1) analyses of unstart modes due to flow transients especially during startup/ignition, (2) engine safety during the shutdown process (3) interaction of steam ejectors with the primary plume i.e. flow transients as well as probability of afterburning. In this abstract we discuss unsteady analyses of the engine shutdown process. However, the final paper will include analyses of a staged startup, drawdown of the engine test cell pressure, and risk assessment of potential afterburning in the facility. Unsteady simulations have been carried out to study the engine shutdown process in the facility and understand the physics behind the interactions between the steam ejectors, the test cell and the supersonic diffuser. As a first approximation, to understand the dominant unsteady mechanisms in the engine test cell and the supersonic diffuser, the turning duct in the facility was removed. As the engine loses power a rarefaction wave travels downstream that disrupts the shock cell structure in the supersonic diffuser. Flow from the test cell is seen to expand into the supersonic diffuser section and re-pressurizes the area around the nozzle along with a upstream traveling compression wave that emanates from near the first stage ejectors. Flow from the first stage ejector expands to the center of the duct and a new shock train is formed between the first and second stage ejectors. Both stage ejectors keep the facility pressurized and prevent any large amplitude pressure fluctuations from affecting the engine nozzle. The resultant pressure loads the nozzle experiences in the shutdown process are small.

Author

Computational Fluid Dynamics; Dynamic Pressure; Rocket Engine Design; Pressure Oscillations; Probability Theory; Risk Assessment; Shock Wave Interaction; Supersonic Diffusers

20090001283 NASA Marshall Space Flight Center, Huntsville, AL, USA

Mission Assessment of the Faraday Accelerator with Radio-frequency Assisted Discharge (FARAD)

Dankanich, John W.; Polzin, Kurt A.; July 20, 2008; 19 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 20-23 Jul. 2008, Hartford,CT, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Pulsed inductive thrusters have typically been considered for future, high-power, missions requiring nuclear electric propulsion. These high-power systems, while promising equivalent or improved performance over state-of-the-art propulsion systems, presently have no planned missions for which they are well suited. The ability to efficiently operate an inductive thruster at lower energy and power levels may provide inductive thrusters near term applicability and mission pull. The Faraday Accelerator with Radio-frequency Assisted Discharge concept demonstrated potential for a high-efficiency, low-energy pulsed inductive thruster. The added benefits of energy recapture and/or pulse compression are shown to enhance the performance of the pulsed inductive propulsion system, yielding a system that con compete with and potentially outperform current state-of-the-art electric propulsion technologies. These enhancements lead to mission-level benefits

associated with the use of a pulsed inductive thruster. Analyses of low-power near to mid-term missions and higher power far-term missions are undertaken to compare the performance of pulsed inductive thrusters with that delivered by state-of-the-art and development-level electric propulsion systems.
Author
Pulsed Inductive Thrusters; Accelerators; Radio Frequency Discharge; Propulsion System Performance; Systems Engineering; Technology Assessment; Spacecraft Propulsion; Power

20090001288 Princeton Univ., Princeton, NJ, USA
Current Sheet Formation in a Conical Theta Pinch Faraday Accelerator with Radio-frequency Assisted Discharge
Polzin, Kurt A.; Hallock, Ashley K.; Choueiri, Edgar Y.; July 20, 2008; 16 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 20 - 23 Jul. 2008, Connecticut, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Data from an inductive conical theta pinch accelerator are presented to gain insight into the process of inductive current sheet formation in the presence of a preionized background gas produced by a steady-state RF-discharge. The presence of a preionized plasma has been previously shown to allow for current sheet formation at lower discharge voltages and energies than those found in other pulsed inductive accelerator concepts, leading to greater accelerator efficiencies at lower power levels. Time-resolved magnetic probe measurements are obtained for different background pressures and pulse energies to characterize the effects of these parameters on current sheet formation. Indices are defined that describe time-resolved current sheet characteristics, such as the total current owing in the current sheet, the time-integrated total current ('strength'), and current sheet velocity. It is found that for a given electric field strength, maximums in total current, strength, and velocity occur for one particular background pressure. At other pressures, these current sheet indices are considerably smaller. The trends observed in these indices are explained in terms of the principles behind Townsend breakdown that lead to a dependence on the ratio of the electric field to the background pressure. Time-integrated photographic data are also obtained at the same experimental conditions, and qualitatively they compare quite favorably with the time-resolved magnetic field data.
Author
Electric Fields; Theta Pinch; Accelerators; Current Sheets; Inductance; Radio Frequency Discharge; Faraday Effect

20090001308 NASA Glenn Research Center, Cleveland, OH, USA
LOX/Methane Main Engine Igniter Tests and Modeling
Breisacher, Kevin J.; Ajmani, Kumund; November 2008; 28 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNC05BAZZB; NNC08JF17T
Report No.(s): NASA/TM-2008-215421; AIAA Paper-2008-4757; E-16585; Copyright; Avail.: CASI: A03, Hardcopy

The LOX/methane propellant combination is being considered for the Lunar Surface Access Module ascent main engine propulsion system. The proposed switch from the hypergolic propellants used in the Apollo lunar ascent engine to LOX/methane propellants requires the development of igniters capable of highly reliable performance in a lunar surface environment. An ignition test program was conducted that used an in-house designed LOX/methane spark torch igniter. The testing occurred in Cell 21 of the Research Combustion Laboratory to utilize its altitude capability to simulate a space vacuum environment. Approximately 750 ignition test were performed to evaluate the effects of methane purity, igniter body temperature, spark energy level and frequency, mixture ratio, flowrate, and igniter geometry on the ability to obtain successful ignitions. Ignitions were obtained down to an igniter body temperature of approximately 260 R with a 10 torr back-pressure. The data obtained is also being used to anchor a CFD based igniter model.
Author
Liquid Oxygen; Methane; Propellants; Lunar Surface; Computational Fluid Dynamics; Hypergolic Rocket Propellants; Ignition; Engine Tests

20090001339 NASA Glenn Research Center, Cleveland, OH, USA
AMBR [Advanced Material Bipropellant Rocket] Engine for Science Missions
Liou, Larry C.; July 2008; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 345620.01.03.01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001339

This viewgraph presentation reviews the Advanced Material Bipropellant Rocket (AMBR) in space propulsion technology for Space Missions.
CASI
Aerospace Engineering; Liquid Rocket Propellants; Space Missions; Technology Utilization

20090001343 NASA Glenn Research Center, Cleveland, OH, USA

Proposed Facility Modifications to Support Propulsion Systems Testing Under Simulated Space Conditions at Plum Brook Station's Spacecraft Propulsion Research Facility (B-2)

Edwards, Daryl A.; September 10, 2008; 14 pp.; In English; Thermal and Fluid Analysis Workshop (TFAWS 2007), 10-14 Sep. 2007, Cleveland, OH, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 750271.09.04.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001343

Preparing NASA's Plum Brook Station's Spacecraft Propulsion Research Facility (B-2) to support NASA's new generation of launch vehicles has raised many challenges for B-2's support staff. The facility provides a unique capability to test chemical propulsion systems/vehicles while simulating space thermal and vacuum environments. Designed and constructed in the early 1960s to support upper stage cryogenic engine/vehicle system development, the Plum Brook Station B-2 facility will require modifications to support the larger, more powerful, and more advanced engine systems for the next generation of vehicles leaving earth's orbit. Engine design improvements over the years have included large area expansion ratio nozzles, greater combustion chamber pressures, and advanced materials. Consequently, it has become necessary to determine what facility changes are required and how the facility can be adapted to support varying customers and their specific test needs. Exhaust system performance, including understanding the present facility capabilities, is the primary focus of this work. A variety of approaches and analytical tools are being employed to gain this understanding. This presentation discusses some of the challenges in applying these tools to this project and expected facility configuration to support the varying customer needs.

Author

Engine Design; Research Facilities; Simulation; Spacecraft Propulsion

20090001843 NASA Marshall Space Flight Center, Huntsville, AL, USA

Operational Characteristics and Plasma Measurements in a Low-Energy FARAD Thruster

Polzin, K. A.; Best, S.; Rose, M. F.; Miller, R.; Owens, T.; July 20, 2008; 2 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 20-23 Jul. 2008, Hartford, CT, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Pulsed inductive plasma accelerators are spacecraft propulsion devices in which energy is stored in a capacitor and then discharged through an inductive coil. The device is electrodeless, inducing a plasma current sheet in propellant located near the face of the coil. The propellant is accelerated and expelled at a high exhaust velocity (order of 10 km/s) through the interaction of the plasma current with an induced magnetic field. The Faraday Accelerator with RF-Assisted Discharge (FARAD) thruster is a type of pulsed inductive plasma accelerator in which the plasma is preionized by a mechanism separate from that used to form the current sheet and accelerate the gas. Employing a separate preionization mechanism in this manner allows for the formation of an inductive current sheet at much lower discharge energies and voltages than those found in previous pulsed inductive accelerators like the Pulsed Inductive Thruster (PIT). In this paper, we present measurements aimed at quantifying the thruster's overall operational characteristics and providing additional insight into the nature of operation. Measurements of the terminal current and voltage characteristics during the pulse help quantify the output of the pulsed power train driving the acceleration coil. A fast ionization gauge is used to measure the evolution of the neutral gas distribution in the accelerator prior to a pulse. The preionization process is diagnosed by monitoring light emission from the gas using a photodiode, and a time-resolved global view of the evolving, accelerating current sheet is obtained using a fast-framing camera. Local plasma and field measurements are obtained using an array of intrusive probes. The local induced magnetic field and azimuthal current density are measured using B-dot probes and mini-Rogowski coils, respectively. Direct probing of the number density and electron temperature is performed using a triple probe.

Author

Plasma Accelerators; Spacecraft Propulsion; Electromagnetic Acceleration; Plasma Propulsion; Magnetoplasmadynamic Thrusters

20090001888 Jacobs Technologies Engineering Science Contract Group, Houston, TX, USA

Scaling of Performance in Liquid Propellant Rocket Engine Combustion Devices

Hulka, James R.; July 21, 2008; 21 pp.; In English; AIAA/ASME/SAE Joint Propulsion Conference, 21-23 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNM05AB50C; Copyright; Avail.: CASI: A03, Hardcopy

This paper discusses scaling of combustion and combustion performance in liquid propellant rocket engine combustion devices. In development of new combustors, comparisons are often made between predicted performance in a new combustor

and measured performance in another combustor with different geometric and thermodynamic characteristics. Without careful interpretation of some key features, the comparison can be misinterpreted and erroneous information used in the design of the new device. This paper provides a review of this performance comparison, including a brief review of the initial liquid rocket scaling research conducted during the 1950s and 1960s, a review of the typical performance losses encountered and how they scale, a description of the typical scaling procedures used in development programs today, and finally a review of several historical development programs to see what insight they can bring to the questions at hand.
Author
Liquid Propellant Rocket Engines; Combustion Chambers; Combustion; Scaling; Performance Tests; Combustion Efficiency; Propulsion System Performance; Aerospace Engineering

20090001899 NASA Marshall Space Flight Center, Huntsville, AL, USA
NanoSail-D: The First Flight Demonstration of Solar Sails for Nanosatellites
Whorton, Mark; Heaton, Andy; Pinson, Robin; Laue, Greg; Adams, Charles L.; August 11, 2008; 17 pp.; In English; 22nd Annual AIAA/USU Conference on Small Satellites, 11-14 Aug. 2008, Logan, UT, USA; Original contains color illustrations
Contract(s)/Grant(s): NNM05AB50C
Report No.(s): SSC08-X-1; Copyright; Avail.: CASI: A03, Hardcopy

The NanoSail-D mission is currently scheduled for launch onboard a Falcon Launch Vehicle in the late June 2008 timeframe. The NanoSail-D, a CubeSat-class satellite, will consist of a sail subsystem stowed in a Cubesat 2U volume integrated with a CubeSat 1U volume bus provided by the NASA Ames Research Center (ARC). Shortly after deployment of the NanoSail-D from a Poly Picosatellite Orbital Deployer (P-POD) ejection system, the solar sail will deploy and mission operations will commence. This demonstration flight has two primary mission objectives: 1) to successfully stow and deploy the sail and 2) to demonstrate de-orbit functionality. Given a nearterm opportunity for launch, the project was met with the challenge of delivering the flight hardware in approximately six months, which required a significant constraint on flight system functionality. As a consequence, passive attitude stabilization will be achieved using permanent magnets to de-tumble and orient the body with the magnetic field lines and then rely on atmospheric drag to passively stabilize the sailcraft in an essentially maximum drag attitude. This paper will present an introduction to solar sail propulsion systems, overview the NanoSail-D spacecraft, describe the performance analysis for the passive attitude stabilization, and present a prediction of flight data results from the mission.
Author
Flight Tests; Launch Vehicles; Nanosatellites; Solar Sails; Systems Engineering; Falcon Missile

20090001919 NASA Stennis Space Center, Stennis Space Center, MS, USA
Design Evolution and Verification of the A-3 Chemical Steam Generator
Kirchner, Casey K.; [2009]; 6 pp.; In English; AIAA JPC Conference, 2-5 Aug. 2009, Denver, CO, USA; Original contains color and black and white illustrations
Report No.(s): SSTI-2220-0175; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001919

Following is an overview of the Chemical Steam Generator system selected to provide vacuum conditions for a new altitude test facility, the A-3 Test Stand at Stennis Space Center (SSC) in Bay St. Louis, MS. A-3 will serve as NASA s primary facility for altitude testing of the J-2X rocket engine, to be used as the primary propulsion device for the upper stages of the Ares launch vehicles. The Chemical Steam Generators (CSGs) will produce vacuum conditions in the test cell through the production and subsequent supersonic ejection of steam into a diffuser downstream of the J-2X engine nozzle exit. The Chemical Steam Generators chosen have a rich heritage of operation at rocket engine altitude test facilities since the days of the Apollo program and are still in use at NASA White Sands Test Facility (WSTF) in New Mexico. The generators at WSTF have been modified to a degree, but are still very close to the heritage design. The intent for the A-3 implementation is to maintain this heritage design as much as possible, making minimal updates only where necessary to substitute for obsolete parts and to increase reliability. Reliability improvements are especially desired because the proposed system will require 27 generators, which is nine times the largest system installed in the 1960s. Improvements were suggested by the original design firm, Reaction Motors, by NASA SSC and NASA WSTF engineers, and by the A-3 test stand design contractor, Jacobs Technology, Inc. (JTI). This paper describes the range of improvements made to the design to date, starting with the heritage generator and the minor modifications made over time at WSTF, to the modernized configuration which will be used at A-3. The paper will discuss NASA s investment in modifications to SSC s E-2 test facility fire a full-scale Chemical Steam Generator in advance of the larger steam system installation at A-3. Risk mitigation testing will be performed in early 2009 at this test facility to verify that the CSGs operate as expected. The generator which will undergo this testing is of the most

recent A-3 configuration, and will be instrumented far in excess of what is normally required for operation. The extra data will allow for easier troubleshooting and more complete knowledge of expected generator performance. In addition, the early testing will give SSC personnel experience in operating the CSG systems, which will expedite the process of installation and activation at A-3. Each Chemical Steam Generator is supported by a complement of valves, instruments, and flow control devices, with the entire assembly called a 'module.' The generators will be installed in groups of three, historically called 'units'. A module is so called because of its modular ability to be replaced or serviced without disturbing the other two modules installed on the same unit. A module is pictured in Figure 1, shown with its generator secured by white bands in its shipping (vs. installed) configuration. The heritage system at WSTF is composed of a single unit (three generator modules), pictured in Figure 2 as it was installed in 1965. In contrast, A-3 will have nine units operating in parallel to achieve vacuum conditions appropriate for testing the J-2X engine. Each of the combustors operates in two modes and achieves the so-called 'full-steam' mode after all three of its stages ignite. Ignition of the first stage is achieved by exciting a spark plug; the second stage and main stage are lit by the flame front of the previous stage. The main stage burns approximately 97% of the total propellant flow and uses the heat energy to vaporize water into superheated steam. While the main stage remains unlit, the combustor is in so-called 'idle' mode. In the WSTF system, this idle mode is not optimized for water usage, and does not need to be, as the water is pumped from a large reservoir. The water supply at A-3 will be contained in tanks with finite volume, so water optimization is preferred for the modnized configuration. Multiple solutions for this issue have been proposed, with the leading concept being a change to the operational definition of 'idle mode,' with the generator running in a lower heat flux condition.

Author

Vacuum Tests; Test Stands; Altitude Tests; Steam; Rocket Engines; Control Equipment; Engine Tests

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CHEMISTRY AND MATERIALS (GENERAL)

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

20090001055 Forest Service, Albuquerque, NM, USA

Low-Impact, Selective Herbicide Application for Control of African Rue. A Preliminary Field Guide

Parker, D.; Reiser, M. H.; Jun. 1997; 7 pp.; In English

Report No.(s): PB2009-102766; No Copyright; Avail.: CASI: A02, Hardcopy

African rue, Peganum harmala L., is a perennial desert shrub that belongs to the calthrop family (Zygophyllaceae). The plant is bright green, succulent, and grows to about a foot in height. Plants appear to be small bushes with many branching stems and narrow leaves. Flowers are white with five petals, and fruits grow as leathery capsules with 45-60 seeds. African rue is a native plant from northern Africa, through the Middle East, to Tibet in Asia. Prolonged overgrazing, periodic dryland farming, and removal of competing desert plants have allowed it to increase over its native range. The plant contains toxic alkaloids that are lethal to cattle and sheep, but poisoning is rare because the plant is extremely unpalatable. Young leaves and mature seeds are more toxic than other parts of the plant. When crushed leaves and stems have a disagreeable odor. The purpose to this preliminary field guide is to describe the new foliar spray method for African rue. As experience is gained, control recommendations with the herbicides could be modified.

NTIS

Africa; Alkaloids; Deserts; Herbicides; Toxicity

20090001125 Brookhaven National Lab., Upton, NY USA

Anisotropic Hexagonal Boron Nitride Nanomaterials - Synthesis and Applications

Han, W. Q.; Aug. 2008; 62 pp.; In English

Contract(s)/Grant(s): DE-AC02-98CH10886

Report No.(s): DE2008-936843; BNL-81439-2008-BC; No Copyright; Avail.: Department of Energy Information Bridge

Boron nitride (BN) is a synthetic binary compound located between III and V group elements in the Periodic Table. However, its properties, in terms of polymorphism and mechanical characteristics, are rather close to those of carbon compared with other III-V compounds, such as gallium nitride. BN crystallizes into a layered or a tetrahedrally linked structure, like those of graphite and diamond, respectively, depending on the conditions of its preparation, especially the pressure applied. Such correspondence between BN and carbon readily can be understood from their isoelectronic structures.

On the other hand, in contrast to graphite, layered BN is transparent and is an insulator. This material has attracted great interest because, similar to carbon, it exists in various polymorphic forms exhibiting very different properties; however, these forms do not correspond strictly to those of carbon. Crystallographically, BN is classified into four polymorphic forms: Hexagonal BN (h-BN); rhombohedral BN (r-BN); cubic BN (c-BN); and wurtzite BN (w-BN). BN does not occur in nature. In 1842, Balmain obtained BN as a reaction product between molten boric oxide and potassium cyanide under atmospheric pressure.
NTIS
Anisotropy; Boron Nitrides

20090001127 Savannah River National Lab., Aiken, SC, USA
Isopar L Release Rates from Saltstone Using Simulated Salt Solutions
Zamecnik, J.; Bronikowski, M.; Cozzi, A.; Eibling, R.; Nash, C.; Jul. 31, 2008; 55 pp.; In English
Contract(s)/Grant(s): DE-AC09-08SR22470
Report No.(s): DE2008-936862; WSRC-TR-2005-00568; No Copyright; Avail.: National Technical Information Service (NTIS)

The Modular Caustic-Side Solvent Extraction (CSSX) Unit (MCU) and the Salt Waste Processing Facility (SWPF) will produce a Decontaminated Salt Solution (DSS) that will go to the Saltstone Production Facility (SPF). Recent information indicates that solvent entrainment in the DSS is larger than expected. The main concern is with Isopar(reg sign) L, the diluent in the solvent mixture, and its flammability in the saltstone vault. If it is assumed that all the Isopar(reg sign) L is released instantaneously into the vault from the curing grout before each subsequent pour, the Isopar(reg sign) L in the vault headspace is well mixed, and each pour displaces an equivalent volume of headspace, the maximum concentration of Isopar(reg sign) L in the DSS to assure 25% of the lower flammable limit is not exceeded has been determined to be about 4 ppm. The amount allowed would be higher if the release from grout were significantly less. The Savannah River National Laboratory was tasked with determining the release of Isopar(reg sign) L from saltstone prepared with a simulated DSS with Isopar(reg sign) L concentrations ranging from 50 to 200 mg/L in the salt fraction and with test temperatures ranging from ambient to 95 C. The results from the curing of the saltstone showed that the amount of Isopar(reg sign) L released versus time can be treated as a percentage of initial amount present; there was no statistically significant dependence of the release rate on the initial concentration. The majority of the Isopar(reg sign) L that was released over the test duration was released in the first few days. The release of Isopar(reg sign) L begins immediately and the rate of release decreases over time. At higher temperatures the immediate release rate is larger than at lower temperatures. Initial curing temperature was found to be very important as slight variations during the first few hours or days had a significant effect on the amount of Isopar(reg sign) L released.
NTIS
Entrainment; Grout; Radioactive Wastes; Solvent Extraction

20090001347 Environmental Protection Agency, Washington, DC, USA
Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment
Jun. 2008; 96 pp.; In English
Report No.(s): PB2009-102680; EPA 100/R-08/004; No Copyright; Avail.: National Technical Information Service (NTIS)

Polychlorinated dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs), and biphenyls (PCBs) are commonly found as contaminants in complex mixtures in the environment, including in animal tissues. For more than a decade, the U.S. Environmental Protection Agency (EPA) and other organizations have estimated the combined risks that such mixtures pose to human health using a method known as the toxicity equivalence methodology. Application of this methodology in ecological risk assessments has proceeded more slowly, in part because of the variety of species from different taxonomic classes (e.g., fish, birds, and mammals) that need to be considered. As both data and experience with the methodology have accumulated experts have come to the consensus that the toxicity equivalence methodology can strengthen assessments of ecological risks. Consultations between EPA and the Department of Interior (DOI) on water quality criteria, based on 2,3,7,8-TCDD alone, for protecting endangered species in the Great Lakes led these agencies to more intensively explore the application of the toxicity equivalence methodology in ecological risk assessment. In 1998, EPA and DOI sponsored a workshop that recommended the development of further guidance on application of the toxicity equivalence methodology. This framework has been developed in direct response to that workshop recommendation.
NTIS
Equivalence; Furans; Polychlorinated Biphenyls; Polyphenyls; Risk; Risk Assessment; Toxicity

20090001379 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Eindhoven, Netherlands

Summary of Coating Surveys on the Four Air Command Frigates (Zeven Provincien Class) (Onderzoek naar de conditie van de coatingsystemen op vier luchtcommandofregatten (Zeven Provincien Klasse))

van der Kaaden, R; Mar 26, 2008; 43 pp.; In English; Original contains color illustrations

Report No.(s): AD-A485757; MT-RAP-2008-00100/MSO; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485757

The condition of coating systems onboard four air command frigates (Zeven Provincien class) is subject to discussion within the Royal Netherlands Navy. An inventory has been made into the current condition of coating systems applied in a selection of various tanks and bilges, underwater hulls, topsides/superstructure and deck coverings. Types of defects and surface areas affected by these defects have been assessed accurately. Causes have been investigated. The survey has revealed that some of the selected coating systems are not fit for purpose (sew' age tanks, grey water tank 2, antifouling on LCF 3/4, deck covering F deck). The quality of the steel works (welding) can be improved, the application of the coating systems varied between poor to reasonable and several material selections/combinations on the superstructure were unfavourable. Bilges in pump rooms 2 and 3 are sensitive to pitting corrosion. These shortcomings and the lack of maintenance have resulted in a performance which is poorer than expected considering the short service period for various pans. Better results can be attained following a review of coating specifications, when quality control during new building is improved and more cleared guarantee agreements are drafted.

DTIC

Coating; Coatings; Surveys

20090001453 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Conformational Changes in Small Ligands Upon Tetanus Toxin Binding

Henderson, Terry J; Gitti, Rossitza K; Jun 2008; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-8EA1DB

Report No.(s): AD-A485965; ECBC-TR-636; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485965

To understand the processes associated with small synthetic ligands binding large protein surfaces, NMR spectroscopy was used to examine the conformational changes in doxorubicin and lavendustin A upon binding to tetanus toxin. C13 T1 measurements suggested that to a first approximation, the conformational behavior of doxorubicin in solution appears to be a composite of a rigid aromatic ring system, ring librations for its cyclohexane and carbohydrate rings, and segmental motions for the pendant C(O)CH2OH group. trNOESY experiments indicated that both ligands adopt rigid conformations when bound to tetanus toxin and each binds a different site on the toxin surface.

DTIC

Bacteria; Ligands; Nuclear Magnetic Resonance; Toxins and Antitoxins

20090001534 Maryland Univ., College Park, MD USA

Tandem Reduction/Cyclization of O-Nitrophenyl Propargyl Alcohols-A Novel Synthesis of 2- & 2,4-Disubstituted Quinolines and Application to the Synthesis of Streptonigrin

Sandelier, Matthew J; Jan 2008; 197 pp.; In English

Report No.(s): AD-A486097; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The quinoline ring system is a common structural component of a wide variety of natural products with highly desirable biological activity, including antimalarial agents such as quinine, chloroquine and mefloquine, as well as antitumor agents such as dynemicin A, luotonin A, and camptothecin. The synthesis of the highly effective, yet prohibitively toxic, antitumor antibiotic streptonigrin is targeted in this research. A concise, convergent synthesis of this antitumor agent will pave the way for an expeditous survey of streptonigrin analogues that have similar pharmaceutical value with diminished toxicity. Our retrosynthetic plan required the development of new methodology to form the heterocyclic ring of quinoline, in a manner that would allow the utilization of palladium-catalyzed coupling of complex aryl triflates to form the tetracyclic structure of this highly functionalized natural product. A method has been developed to synthesize complex, substituted quinolines in a facile manner through the utilization of o-nitrophenyl propargyl alcohols. Through either direct lithium acetylide addition of available alkynes, or Sonogashira coupling to terminal propargyl alcohols, the assembly of complex internal propargyl alcohols has directly lead to 2-aryl-, 2-alkenyl and 2-alkylquinolines via reductive cyclization under mildly acid conditions. This reductive cyclization takes advantage of the facile Meyer-Schuster rearrangement of resonance-stabilized o-anilinopropargyl alcohols to o-aminochalcones, which cyclize to quinoline in a one-pot procedure. This work has also

examined the use of this reductive cyclization to form 2- pyridylquinolines, however such cyclization has repeatedly led to the 4-quinolone. The mechanism of such an anomalous cyclization has been studied. Although the mechanism has not been definitively identified, several potential pathways have been examined, with evidence favoring an acid-catalyzed, non-Meyer-Schuster rearrangement.
DTIC
Alcohols; Propargyl Groups

20090001759 Savannah River National Lab., Aiken, SC, USA
Initial Characterization and Performance Evaluation of a Zirconium-Based Metallic Waste Form
Kane, M.; Sindelar, R.; Sep. 30, 2008; 35 pp.; In English
Contract(s)/Grant(s): DE-AC09-08SR22470
Report No.(s): DE2008-939427; SRNS-STI-2008-00013; No Copyright; Avail.: National Technical Information Service (NTIS)

A metallic waste form or alloy system for immobilization of Zircaloy cladding hulls, Undissolved Solids (UDS), Technicium (Tc) metal and Transition Metal Fission Products (TMFP) waste stream materials from separations processes for commercial spent nuclear fuel has been developed, and initial characterization of the phase assemblage and composition, and corrosion testing under aqueous conditions has been completed for the waste form with various levels of surrogate waste species. The waste stream materials are those from processes being developed as part of the Separations Campaign under the Department of Energy's (DOE's) Global Nuclear Energy Partnership (GNEP) program. The development of waste forms for these materials is under the Waste Form Campaign.
NTIS
Evaluation; Performance Tests; Spent Fuels; Zirconium

20090001764
Power Attached FRP Technology for Rapid Strengthening of Alabama's Bridges
Saafi, M.; Oct. 2007; 63 pp.; In English
Report No.(s): PB2009-102438; RESEARCH-PROJECT-930-672; No Copyright; Avail.: CASI: A04, Hardcopy

The objective of this research is to provide ALDOT with a new low-cost and rapid strengthening technique for bridges. In the proposed technique, pultruted CFRP strips having bearing strength and longitudinal strength and stiffness will be attached to the concrete surface using closely spaced stainless steel Power Actuated Fasteners (PAF). During installation, an FRP strip is placed against the concrete surface, then using a commercially available high power gun the fasteners will be embedded into concrete through the FRP to mechanically attach the CFRP to concrete structure. The increase in strength due to the attached FRP is generated by the composite action where the load will be transferred to the CFRP through the powered actuated fasteners. The advantages of the proposed technique are: (1) Blasting, cleaning and smoothening of the surfaces are not required. (2) The proposed strengthening system can be applied to severely damaged surfaces with large cracks or potholes. Also unskilled workers can perform the proposed strengthening technique. (3) The proposed strengthening technique can applied regardless the moisture condition of the concrete surface and the weather conditions. (4) Concrete members strengthened with the proposed technique will have strength similar to those strengthened with epoxy bonded FRP, except that in the proposed system the increase doesnt depend the integrity of the interface between the FRP and concrete. (5) The proposed strengthening technique can be applied while the bridge is open to the traffic. (6) The proposed strengthening technique is extremely inexpensive with an expected cost of $10/ft2 including materials, labor and equipment. The proposed system can be applied in few hours for large structures. (7) Unlike epoxy bonded FRP, concrete members strengthened with the proposed system will exhibit ductile failure with warning.
NTIS
Alabama; Fiber Composites

20090001870 Air Force Research Lab., Edwards AFB, CA USA
Effect of Anode Current Fluctuations on Ion Energy Distributions within a 600 W Hall Effect Thruster
Hargus, Jr , William A; Nakles, Michael R; Tedrake, Rachel; Pote, Bruce; Jun 23, 2008; 11 pp.; In English
Contract(s)/Grant(s): Proj-33SP
Report No.(s): AD-A486027; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486027

This work presents axial ion energy distribution measurements within the acceleration channel of the 600 W Busek Co.

Inc. BHT-HD-600 laboratory Hall thruster derived from laser-induced fluorescence measurements of the 5d[4](sub 7/2) - 6p[3](sub 5/2) xenon ion excited state transition. Acceleration channel centerline ion energy distributions are measured for three closely related operating conditions which only differ in the magnitude of the radial magnetic field strength. These three operating conditions span a broad range of discharge current oscillations strength. The 0 to 200 kHz frequency domain is characterized, and the dominant 40 kHz to 50 kHz frequency appears most likely to be axially traveling ionization waves, commonly known as the breathing mode oscillations. These oscillations manifest themselves to the laser induced fluorescence diagnostic as clearly broadened ion energy distributions when the oscillation strength is high. We determine the spatial extent of the axial breathing mode oscillation nonintrusively. The coherence and magnitude of the discharge current oscillations are inversely proportional to acceleration channel radial magnetic strength.
DTIC
Anodes; Energy Distribution; Hall Effect; Hall Thrusters; Ion Distribution; Ions; Laser Induced Fluorescence; Oscillations

20090001887 NASA Marshall Space Flight Center, Huntsville, AL, USA
Energy Band Gap, Intrinsic Carrier Concentration and Fermi Level of CdTe Bulk Crystal between 304 K and 1067K
Su, Ching-Hua; [2008]; 20 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: Other Sources

Optical transmission measurements were performed on CdTe bulk single crystals. It was found that when sliced and polished CdTe wafers were used, a white film started to develop on the sample surface and the wafer became opaque when it was heated above 530 K. Therefore, a bulk crystal of CdTe was first grown in the window area by physical vapor transport. The optical transmission was then measured between 304 and 1067 K and from which the energy band gap was derived. The band gaps of CdTe can be fit well as a function of temperature by the Varshini expression. Using the band gap data, the high temperature electron-hole equilibrium was calculated numerically by assuming the Kane's conduction band structure and a heavy-hole parabolic valance band. The calculated intrinsic carrier concentrations agree well with the experimental data reported previously. The calculated intrinsic Fermi levels between 200 and 1200 K were also presented.
Author
Cadmium Tellurides; Carrier Density (Solid State); Conduction Bands; Energy Bands; Energy Gaps (Solid State)

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COMPOSITE MATERIALS

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

20090001058 North Carolina State Univ., Raleigh, NC, USA
Value Engineering and Cost Effectiveness of Various Fiber Reinforced Polymer (FRP) Repair Systems
Rizkalla, S.; Rosenboom, O.; Miller, A.; Walter, C.; Jun. 2007; 226 pp.; In English
Contract(s)/Grant(s): NCDOT-2006-10
Report No.(s): PB2009-102492; No Copyright; Avail.: National Technical Information Service (NTIS)

This report is an extension to the final report for NCDOT project 2004-15 Value Engineering and Cost-Effectiveness of Various Fiber Reinforced Polymers (FRP) Repair Systems, submitted in June 2005. In that report, seventeen 30-ft long prestressed concrete c-channels were tested under static and fatigue loading conditions using various carbon fiber reinforced polymer (CFRP) strengthening systems to determine their structural behavior, cost effectiveness and constructability. The 2004- 15 final report also included the behavior of impact damaged AASHTO girders repaired by CFRP systems and tested under fatigue loading conditions. This final report for NCDOT project 2006-10, summarizing the results of Phase II of the NCDOT project 2004-15, includes the behavior of four additional c-channel prestressed concrete girders strengthened with externally bonded high modulus CFRP sheets and high strength steel reinforced polymer (SRP) wire mesh. The report includes also the behavior of four additional AASHTO type II girders. Two long-span AASHTO girders were tested static loading conditions to assess the performances of FRP systems designed to repair impact damage. Two AASHTO girders were tested using short spans to determine the effectiveness of using FRP to restore the shear capacity of impact damaged girders with one girder tested as control specimen and one damaged then repaired with FRP. The repaired girder was stronger than the damaged girder, indicating that the FRP repair is effective in restoring the girder shear capacity. Based on the above, the entire experimental program consisted of twenty-one girders strengthened with various FRP and SRP materials and five AASHTO girders repaired with FRP to restore their flexural and shear capacities. The research indicates that FRP systems are effective

for the strengthening/repair of concrete highway bridges. The report provides detailed procedures for installation as well as efficient inspection procedures to ensure effectiveness of the strengthening/repair systems.
NTIS
Carbon Fibers; Cost Effectiveness; Fiber Composites; Girders; Value Engineering

20090001060 North Carolina Univ., Charlotte, NC, USA
Analysis and Testing of a Bridge Deck Reinforced With GFRP Rebars
Gergely, J.; Boyajian, D. M.; Young, D. T.; Frank, C. R.; Szabo, I. F.; Apr. 03, 2007; 211 pp.; In English
Contract(s)/Grant(s): NCDOT-2005-22
Report No.(s): PB2009-102490; No Copyright; Avail.: National Technical Information Service (NTIS)

The present project had two main objectives, to experimentally and analytically investigate a bridge deck reinforced with glass fiber reinforced polymer rebars, and to perform durability tests on four rebar types. An analytical investigation was performed using the finite element software ANSYS for both the actual bridge deck, and for the reduced size laboratory experiment. In addition, laboratory experiments were also performed on an 11 ft long bridge deck model built inside the structures lab. Except for the length of the girder-deck model, the true scale was used for every other dimension. Three different tests were performed on the model, and the test data verified the analytical results. Once completed, this bridge located in Macon County was instrumented and tested using two loaded tandem trucks. For the durability testing, four different types of Glass Fiber Reinforced Polymer (GFRP) reinforcement provided by different rebar vendors were evaluated under exposure to an alkaline environment at different temperatures. For the moisture tests, a total of 96 specimens were monitored for changes in length, diameter, and weight. A total 128 unscathed samples and 64 nicked samples simulating defects to the rebars that might occur on the field site were tested in tension to determine the rate of degradation in tensile properties. Concrete cylinders were poured, and 168 pullout specimens were tested.
NTIS
Evaluation; Glass Fiber Reinforced Plastics

20090001566 Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Munich, Germany
High-Speed Photographic Study of Wave Propagation and Impact Damage in Transparent Laminates
Straburger, Elmar; Steinhauser, M O; Apr 2008; 64 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N62558-05-P-0303; Proj-DC05
Report No.(s): AD-A486159; ARL-CR-605; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Conventional transparent armor consists of glass laminates with polymer interlayer and backing. It has been demonstrated that the materials, the ratio of materials, and the type and thickness of the interlayers affect the ballistic efficiency of the laminate. Borosilicate glass, Starphire ultra-clear soda-lime glass, and the transparent, polycrystalline ceramic AION are materials being considered for transparent armor applications. A comprehensive series of Edge-on Impact tests has been conducted in order to examine wave and damage propagation through the single materials (baseline tests) and laminated structures. The numerical simulation part of this project focused on the modeling and simulation of projectile impact on the polycrystalline, transparent ceramic AION. In the approach chosen here, the ceramic was not treated as a continuum. In order to model the polyhedral microstructure of the ceramics, a code, which is based on the theory of power diagrams, was implemented. After having obtained a three-dimensional (3-D) grain structure that corresponds on average to what is observed in micrographs, these structures are being meshed in three dimensions using tetrahedra in 3-D vs. triangles in two dimensions. The generated and meshed microstructures were used as input for a commercial program package (LSDyna) and subsequent finite-element analyses.
DTIC
High Speed; Impact Damage; Laminates; Photographs; Transparence; Wave Propagation

20090001838 Applied Research Associates, Inc., Tyndall AFB, FL USA
Spall Repair Test and Evaluation
Hammons, Michael I; Aug 15, 2008; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4915
Report No.(s): AD-A485788; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485788

There are two major thrusts of the Spall Repair Technology research effort: (1) evaluation and development of specialized equipment and procedures to expedite and improve the process of preparing spalls for placement of rapid-setting materials and

(2) development of tools to predict the performance of spall repairs in service. A series of experiments were performed using five excavation methods (treatments) on nominal 2-foot-wide 2-foot-long by 4-inch-deep spalls. The type of equipment used were; Jackhammer, Hydraulic breaker on a skid-steer, cold planer, and multiple-blade saw. Production rate, petrographic examination, bond strength and performance under simulated aircraft trafficking were use to determine measures of merit. Over a dozen fast setting materials for concrete were evaluated. The research effort is currently in the laboratory analysis phase to develop performance and sensitivity curves which will be used in determining life expectancy of a specific equipment and material repair.
DTIC
Evaluation; Maintenance; System Effectiveness

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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*.

20090001049 Savannah River National Lab., Aiken, SC, USA
Alternative Materials to PD Membranes for Hydrogen Purification
Korinko, P.; Adams, T.; Sep. 12, 2008; 11 pp.; In English
Contract(s)/Grant(s): DE-AC09-08SR22470
Report No.(s): DE2008-938429; WSRC-STI-2008-00088; No Copyright; Avail.: National Technical Information Service (NTIS)

Development of advanced hydrogen separation membranes in support of hydrogen production processes such as coal gasification and as front end gas purifiers for fuel cell based system is paramount to the successful implementation of a national hydrogen economy. Current generation metallic hydrogen separation membranes are based on Pd-alloys. Although the technology has proven successful, at issue is the high cost of palladium. Evaluation of non-noble metal based dense metallic separation membranes is currently receiving national and international attention. The focal point of the reported work was to evaluate two different classes of materials for potential replacement of conventional Pd-alloy purification/diffuser membranes. Crystalline V-Ni-Ti and Amorphous Fe- and Co-based metallic glass alloys have been evaluated using gaseous hydrogen permeation testing techniques.
NTIS
Coal; Hydrogen; Membranes; Palladium Alloys; Purification

20090001085 Fluor Daniel Hanford, Inc., Richland, WA, USA
Effluent Treatment Facility Peroxide Destruction Catalyst Testing
Halgren, D. L.; Jul. 30, 2008; 11 pp.; In English
Report No.(s): DE2008-935398; HNF-38408 REV 0; No Copyright; Avail.: Department of Energy Information Bridge

The 200 Area Effluent Treatment Facility (ETF) main treatment train includes the peroxide destruction module (PDM) where the hydrogen peroxide residual from the upstream ultraviolet light/hydrogen peroxide oxidation unit is destroyed. Removal of the residual peroxide is necessary to protect downstream membranes from the strong oxidizer. The main component of the PDM is two reaction vessels utilizing granular activated carbon (GAC) as the reaction media. The PDM experienced a number of operability problems, including frequent plugging, and has not been utilized since the ETF changed to groundwater as the predominant feed. The unit seemed to be underperforming in regards to peroxide removal during the early periods of operation as well. It is anticipated that a functional PDM will be required for wastewater from the vitrification plant and other future streams. An alternate media or methodology needs to be identified to replace the GAC in the PDMs. This series of bench scale tests is to develop information to support an engineering study on the options for replacement of the existing GAC method for peroxide destruction at the ETF.
NTIS
Catalysts; Destruction; Effluents; Hydrogen Peroxide; Peroxides; Radioactive Wastes; Waste Management; Water Treatment

20090001178 Idaho National Lab., Idaho Falls, ID, USA

Impact Testing of Stainless Steel Material at Cold Temperatures

Snow, S. D.; Morton, D. K.; Blandford, R. K.; Jul. 01, 2008; 12 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2008-936616; INL/CON-07-13494; No Copyright; Avail.: National Technical Information Service (NTIS)

Stainless steels are used for the construction of numerous spent nuclear fuel or radioactive material containers that may be subjected to high strains and moderate strain rates during accidental drop events. Mechanical characteristics of these base materials and their welds under dynamic loads in the strain rate range of concern are not well documented. However, a previous paper reported on impact testing and analysis results performed at the Idaho National Laboratory using 304/304L and 316/316L stainless steel base material specimens at room and elevated temperatures. The goal of the work presented herein is to add recently completed impact tensile testing results at -20 degrees F conditions for dual-marked 304/304L and 316/316L stainless steel material specimens (hereafter referred to as 304L and 316L, respectively). Recently completed welded material impact testing at -20 degrees F, room, 300 degrees F, and 600 degrees F is also reported. Utilizing a drop-weight impact test machine and 1/4-inch to 1/2-inch thick dog-bone shaped test specimens, the impact tests achieved strain rates in the 4 to 40 per second range, depending upon the material temperature. Elevated true stress-strain curves for these materials reflecting varying strain rates and temperatures are presented herein.

NTIS

Impact Tests; Low Temperature; Stainless Steels

20090001351 Library of Congress, Washington, DC USA

Nanotechnology and Environmental, Health, and Safety: Issues for Consideration

Sargent, John F; Aug 6, 2008; 46 pp.; In English; Original contains color illustrations

Report No.(s): AD-A485710; CRS-RL34614; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485710

Nanotechnology a term encompassing nanoscale science, engineering, and technology is focused on understanding, controlling, and exploiting the unique properties of matter that can emerge at scales of one to 100 nanometers. A key issue before Congress regarding nanotechnology is how best to protect human health, safety, and the environment as nanoscale materials and products are researched, developed, manufactured, used, and discarded. While the rapidly emerging field of nanotechnology is believed by many to offer significant economic and societal benefits, some research results have raised concerns about the potential adverse environmental, health, and safety (EHS) implications of nanoscale materials. Stakeholders generally agree that concerns about potential detrimental effects of nanoscale materials and devices both real and perceived must be addressed to protect and improve human health, safety, and the environment; enable accurate and efficient risk assessment, risk management, and cost-benefit trade-offs; foster innovation and public confidence; and ensure that society can enjoy the widespread economic and societal benefits that nanotechnology may offer. Congressionally-mandated reviews of the National Nanotechnology Initiative (NNI) by the National Research Council and the President's Council of Advisors on Science and Technology have concluded that additional research is required to make a rigorous risk assessment of nanoscale materials.

DTIC

Environmental Surveys; Health; Nanotechnology; Risk

20090001363 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Vapor-Phase Infrared Absorptivity Coefficient of Cyclohexyl Isothiocyanate

Samuels, Alan C; Miles, Jr , Ronald W; Williams, Barry R; Hulet, Melissa S; Jul 2008; 21 pp.; In English

Report No.(s): AD-A485730; ECBC-TR-637; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485730

We measured the vapor-phase absorptivity coefficient of cyclohexyl isothiocyanate in the mid-infrared (4000-550 cm(-1)) at a spectral resolution of 0.125 cm(-1). The chemical used in the feedstock was subjected to a rigorous analysis by gas chromatography-mass spectrometry, nuclear magnetic resonance, and Karl-Fischer titration to verify its purity. We describe the experimental method used to acquire the individual spectra that were used to produce the composite spectrum and summarize the statistical uncertainties in the data.

DTIC

Absorptivity; Cyclohexane; Hexyl Compounds; Infrared Radiation; Radicals; Vapor Phases

20090001532 Florida Univ., Gainesville, FL USA

Application of Trianionic Pincer Ligands to Reactions Involving Group VI Alkylidynes, Metal-Metal Multiple Bonds, and Group IV Amides

Peloquin, Andrew J; Aug 1, 2008; 163 pp.; In English

Report No.(s): AD-A486094; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In an effort to isolate a pincer-support tungsten alkylidyne, several new tungsten alkylidenes and a ditungsten compound have been isolated, supported by the previously reported OCO3- pincer ligand [3,3 -di-tert-butyl-2,2 -di-(hydroxy-kappaO)-1,1 :3 ,1 -terphenyl-2 -yl-kappaC2] (tBuOCO 1). When the tBuOCO ligand precursor is treated with W(OAr)2(CH2(CH3)3)-(aC(CH3)3) (OAr= 2,6-diisopropylphenoxide) in benzene, the alkylidene complex [tBuOCO]- W(=CH(CH3)3)(O-2,6-iPr2-C6H3) (3) results and was characterized by a combination of one and two dimensional NMR spectroscopy, single-crystal X-ray crystallography, and combustion analysis. To aid in the final abstraction, W(CH2(CH3)3)3(aC(CH3)3) was next combined with 1, but the reaction resulted in a complicated mixture of products. From this mixture, two closely related structural isomers of the form {[tBuOCO](CH3)3CCH=}W(-tBuOCHO)W- {=CHC(CH3)3[tBuOCO]} (4 and 5) were isolated. This bridged, dinuclear complex was analyzed by single-crystal X-ray crystallography. Finally, the reaction of (NMe2)3WaW(NMe2)3 with two equivalents of 1 results first in [tBuOCHO](NMe2)WaW(NMe2)[tBuOCHO] (7) and after prolonged heating, [tBuOCHO]W(mu-NMe2)2(mu-O)W[tBuOCHO] (8). These complexes were analyzed by a combination of NMR spectroscopy, single-crystal X-ray crystallography, and combustion analysis. The exact mechanism of formation for 8 is not yet know, but it potentially represents a rare example of the oxidative addition of water to an early transition metal. DTIC

Amides; Chemical Reactions; Ligands; Metal-Metal Bonding

20090001631 North Carolina State Univ., Raleigh, NC USA

Upstream Islands of Flame in Lifted-Jets Partially Premixed Combustion

Lyons, K M; Watson, K A; Carter, C D; Donbar, J M; Jan 2007; 10 pp.; In English

Contract(s)/Grant(s): W911NF-05-1-0045; CTS-99-09125

Report No.(s): AD-A486369; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Contemporary interest exists in understanding the roles of leading edge flow deflection, secondary jet instabilities and islands of ignited gases in permitting lifted flames to stabilize. To assess these issues, elements of the leading-edge of a lifted turbulent jet flame have been investigated using laser-imaging techniques. Images of flame position, morphology and dynamics are presented primarily from CH planar laser-induced fluorescence (CH-PLIF) measurements. In particular, evidence of flame islands, or flame fragments, upstream of the bulkflame leading edge are reported and discussed. This evidence is presented in the form of sequential CH-PLIF images and well as CH-PLIF=Rayleigh scattering images. Images showing thermal characteristics of the regions surrounding the edge flame are also described. DTIC

Combustion; Flames; Islands; Jet Flow; Premixing; Upstream

20090001632 Environmental Protection Agency, Washington, DC USA

Analysis of Selected Enhancements for Soil Vapor Extraction

Sep 1997; 247 pp.; In English

Contract(s)/Grant(s): 68-W5-0055

Report No.(s): AD-A486377; EPA-542-R-97-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report provides an engineering analysis of, and status report on, selected enhancements for soil vapor extraction (SVE) treatment technologies. The report is intended to assist project managers considering an SVE treatment system by providing them with an up-to-date status of enhancement technologies; an evaluation of each technology's applicability to various site conditions; a presentation of cost and performance information; a list of vendors specializing in the technologies; a discussion of relative strengths and limitations of the technologies; recommendations to keep in mind when considering the enhancements; and a compilation of references. The performance of an SVE system depends on properties of both the contaminants and the soil. SVE is generally applicable to compounds with a vapor pressure of greater than 1 millimeter of mercury at 20EC and a Henry s Law constant of greater than 100 atmospheres per mole fraction. SVE is most effective at sites with relatively permeable contaminated soil and with saturated hydraulic conductivities of greater than 1 x 10 or 1 x 10 centimeter per second (cm/s). SVE by itself does not effectively remove contaminants -3 -2 in saturated soil. However, SVE can be used as an integral part of some treatment schemes that treat both groundwater and the overlying vadose zone. Enhancement technologies should be considered when contaminant or soil characteristics limit the effectiveness of SVE or when contaminants are present in saturated soil. The five enhancement technologies covered in this report are as follows and

are described in the following subsections: * Air Sparging * Dual-phase Extraction * Directional Drilling * Pneumatic and Hydraulic Fracturing * Thermal Enhancement.
DTIC
Augmentation; Contamination; Extraction; Soils; Vapor Pressure; Vapors; Volatile Organic Compounds

20090001635 Environmental Protection Agency, Washington, DC USA
Arsenic Treatment Technologies for Soil, Waste, and Water
Ellis, David; Frey, Hilton; Markey, Richard M; Redwine, James C; Navratil, James D; Robbins, Robert G; Schreier, Cindy; Smythe, David; Sullivan, Enid J; Wickramanayake, G B; Sep 2002; 133 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 68-W-99-003; 68-W-02-034
Report No.(s): AD-A486380; EPA-542-R-02-004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report contains information on the current state of the treatment of soil, waste, and water containing arsenic, a contaminant that can be difficult to treat and may cause a variety of adverse health effects in humans. This information can help managers at sites with arsenic-contaminated media, generators of arsenic contaminated waste and wastewater, and owners and operators of drinking water treatment plants to: ' Identify proven and effective arsenic treatment technologies ' Screen those technologies based on effectiveness, treatment goals, application-specific characteristics, and cost ' Apply experience from sites with similar treatment challenges ' Find more detailed arsenic treatment information Arsenic is in many industrial raw materials, products, and wastes, and is a contaminant of concern in soil and groundwater at many remediation sites. Because arsenic readily changes valence state and reacts to form species with varying toxicity and mobility, effective treatment of arsenic can be difficult. Treatment can result in residuals that, under some environmental conditions, become more toxic and mobile. In addition, the recent reduction in the maximum contaminant level (MCL) for arsenic in drinking water from 0.050 to 0.010 mg/L will impact technology selection and application for drinking water treatment, and could result in lower treatment goals for remediation of arsenic-contaminated sites. A lower treatment goal may affect the selection, design, and operation of arsenic treatment systems. This report identifies 13 technologies to treat arsenic in soil, waste, and water.
DTIC
Arsenic; Contaminants; Soils; Toxicity; Waste Water; Water Treatment

20090001636 Environmental Protection Agency, Washington, DC USA
Proven Alternatives for Aboveground Treatment of Arsenic in Groundwater
Oct 2002; 69 pp.; In English
Report No.(s): AD-A486381; EPA542-R-02-004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue paper identifies and summarizes experiences with proven aboveground treatment alternatives for arsenic in groundwater, and provides information on their relative effectiveness and cost. The information contained in this paper can also be found in the report Arsenic Treatment Technologies for Soil, Waste, and Water , EPA542-R-02-004 (Ref. 1.12), which provides cost and performance data for additional technologies that can treat arsenic in soil, waste, and water. This paper has been developed jointly by EPA s Engineering Forum and Technology Innovation Office. EPA's Engineering Forum is a group of professionals, representing EPA Regional Offices, who are committed to identifying and resolving the engineering issues related to remediation of Superfund and hazardous waste sites. The Forum is sponsored by the Technical Support Project. In January 2001, EPA published a revised maximum contaminant level (MCL) for arsenic in drinking water that requires public water suppliers to maintain arsenic concentrations at or below 0.010 milligrams per liter (mg/L) by 2006 (Ref. 1.1, 1.9). The revised standard may affect arsenic cleanup goals for groundwater. The information contained in this issue paper can help managers at sites with arsenic-contaminated groundwater to: ' Identify proven and effective treatment technologies ' Screen those technologies based on effectiveness, treatment goals, site characteristics, and cost ' Apply technology and experience from sites with similar remediation challenges ' Find more detailed arsenic treatment information using this issue paper as a reference Arsenic is a component of many industrial raw materials, products, and wastes, and is a contaminant of concern in groundwater at many remediation sites.
DTIC
Alternatives; Arsenic; Contaminants; Ground Water; Hazardous Wastes

20090001760 Savannah River National Lab., Aiken, SC, USA
Determination of the Fraction of GIBBSITE and Boehmite Forms of Aluminum in Tank 51H Sludge
Hay, M.; Adu-Wusu, K.; McCabe, D.; Aug. 31, 2008; 19 pp.; In English
Contract(s)/Grant(s): DE-AC09-08SR22470
Report No.(s): DE2008-939428; WSRC-STI-2008-00366; No Copyright; Avail.: Department of Energy Information Bridge

The Savannah River National Laboratory (SRNL) was tasked with developing a test to determine the fraction of the

gibbsite and boehmite forms of aluminum in the sludge solids. Knowledge of the fractions of gibbsite and boehmite in the sludge contained in various waste tanks would facilitate better sludge mass reduction estimates and allow better planning/scheduling for sludge batch preparation. The composite sludge sample prepared for use in the test from several small samples remaining from the original 3-L sample appears to be representative of the original sample based on the characterization data. A Gibbsite/Boehmite Test was developed that uses 8 M NaOH and a temperature of 65 C to dissolve aluminum. The soluble aluminum concentration data collected during the test indicates that, for the three standards containing gibbsite, all of the gibbsite dissolved in approximately 2 hours. Under the test conditions boehmite dissolved at more than an order of magnitude more slowly than gibbsite. An estimate based on the soluble aluminum concentration from the sludge sample at two hours into the test indicates the sludge solids contain a form of aluminum that dissolves at a rate similar to the 100% Boehmite standard. Combined with the XRD data from the original 3-L sample, these results provide substantial evidence that the boehmite form of aluminum predominates in the sludge. A calculation from the results of the Gibbsite/Boehmite test indicates the sludge contains approx. 3% gibbsite and approx. 97% boehmite. The sludge waste in Tank 51H was recently treated under Low Temperature Aluminum Dissolution (LTAD) conditions and a substantial fraction of aluminum (i.e., sludge mass) was removed, avoiding production of over 100 glass canisters in Defense Waste Processing Facility (DWPF). Results of the Gibbsite/Boehmite test indicate that the aluminum in this sludge was in the form of the more difficult to dissolve boehmite form of aluminum. Since boehmite may be the dominant form of aluminum in Savannah River Site (SRS) waste tank sludge, this result suggests that the conditions of the LTAD process can be used to dissolve both the gibbsite and boehmite forms of aluminum in tank sludge and costly tank infrastructure upgrades required for the higher temperature baseline process can be avoided. However, this conclusion should be confirmed by testing additional waste tank samples.

NTIS

Aluminum; Aluminum Oxides; Radioactive Wastes; Sludge; Thermodynamic Properties; Underground Storage

20090001785 Air Force Research Lab., Edwards AFB, CA USA; Engineering Research and Consulting, Inc., Edwards AFB, CA, USA

Ionic Liquid Hypergols! (Preprint)

Hawkins, Tommy; Rosander, Michael; Vaghjiani, Ghanshyam; Chambreau, Steven; Drake, Gregory; Schneider, Stefan; Oct 22, 2007; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2303

Report No.(s): AD-A486116; AFRL-RZ-ED-JA-2008-041; No Copyright; Avail.: Defense Technical Information Center (DTIC)

After seminal work presented a decade ago, ionic liquids (IL) have now received a lot of attention as energetic materials for propellant applications. In bipropellant rocket engines, it is desirable to achieve ignition by means of a hypergolic reaction and so to minimize system complexity. Hypergolic bipropellants are defined as fuel and oxidizer combinations that, upon contact, chemically react and release enough heat to spontaneously ignite, eliminating the need for an additional ignition source. This also makes them highly reliable for spacecraft and satellites which need to fire their rocket engines hundreds, or even thousands, of times during their lifetime. Unfortunately, no reliable a priori method for prediction of hypergolicity for fuel - oxidizer pairs is available today. The initial 'hunting for the hypergol', as John Clark entitled one of the chapters in his book Ignition!, took place mainly during WWII. At that time, such toxic systems as 'C-Stoff' (a mixture of N2H4-H2O, methanol and water) and others consisting of triethyl amine, aniline, toluidine, xylidine and N-methyl aniline were developed. Today, environmental and health concerns are becoming more and more pressing in the propellant world. Nevertheless, hydrazine and its methylated derivatives are still the state-of-the-art fuels for bipropellant applications. Most of the problems handling hydrazine and its derivatives are related to their volatility, as they are carcinogenic vapor toxins. For these reasons, it is exceedingly attractive to replace hydrazine with ILs which have become paragons of environmental friendliness, green chemistry and low vapor toxicity.

DTIC

Anions; Fuels

20090001832 Air Force Research Lab., Wright-Patterson AFB, OH USA

Experimental Studies of Pylon-Aided Fuel Injection into a Supersonic Crossflow

Gruber, Mark R; Carter, Campbell D; Montes, Daniel R; Haubelt, Lane C; King, Paul I; Hsu, Kuang-Yu; May 2008; 13 pp.; In English

Contract(s)/Grant(s): Proj-3012

Report No.(s): AD-A485818; AFRL-RZ-WP-TP-2008-2170; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485818

An investigation of the nonreacting flow associated with pylon-aided gaseous fuel injection into a Mach 2 crossflow is described. In this study, a small pylon was positioned just upstream of a circular flush-wall fuel injector. Three pylon geometries were studied, along with a no-pylon reference case. In all cases, a typical cavity-based flameholder was positioned downstream of the fuel injector. The injectant plume characteristics were interrogated using a variety of laser-based and probe-based measurement techniques. Planar laser-induced fluorescence of nitric oxide was used to study the instantaneous plume structure. Spontaneous vibrational Raman scattering provided time-averaged plume characteristics and mixing information. Probe-based instrumentation was used in conjunction with the mixing data to estimate the total pressure losses associated with each configuration. Each pylon had a unique influence on the fuel-injection plume. In all cases, the presence of the pylon resulted in improved fuel penetration into the supersonic crossflow without significantly changing the total pressure-loss characteristics. Mixing efficiencies of the pylon-aided injection cases were not substantially different from the reference case.

DTIC

Cross Flow; Fuel Injection; Pylons; Supersonic Combustion

20090001847 Defence Science and Technology Organisation, Victoria, Australia

The Diffusion Ordered Spectroscopy (DOSY) Pulse Sequence and Defence Applications

Ovenden, Simon P; Bourne, David J; May 2008; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A485737; DSTO-TR-2130; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485737

This technical report will discuss all aspects of the DOSY two dimensional NMR experiment, including setting up the experiment, the collection of raw data, and the data processing required. Details of the DOSY experiment are explained through data collected on a variety of samples involving several chemical classes. At the end of the technical report is a discussion on the application of the DOSY pulse sequence to aspects of defence science related mixture analysis.

DTIC

Chemical Analysis; Diffusion; Gas Chromatography; Liquid Chromatography; Mass Spectroscopy; Spectroscopy

20090001875 Air Force Research Lab., Edwards AFB, CA USA

Background Pressure Effects on Internal and Near-field Ion Velocity Distribution of the BHT-600 Hall Thruster

Nakles, Michael R; Hargus, Jr, William A; Jun 24, 2008; 10 pp.; In English

Contract(s)/Grant(s): Proj-33SP

Report No.(s): AD-A486026; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA486026

Presented is a study of the effects of chamber background pressure on the ion axial velocity distribution within the discharge chamber and in the near-field of the Busek BHT-HD-600 xenon Hall effect thruster. Ion velocity distributions were measured along the acceleration channel centerline using laser-induced fluorescence of the 5d[4](sub 7/2)-6p[3](sub 5/2) xenon ion excited state transition. Measurements were taken at the lowest possible chamber background pressure and a pressure that was a factor of two higher. In addition to varying the background pressure, the magnetic field of the discharge chamber was switched between two configurations. The radial magnetic was set to a low and high strength case, which produced two different anode current oscillatory regimes. Ion axial velocity distribution function peaks were used to approximate ion energy and axial electric field strength to compare the acceleration profiles of the tested thruster operating conditions. Increasing background pressure shifted the ion acceleration region upstream in the discharge chamber. The width of the velocity distributions correlated strongly to the radial magnetic field strength. The high magnetic field case data showed narrower peaks.

DTIC

Hall Thrusters; Ion Distribution; Near Fields; Pressure Effects; Velocity Distribution; Xenon

20090001910 NASA Johnson Space Center, Houston, TX, USA

Control of the Diameter and Chiral Angle Distributions during Production of Single-wall Carbon Nanotubes

Nikolaev, Pavel; Holmes, William; Sosa, Edward; Boul, Peter; Arepalli, Sivaram; Yowell, Leonard; December 2008; 21 pp.; In English; 2008 MRS Fall meeting, 1-5 Dec. 2008, Boston, MA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNJ05HI05C; SAAAT07021; Copyright; Avail.: CASI: A03, Hardcopy

Many applications of single wall carbon nanotubes (SWCNT), especially in microelectronics, will benefit from use of certain (n,m) nanotube types (metallic, small gap semiconductor, etc.). However, as produced SWCNT samples are polydispersed, with many (n,m) types present and typical approximate 1:2 metal/semiconductor ratio. It has been recognized that production of SWCNTs with narrow 'tube type populations' is beneficial for their use in applications, as well as for the subsequent sorting efforts. In the present work, SWCNTs were produced by a pulsed laser vaporization (PLV) technique. The nanotube type populations were studied with respect to the production temperature with two catalyst compositions: Co/Ni and Rh/Pd. The nanotube type populations were measured via photoluminescence, UV-Vis-NIR absorption and Raman spectroscopy. It was found that in the case of Co/Ni catalyst, decreased production temperature leads to smaller average diameter, exceptionally narrow diameter distribution, and strong preference toward (8,7) nanotubes. The other nanotubes present are distributed evenly in the 7-30 deg chiral angle range. In the case of Rh/Pd catalyst, a decrease in the temperature leads to a small decrease in the average diameter, with the chiral angle distribution skewed towards 30 o and a preference toward (7,6), (8,6) and (8,7) nanotubes. However, the diameter distribution remains rather broad. These results demonstrate that PLV production technique can provide at least partial control over the nanotube (n,m) populations. In addition, these results have implications for the understanding the nanotube nucleation mechanism in the laser oven.

Author

Carbon Nanotubes; Nanofabrication; Diameters; Chirality; Pulsed Lasers; Vaporizing; Nanostructure Growth

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METALS AND METALLIC MATERIALS

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

20090000988 Oak Ridge National Lab., TN USA

Multi-Phase High Temperature Alloys: Exploration of Alumina-Forming, Creep-Resistant Austenitic Stainless Steels

Brady, M. P.; Yamamoto, Y.; Lu, Z. P.; Lu, P. J.; Maziasz, P. J.; January 2008; 8 pp.; In English

Report No.(s): DE2008-931001; No Copyright; Avail.: Department of Energy Information Bridge

Work in 2007 focused on the development of a new class of heat-resistant austenitic stainless steel alloys which achieved a unique combination of high-temperature creep strength and excellent oxidation resistance via protective Al(sub 2)O(sub 3) scale formation. Strengthening is achieved via the formation of stable nano NbC carbides with/without Fe(sub 2)Nb and related intermetallic phase dispersions, with controlled levels of Al to enable Al(sub 2)O(sub 3) scale formation in both air and air + water vapor environments up to (approx)800-900 C. The developed alloys exhibit comparable creep resistance to that of the best commercial heat-resistant austenitic stainless steels, and the protective Al(sub 2)O(sub 3) scale formation provides oxidation resistance superior to that of advanced Cr(sub 2)O(sub 3)-forming heat-resistant austenitic alloys. Preliminary screening also indicated that the developed Al-modified alloys were amenable to welding.

NTIS

Aluminum Oxides; Austenitic Stainless Steels; Creep Strength; High Temperature

20090001083 Southwest Research Inst., San Antonio, TX USA

Cost-Effective Method for Producing Self Supported Palladium Alloy Membranes for Use in Efficient Production of Coal Derived Hydrogen, (Final)

Coulter, K.; Mar. 31, 2008; 73 pp.; In English

Contract(s)/Grant(s): DE-FC26-03NT41849

Report No.(s): DE2008-935388; No Copyright; Avail.: National Technical Information Service (NTIS)

Southwest Research Institute(reg sign) (SwRI(reg sign)) has utilized its expertise in large-area vacuum deposition methods to conduct research into the fabrication of dense, freestanding Pd-alloy membranes that are 3-5 microns thick and over 100 inches(sup 2) in area. The membranes were deposited onto flexible and rigid supports that were subsequently removed and separated using novel techniques developed over the course of the project. Using these methods, the production of novel alloy compositions centered around the Pd-Cu system were developed with the objective of producing a thermally

stable, nano-crystalline grain structure with the highest flux recorded as 242 SCFH/feet(sup 2) for a 2 (micro)m thick Pd(sub 53)Cu(sub 47) at 400 degrees C and 20 psig feed pressure which when extrapolated is over twice the 2010 Department of Energy pure H(sub 2) flux target. Several membranes were made with the same permeability, but with different thicknesses and these membranes were highly selective. Researchers at the Colorado School of Mines supported the effort with extensive testing of experimental membranes as well as design and modeling of novel alloy composite structures. IdaTech provided commercial bench testing and analysis of SwRI-manufactured membranes.
NTIS
Coal; Copper; Cost Effectiveness; Hydrogen; Hydrogen Production; Membranes; Palladium Alloys

20090001186 Air Force Research Lab., Wright-Patterson AFB, OH USA
Microstructural Influences on Very High Cycle Fatigue Crack Initiation in Ti-6246
Szczepanski, C J; Jha, S K; Larsen, J M; Jones, J W; Apr 2008; 24 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A490160; AFRL-RX-WP-TP-2008-4310; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The fatigue behavior of an alpha + beta titanium alloy, Ti-6Al-2Sn-4Zr-6Mo, has been characterized in the very high cycle fatigue (VHCF) regime using ultrasonic fatigue (20 kHz) techniques. Stress levels of 40 to 60% of the yield strength of this alloy have been examined. Fatigue lifetimes in the range of 10 (to the 6th) to 10 (to the 9th) cycles are observed and fatigue cracks initiate from both surface and subsurface sites. This study examines the mechanisms of fatigue crack formation by quantifying critical microstructural features observed in the fatigue crack initiation region. The fracture surface near the fatigue crack initiation site was crystallographic in nature. Facets, which result from the fracture of primary alpha grains, are associated with the crack initiation process. The primary alpha grains that form facets are typically larger in size than average. The spatial distribution of primary alpha grains relative to each other observed near the initiation site did not correlate with fatigue life. Furthermore, the spatial distribution of primary alpha grains did not provide a suitable means for discerning crack initiation sites from randomly selected nominal areas.
DTIC
Crack Initiation; Fatigue (Materials); Microstructure; Titanium Alloys

20090001187 Air Force Research Lab., Wright-Patterson AFB, OH USA
Plasticity of Micrometer-Scale Single-Crystals in Compression: A Critical Review
Uchic, Michael D; Shade, Paul A; Dimiduk, Dennis M; Oct 2008; 37 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A490159; AFRL-RX-WP-TP-2008-4326; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This review examines the recent literature that has focused on uniaxial compression experiments of single crystals at the micrometer-scale. Collectively, the studies discovered new regimes of plastic flow that are size-scale dependent and that occur in the absence of strong strain gradients. However, the quantitative comparison of the flow curves between independent studies is hampered by differences in the particular implementations of the testing methodology. Two schools of thought have emerged regarding the observed size-scale effects; one attributes the effects to lack of dislocations in small samples, while the other attributes them to dislocation behavior in truncated volumes. The former, by its nature, lacks quantitative models. The latter has relied on modeling of the microcompression experiment using 3D discrete dislocation simulations, which has provided leading insight into the mechanisms that may control plastic flow in FCC metals. These efforts identified the importance of the initial dislocation density and distribution of mobile segments, as well as altered multiplication and hardening responses due to finite source statistics.
DTIC
Plastic Flow; Plastic Properties; Single Crystals; Strain Hardening

20090001191 Air Force Research Lab., Wright-Patterson AFB, OH USA; Monash Univ., Melbourne, Australia; Metz Univ., France
A Comparison of Continuous SPD Processes for Improving the Mechanical Properties of Aluminum Alloy 6111
Lapovok, R; Toth, L S; Winkler, M; Semiatin, S L; Apr 2008; 31 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A490130; AFRL-RX-WP-TP-2008-4319; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Microstructure evolution, mechanical properties, formability, and texture development were determined for AA6111

samples processed by asymmetric rolling (ASR) with different roll friction, velocity, or diameters, conventional rolling (CR), and equal-channel-angular pressing (ECAP). Highly elongated or sheared grain structures were developed during ASR/CR and ECAP, respectively. ASR led to improved r-values and formability compared to CR primarily as a result of the development of moderate shear-texture components analogous to those developed during ECAP of billet material. ASR based on different roll diameters gave the best combination of strength, ductility, and formability.
DTIC
Aluminum Alloys; Mechanical Properties; Plastic Deformation

20090001193 Air Force Research Lab., Wright-Patterson AFB, OH USA
Applying a Physics-Based Description of Fatigue Variability Behavior to Probabilistic Life Prediction
Jha, S K; Larsen, J M; Rosenberger, A H; Jul 2007; 31 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A490110; AFRL-RX-WP-TP-2008-4308; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe fatigue lifetime variability as the separation/overlap of a crack-growth-controlled life-limiting mechanism and a mean-lifetime dominating behavior. We implement this description through a bimodal probability density representing the superposition of the crack growth and the mean-lifetime dominating densities. With the help of an a+b titanium alloy it is shown that the effect of microstructure, temperature, and loading variables on lifetime variability can be realized in terms of the degree of influence of these variables on the two densities affecting their separation and therefore, the total variability. We suggest that this behavior may be related to the development of a range of heterogeneity levels in a material at any given loading condition, which appears to present some probability of a predominately crack-growth controlled mechanism. A procedure, based on the new description of fatigue variability, for predicting the probability of failure from relatively small number of experiments is discussed.
DTIC
Crack Propagation; Fatigue Life; Life (Durability); Predictions; Titanium Alloys; Variability

20090001194 Universal Energy Systems, Inc., Dayton, OH USA; Air Force Research Lab., Wright-Patterson AFB, OH, USA
Precipitation of Al3(Sc,Zr) Particles in a Direct Chill Cast Al-Zn-Mg-Cu-Sc-Zr Alloy During Conventional Solution Heat Treatment and its Effect on Tensile Properties
Senkov, O N; Shaghiev, M R; Senkova, S V; Miracle, D B; Dec 2007; 48 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5233; F04611-02-C-0014; Proj-2311
Report No.(s): AD-A490109; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The effect of heat treatment on precipitation and growth of coherent nanometer-sized Al3(Sc,Zr) particles and the effect of these particles on tensile properties of a direct chill (DC) cast Al-Zn-Mg-Cu-Sc-Zr alloy were studied. The size distribution, average size, number density and volume fraction of the Al3(Sc,Zr) particles were determined as a function of the solution treatment temperature and time. The average particle diameter increased from 6.0 nm to 27.3 nm, the volume fraction increased from 0.11% to 0.46%, while their number density decreased from 5.4x10(exp 15) cm-3 to 3.1x10(exp 14) cm-3 with an increase in the solution treatment temperature from 460deg C to 480 deg C and holding time from 1 hour to 48 hours. The particle size distributions were well described by normal (Gaussian) distributions but did not follow the Lifshitz-Slyozov-Wagner (LSW) theory of Ostwald ripening. To describe the observed particle size distributions, a stochastic process of particle growth was added to the normal process of growth. The kinetics of phase transformation followed the Kolmogorov-Johnson-Mehl-Avrami (KJMA) law, with the Avrami exponent m = 0.404.
DTIC
Aluminum Alloys; Cooling; Heat Treatment; Tensile Properties

20090001195 Air Force Research Lab., Wright-Patterson AFB, OH USA; Venizelou 31, Megara, Greece
Effect of Deformation and Prestrain Mode on the Flow Behavior of Ti-6Al-4V
Nicolaou, P D; Semiatin, Sheldon L; Jan 2008; 16 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5235; Proj-4347
Report No.(s): AD-A490108; AFRL-RX-WP-TP-2008-4304; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The effect of strain path on the plastic-flow behavior of Ti-6Al-4V with a colony-alpha perform microstructure was

determined. Specifically, the stress-strain response in compression following a prestrain via torsion, compression, or rolling was interpreted. It was found that the flow-softening parameter was dependent on the level of the prestrain, but independent of the mode of prestrain. After a prestrain of ~0.3, however, it decreased very slowly.
DTIC
Aluminum Alloys; Deformation; Flow; Softening; Titanium Alloys; Titanium Aluminides; Vanadium Alloys

20090001196 Air Force Research Lab., Wright-Patterson AFB, OH USA; Illinois Univ., IL, USA; California Univ., Davis, CA, USA
Ab-Initio Molecular Dynamics Simulations of Molten Ni-Based Superalloys
Asta, Mark; Trinkle, Dallas; Woodward, Christopher; Jun 2007; 9 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A490101; AFRL-RX-WP-TP-2008-4306; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In casting of single-crystal turbine blades for jet engines, the formation of solidification defects has become an increasingly important problem due to the rising levels of refractory elements in Ni-based superalloys. Refractory elements, which are beneficial for high-temperature mechanical properties, enhance density-driven convective instabilities underlying the formation of freckle defects in directional solidification. In support of an effort aimed at the development of validated mathematical criteria for predicting solidification-defect formation in superalloys, ab-initio molecular dynamics simulations have been performed to calculate atomic volumes of Ni-Al, Ni-W, Ni-Re and Ni-Al-W melts.
DTIC
Heat Resistant Alloys; Molecular Dynamics; Nickel Alloys; Simulation

20090001202 Air Force Research Lab., Wright-Patterson AFB, OH USA
Multi-Scale Characterization of Orthotropic Microstructures
Tschopp, M A; Wilks, G; Spowart, J E; Apr 2008; 23 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A489997; AFRL-RX-WP-TP-2008-4325; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Computer-generated 2-D microstructures of varying second-phase area fraction (5% to 30%), aspect ratio (1 to 16), and degree of alignment (where the reinforcement major-axis orientation is random, perfectly aligned, or semi-aligned) are analyzed via the isotropic and directional forms of the computationally efficient Multi-Scale Analysis of Area Fractions (MSAAF) technique. The impact of these microstructure parameters on the representative volume element (RVE) necessary to characterize a microstructure is ascertained with variations in isotropic and directional homogenous length scales, derivative quantities of the MSAAF technique. Analysis of these results produces empirical expressions for the directional homogenous length scale as a function of area fraction and aspect ratio for the limiting cases of random and 'perfect' second phase alignment. Generally, particle alignment is observed to increase the aspect ratio of a microstructure's RVE -- a trend amplified by higher reinforcement aspect ratios and lower area fractions.
DTIC
Microstructure; Orthotropism

20090001204 Michigan Univ., Ann Arbor, MI USA
Gamma Prime Morphology and Creep Properties of Nickel Based Superalloys With Platinum Group Metal Additions (Preprint)
Sluytman, J S; Suzuki, A; Bolcavage, A; Helmink, R C; Ballard, D L; Pollock, T M; Apr 2008; 12 pp.; In English
Contract(s)/Grant(s): FA8650-05-C-5220; Proj-4347
Report No.(s): AD-A489975; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The microstructure and creep properties of platinum group metal (PGM) modified nickel based superalloys have been investigated. Alloys containing Pt and/or Ir along with variations in Cr, Ta, Re, Ru, and W exhibited relatively high solidus and liquidus temperatures. Differential thermal analysis (DTA) showed a strong dependence of the gamma' solvus on the level of Ta. The morphology of the gamma' precipitates was influenced by the presence of Cr, Ta, Ru, and W and ranged from cuboidal to semi-spherical. Compression creep tests were conducted at 1000 C at stresses ranging from 40 to 90 MPa. Alloys containing approximately 8 wt% Pt combined with Cr and Ta displayed the best resistance to creep deformation at stresses around 80 MPa. Post-creep analysis of the rafted structures indicated that all PGM modified alloys without Ru and W

possessed positive misfit with magnitudes ranging from ~0.3 to 1.5%. The partitioning of PGMs between the gamma and gamma' phases and their resultant influence on creep performance is discussed.
DTIC
Creep Properties; Heat Resistant Alloys; Morphology; Nickel Alloys; Platinum

20090001209 Universal Energy Systems, Inc., Dayton, OH USA
Modeling of Texture Evolution During Hot Forging of Alpha/Beta Titanium Alloys (Preprint)
Glavicic, M G; Goetz, R L; Barker, D R; Shen, G; Furrer, D; Woodfield, A; Semiatin, S L; Jun 2007; 26 pp.; In English
Contract(s)/Grant(s): F33615-99-2-5212; Proj-4347
Report No.(s): AD-A489816; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489816

Texture development during the subtransus hot forging of alpha/beta titanium alloys with an equiaxed-alpha microstructure was modeled using the Los Alamos Polycrystalline Plasticity (LApp) code and <111> pencil-glide polycrystalline plasticity code coupled with the finite-element-method (FEM) program DEFORM. The methodology treated the partitioning of the imposed strain between the alpha and beta phases, and thus enabled the prediction of the distinct deformation textures developed in the primary alpha and beta matrix during hot working. Two variant selection rules in conjunction with the beta deformation texture were also examined to establish a method for predicting the transformation texture of secondary alpha developed as a result of beta decomposition during cool-down following forging or heat treatment. The approach was validated via an industrial-scale trail comprising hot pancake forging of Ti-6Al-4V.
DTIC
Forging; Hot Working; Textures; Titanium Alloys

20090001210 Air Force Research Lab., Wright-Patterson AFB, OH USA
Implementation of Exact Grain-Boundary Geometry Into a 3D Monte-Carlo (POTTS) Model for Microstructure Evolution
Ivasishin, O M; Shevchenko, S V; Semiatin, S L; Jul 2008; 19 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A489814; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489814

A three-dimensional Monte-Carlo (Potts) model was modified to incorporate the effect of grain-boundary inclination on boundary mobility. For this purpose, a straightforward geometric construction was developed to determine the local orientation of the grain-boundary plane. The combined effects of grain-boundary mobility were incorporated into the Monte-Carlo code using the definition of the tilt-twist component (TTC). The modified code was validated by simulating grain growth in microstructures comprising equiaxed or elongated grains as well as the static recrystallization of a microstructure of deformed (elongated) grains.
DTIC
Geometry; Grain Boundaries; Microstructure; Monte Carlo Method; Three Dimensional Models

20090001211 Air Force Research Lab., Wright-Patterson AFB, OH USA
Branch Elimination During Heat Treatment of Titanium Alloys With a Colony-Alpha Microstructure (Preprint)
Semiatin, S L; Poteet, P S; Jul 2008; 14 pp.; In English
Contract(s)/Grant(s): F33615-02-2-5800; Proj-4347
Report No.(s): AD-A489792; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489792

The kinetics of the dissolution of lamellar branches in an alpha-beta titanium alloy with a colony-alpha microstructure were determined using a series of heat treatments at 900 and 955 degrees C. The experiments revealed that the branch recession rate was constant. An approximate diffusion analysis was developed to describe the diffusion process, and corresponding model predictions showed good agreement with measurements.
DTIC
Colonies; Heat Treatment; Microstructure; Titanium Alloys

20090001312 NASA Glenn Research Center, Cleveland, OH, USA; Sest, Inc., Middleburgh Heights, OH, USA
Advanced Stirling Convertor Heater Head Durability and Reliability Quantification
Krause, David L.; Shah, Ashwin R.; Korovaichuk, Igor; Kalluri, Sreeramesh; November 2008; 20 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNC05BAZZB; NNC08JF17T
Report No.(s): NASA/TM-2008-215449; AIAA Paper-2008-5772; E-16652; Copyright; Avail.: CASI: A03, Hardcopy

The National Aeronautics and Space Administration (NASA) has identified the high efficiency Advanced Stirling Radioisotope Generator (ASRG) as a candidate power source for long duration Science missions, such as lunar applications, Mars rovers, and deep space missions, that require reliable design lifetimes of up to 17 years. Resistance to creep deformation of the MarM-247 heater head (HH), a structurally critical component of the ASRG Advanced Stirling Convertor (ASC), under high temperatures (up to 850 C) is a key design driver for durability. Inherent uncertainties in the creep behavior of the thin-walled HH and the variations in the wall thickness, control temperature, and working gas pressure need to be accounted for in the life and reliability prediction. Due to the availability of very limited test data, assuring life and reliability of the HH is a challenging task. The NASA Glenn Research Center (GRC) has adopted an integrated approach combining available uniaxial MarM-247 material behavior testing, HH benchmark testing and advanced analysis in order to demonstrate the integrity, life and reliability of the HH under expected mission conditions. The proposed paper describes analytical aspects of the deterministic and probabilistic approaches and results. The deterministic approach involves development of the creep constitutive model for the MarM-247 (akin to the Oak Ridge National Laboratory master curve model used previously for Inconel 718 (Special Metals Corporation)) and nonlinear finite element analysis to predict the mean life. The probabilistic approach includes evaluation of the effect of design variable uncertainties in material creep behavior, geometry and operating conditions on life and reliability for the expected life. The sensitivity of the uncertainties in the design variables on the HH reliability is also quantified, and guidelines to improve reliability are discussed.
Author
Stirling Cycle; Creep Properties; Design Analysis; Finite Element Method; Heat Resistant Alloys; High Temperature; Reliability Analysis; Deformation; Gas Pressure

20090001407 National Research Council of Canada, Ottawa, Ontario Canada
Progress in Building NRC's Cesium Fountain Clock
Marmet, Louis; Dube, Pierre; Gigault, Christian; Aug 2005; 5 pp.; In English
Report No.(s): AD-A485837; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485837

We report recent progress made on the construction of a cesium fountain atomic clock at the Frequency and Time Group of the National Research Council (NRC) Canada. We also future design plans and operation scheme of the fountain.
DTIC
Atomic Clocks; Cesium; Clocks; Progress

20090001449 Physikalisch-Technische Bundesanstalt, Brunswick, Germany
The New PTB Caesium Fountain Clock CSF2
Wynands, R; Bauch, A; Griebsch, D; Schroeder, R; Weyers, S; Aug 2005; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485943; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485943

At PTB a second caesium fountain clock, CSF2, is in the process of being set up. It differs from the first PTB caesium fountain standard CSF1 in a number of details, which are consecutively specified. First cold atoms have been prepared in the new apparatus.
DTIC
Atomic Clocks; Cesium; Clocks; Frequency Standards

20090001618 RAND Corp., Santa Monica, CA USA
A Common Operating Picture for Air Force Material Sustainment. First Steps
Pyles, Raymond A; Tripp, Robert S; Lynch, Kristin F; Snyder, Don; Mill, Patrick; Drew, John G; Jan 2008; 143 pp.; In English
Contract(s)/Grant(s): FA7014-06-C-0001
Report No.(s): AD-A486319; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force materiel sustainment system (MSS) is continually caught between two countervailing forces: demands for

increased efficiency and lower costs one side, and demands for increasingly effective support to combat operations and peacetime training on the other. Compounding the situation, the Air Force is currently facing more unpredictable operational demands- in terms of both their location and their required operating capabilities. We envision a materiel sustainment system common operating picture (COP) that would better synchronize the MSS's activities- enhancing responsiveness to changing operational needs reducing opportunities for unintended wasted effort, and coordinating efforts to improve support in one agency while ensuring that complementary efforts in another area are accomplished.
DTIC
Education; Images

20090001633 Interstate Technology Regulatory Cooperation, Washington, DC USA
Emerging Technologies for the Remediation of Metals in Soils, Insitu Stabilization/Inplace Inactivation
Dec 1997; 32 pp.; In English
Report No.(s): AD-A486378; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Inplace inactivation is a site stabilization technique in which amendments are applied to soils to alter the soil contaminant chemistry, making contaminants less soluble, less mobile, and less bioavailable. Inplace inactivation does not affect the total contaminant concentration, but reduces the risk of harm to a target organism (humans, animals, etc.) by reducing biological activity. The ITRC Metals in Soils Team identified these techniques as being applicable to some sites with soils contaminated with metals. This technology overview provides an introduction to inplace inactivation / insitu stabilization techniques and discusses several current approaches to implementation. The document outlines several case studies and identifies future research and development needs, as well as potential stakeholder and regulatory concerns. A preliminary cost discussion is included, as is an outline for a potential project workplan. Membership on this work team was open to all ITRC members. Participants with expertise or interest in metals treatment technologies in their states elected to join the team and contributed consistently to the development of this work product. Members of the RTDF (Remediation Technologies Development Forum) IINERT technology team (In-Place Inactivation and Natural Ecological Restoration Technologies) also participated in this team and helped to provide an industry perspective. A representative from the U.S. Army Corps of Engineers and the Department of Energy actively participated on the team. Support was also provided by the USA Environmental Protection Agency and the Department of Defense. Input regarding public and community concerns for these technologies was provided by ITRC public stakeholder representatives.
DTIC
Contaminants; Deactivation; Metals; Soils

20090001634 Interstate Technology Regulatory Cooperation, Washington, DC USA
Technical And Regulatory Guidelines for Soil Washing
Dec 1997; 50 pp.; In English
Report No.(s): AD-A486379; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Soil washing is a process that uses physical and/or chemical techniques to separate contaminants from soil and sediments. This ITRC Metals in Soils Team document focuses on technical and regulatory issues associated with implementation of soil washing technology at sites contaminated with metals. The document provides guidelines to facilitate the deployment of soil washing technologies by users and regulators. Initial sections of the document focus on a technology overview and status, and discuss issues which may be impeding the selection of soil washing as a remedial alternative at sites. Later sections present technical and regulatory guidelines for sampling both pre- and post-processed soils and discuss potential feed soil limitations. Technical discussions on soil handling and stockpiling, system operation, and dust control are included as guidance for project implementation. General discussions of water discharge requirements, concentrated treatment residue, record keeping, QA/QC and health and safety are included to provide guidelines for regulators and project managers responsible for oversight. This document also includes recommendations for regulatory change, and Appendix E contains a list of additional technical contacts for further assistance if necessary. Members of the team developed the draft document. Technical and regulatory issues were discussed during conference calls and breakout sessions at ITRC meetings, and consensus was reached whenever possible. The document was distributed for peer review and comments were received from representatives of state and federal agencies, public stakeholders, industry, consultants, and vendors. Comments were discussed, evaluated and incorporated into the document as appropriate. This document is now under review by ITRC state agencies to determine the degree of concurrence on the technical and regulatory guidelines contained within.
DTIC
Contaminants; Metals; Sediments; Soils; Washing

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*.

20090001109 Savannah River National Lab., Aiken, SC, USA
Sludge Batch 5 (SB5): Selection of Candidate Frits and Characterization of Preliminary Glass Systems
Fox, K. M.; Edwards, T. B.; Best, D. R.; Reamer, I. A.; Workman, R. J.; Jul. 2007; 23 pp.; In English
Report No.(s): DE2008-918142; WSRC-SIT-2007-00418; No Copyright; Avail.: Department of Energy Information Bridge

Six potential frits were identified as candidates for processing the February 2007 projected SB5 composition (i.e., no implementation of aluminum dissolution) from an array of frit formulations based upon composition-property model predictions. Test glasses were fabricated in the laboratory to verify the applicability of the product performance models to glasses produced with these frits. Characterization of the glasses fabricated with the selected frits showed that all of the glasses had durability responses that are considered very acceptable at a waste loading of 36%. The durability responses were predictable by the free energy of hydration models. No crystallization was identified in the quenched glasses. Samples of the glasses that were slowly cooled following the canister centerline cooled (ccc) thermal profile were found to contain small amounts of magnetite. This crystalline phase had little impact on the durability of the glasses, and therefore is not an issue for concern based on the February 2007 projections. Note that revised versions of the SB5 flowsheet, including those incorporating aluminum dissolution, are expected, which will require additional frit development work when received. Initial melt rate testing results showed that the previously identified trend of increasing melt rate with increasing concentration of B2O3 for SB4 may be extended to this SB5 system.
NTIS
Glass; Radioactive Wastes; Sludge

20090001126 Savannah River National Lab., Aiken, SC, USA; SIA Radon, Moscow, Russian Federation
Full-Scale Cold Crucible Test on Vitrification of Savannah River Site SB4 HLW Surrogate
Kobelev, A. P.; Stefanovsky, S. V.; Lebedev, V. V.; Polkanov, M. A.; Gorbunov, V. V.; Aug. 2008; 13 pp.; In English
Contract(s)/Grant(s): DE-AC09-08SR22470
Report No.(s): DE2008-936858; SRNS-STI-2008-00017; No Copyright; Avail.: Department of Energy Information Bridge

The full-scale cold crucible test on vitrification of sludge batch 4 (SB4) Savannah River Site HLW surrogate using a 418 mm inner diameter stainless steel crucible was carried-out for 66 hrs. Commercially available Frit 503-R4 (8 wt.% Li(sub 2)O, 16 wt.% B(sub 2)O(sub 3), 76 wt.% SiO(sub 2)) was used as a glass forming additive at a calcine to frit ratio of 1:1 (50 wt.% calcine, 50 wt.% frit). Two portions of slurry prepared from frit and mixture of chemicals simulating waste in amount of (approx.) 750 kg and from frit and waste surrogate prepared by the SRT-MST-2007-00070 procedure in amount of (approx.) 1,300 kg with water content of (approx.) 27 and (approx.) 50 wt.%, respectively, was processed and (approx.) 875 kg of the vitrified product in total ((approx.) 415 + 460 kg) was obtained. Average parameters were as follows: vibration power - 121.6 to 134.1 kW, feed rate (capacity) - 25.1 to 39.8 kg/hr, glass pour rate (productivity) - 14.0 kg/hr specific energy expenses for feed processing - 4.8 to 3.4 kW x hr/kg, specific energy expenses for glass production (melting ratio) - 8.7 to 9.6 kW x hr/kg, specific glass productivity - 2453 kg/(m(sup 2) x d). The product was composed of major vitreous and minor spinel structure phases. No nepheline phase was found. Average degree of crystallinity was estimated to be (approx.) 12 vol.%. Cesium was found to be the most volatile component (up to (approx.) 60 wt.% of total). Lithium, sodium and boron are less volatile.
NTIS
Crucibles; Full Scale Tests; Grasslands; Radioactive Wastes; Rivers; Vitrification

20090001128 Savannah River National Lab., Aiken, SC, USA
Variability Study with FRIT 510 to Support a Second Tank 40 Decant
Raszewski, F.; Tommy, E. T.; Peeler, D.; Best, D.; Reamer, I.; Jul. 29, 2008; 125 pp.; In English
Contract(s)/Grant(s): DE-AC09-08SR22470
Report No.(s): DE2008-936863; WSRC-STI-2008-00315; No Copyright; Avail.: National Technical Information Service (NTIS)

Sludge Batch 4 (SB4) is currently being processed in the Defense Waste Processing Facility (DWPF) using Frit 510. The slurry pumps in Tank 40 are experiencing in-leakage of bearing water, which is causing the sludge slurry in Tank 40 to become dilute at a rapid rate. Currently, the DWPF is removing this dilution water by performing caustic boiling during the Sludge Receipt and Adjustment Tank (SRAT) cycle. In order to alleviate prolonged SRAT cycle times, which may eventually impact

canister production rates, the Liquid Waste Organization (LWO) performed a 100K gallon supernate decant of Tank 40 in April 2008. SRNL performed a supplemental glass variability study to support the April 2008 100K gallon decant incorporating the impact of coupled operations (addition of the Actinide Removal Process (ARP) stream). Recently LWO requested that SRNL assess the impact of a second decant (up to 100K gallon) to the Frit 510-SB4 system. This second decant occurred in June 2008. LWO provided nominal compositions on May 6, 2008 representing Tank 40 prior to the second decant, following the second decant, and the SB4 Heel prior to blending with Tank 51 to constitute SB5. Paper study assessments were performed for these options based on sludge-only and coupled operations processing (ARP addition), as well as possible Na(sub 2)O additions (via NaOH additions) to both flowsheets. A review of the ComProTM database relative to the compositional region defined by the projections after the second decant coupled with Frit 510 identified only a few glasses with similar glass compositions. These glasses were acceptable from a durability perspective, but did not sufficiently cover the new glass compositional region. Therefore, SRNL recommended that a supplemental variability study be performed to support the June 2008 Tank 40 decant. Glasses were selected for the variability study based on three sludge compositional projections (sludge-only, coupled and coupled + 2 wt% Na(sub 2)O) at waste loadings (WLs) of interest to DWPF (32%, 35% and 38%). These nine glasses were fabricated and characterized using chemical composition analysis, X-ray Diffraction (XRD) and the Product Consistency Test (PCT). All of the glasses that were selected for this study satisfy the Product Composition Control System (PCCS) criteria and are deemed processable and acceptable for the DWPF, except for the SB4VS2-03 (sludge-only at 38% WL) target composition. This glass fails the T(sub L) criterion and would not be considered processable based on Slurry Mix Evaporator (SME) acceptability decisions. The durabilities of all of the study glasses (both quenched and ccc) are well below that of the normalized leachate for boron (NL) of the reference EA glass (16.695 g/L) and are predictable using the current PCCS models.

NTIS

Frit; Radioactive Wastes; Sludge; Variability

20090001157 NASA White Sands Test Facility, NM, USA

Effect of Oxygen Concentration on Autogenous Ignition Temperature and Pneumatic Impact Ignitability of Nonmetallic Materials

Smith, Sarah; [2009]; 8 pp.; In English; 12th International Symposium on Materials in Oxygen-Enriched Atmospheres, 7-0 Oct. 2009, Berlin, Germany; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001157

Extensive test data exist on the ignitability of nonmetallic materials in pure oxygen, but these characteristics are not as well understood for lesser oxygen concentrations. In this study, autogenous ignition temperature testing and pneumatic impact testing were used to better understand the effects of oxygen concentration on ignition of nonmetallic materials. Tests were performed using oxygen concentrations of 21, 34, 45, and 100 %. The following materials were tested: PTFE Teflon(Registered Trademark), Buna-N, Silicone, Zytel(Registered Trademark) 42, Viton(registered Trademark) A, and Vespel(Registered Trademark) SP-21.

Author

Ignition Temperature; Polytetrafluoroethylene; Silicones; Buna (Trademark); Ignition; Oxygen

20090001203 Missouri Univ., Rolla, MO USA; Boeing Co., USA

Aqueous-Based Extrusion Fabrication of Ceramics on Demand

Mason, Michael S; Huang, Tieshu; Landers, Robert G; Leu, Ming C; Hilmas, Gregory E; Hayes, Michael W; Jul 2007; 13 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865

Report No.(s): AD-A489996; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Aqueous-Based Extrusion Fabrication is an additive manufacturing technique that extrudes ceramic slurries of high solids loading layer by layer for part fabrication. The material reservoir in a previously developed system has been modified to allow for starting and stopping of extrusion process on demand. Design pros and cons are examined and a comparison between two material reservoir designs is made. Tests were conducted to determine the optimal deposition parameters for starting and stopping of the extrudate on demand. The collected test data is used to create a process model that describes the relationship between ram velocity and material extrusion rate. This model allows for the development of a deposition strategy that improves material deposition consistency, including reduced material buildup at sharp corners. Example parts are fabricated using the deposition strategy and hardware design.

DTIC

Aqueous Solutions; Ceramics; Extruding; Fabrication

20090001310 NASA Glenn Research Center, Cleveland, OH, USA

Shear Modulus for Nonisotropic, Open-Celled Foams Using a General Elongated Kelvin Foam Model

Sullivan, Roy M.; Ghosn, Louis J.; November 2008; 17 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2008-215430; E-16613; Copyright; Avail.: CASI: A03, Hardcopy

An equation for the shear modulus for nonisotropic, open-celled foams in the plane transverse to the elongation (rise) direction is derived using an elongated Kelvin foam model with the most general geometric description. The shear modulus was found to be a function of the unit cell dimensions, the solid material properties, and the cell edge cross-section properties. The shear modulus equation reduces to the relation derived by others for isotropic foams when the unit cell is equiaxed. Author

Foams; Modulus of Elasticity; Elongation; Shear Properties

20090001581 Naval Air Warfare Center, Patuxent River, MD USA

Trivalent Chromium Process (TCP) as a Sealer for MIL-A-8625F Type II, IIB, and IC Anodic Coatings

Matzdorf, Craig; Beck, Erin; Hilgeman, Amy; Prado, Ruben; Aug 29, 2008; 50 pp.; In English

Report No.(s): AD-A486208; NAWCADPAX/TR-2008/104; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents evaluations of trivalent chromium compositions (TCP) as sealers for MIL-A-8625F Type II, IIB, and IC anodic coatings conducted from March 2001 through December 2007 by Materials Engineering, AIR-4.3.4, at NAWCAD Patuxent River, Maryland, and the In-Service Support Center at Fleet Readiness Center (FRC) Southeast, Jacksonville, Florida. Key performance criteria evaluated are bare, or unpainted, corrosion resistance in ASTM B 117 neutral salt fog (NSF) and ASTM G 85 Annex 4 acidified salt fog (SO2 SF), painted corrosion resistance in NSF and SO2 SF, and paint adhesion. The performance of TCP as a sealer was compared to standard sealers like dichromate and water which are commonly used in aerospace and other industries. Paint adhesion was performed with commonly used high-solids and water-borne chromated and chromate-free primers qualified to MIL-PRF-23377 and MIL-PRF-85582. In these series of evaluations, TCP performs as good as or better than chromate in corrosion resistance and equal to chromate in paint adhesion. TCP is far superior to water for sealing. An additional benefit is that the TCP is applied at ambient conditions for 5 to 10 min. Chromate and water sealers are applied at 190 deg F to 200 deg F for up to 25 min.

DTIC

Adhesion; Aluminum; Anodic Coatings; Chromium; Corrosion Resistance; Paints; Sealers; Sealing

20090001787 Air Force Research Lab., Edwards AFB, CA USA

Structural Investigation of Fluoridated POSS Cages Using Ion Mobility Mass Spectrometry and Molecular Mechanics

Bodzin, Dena J; Anderson, Stanley E; Haddad, Timothy S; Boatz, Jerry A; Mabry, Joseph M; Mitchell, Connie; Bowers, Michael T; Jan 9, 2008; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2303

Report No.(s): AD-A486113; AFRL-RZ-ED-JA-2008-013; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ion mobility and molecular modeling methods were used to investigate the gas phase conformational properties of Polyhedral Oligomeric Silsesquioxane (POSS) fluoride salts, where the fluoride is encapsulated within the POSS cage. Theoretical calculations demonstrate that the binding energy of fluoride to the interior of the POSS cage ranges from 70 to 270 kcal/mol as a function of substituent. Sodiated positive ions of the form HF\@R8T8Na+ (T = SiO3/2, R = styrenyl, phenyl, and vinyl) were examined by MALDI; ESI was used to study the negative ions F-\@R8T8 (R = styrenyl, phenyl, vinyl, trifluoropropyl, and nonafluorohexyl). The ion mobilities of these species were measured and used to calculate collision cross sections. These cross sections were compared to X-ray crystal structures and theoretical cross sections obtained from molecular mechanics and dynamics calculations. Experimental cross sections were consistent with all of the known X-ray crystal structures (styrenyl, vinyl and phenyl POSS species). The experimental cross sections also agreed with the calculated cross sections for each monomer species. Due to the compact nature of the POSS monomer cages, each sample had only one stable conformation, and only one low-energy family of structures was found for each set of sample calculations.

DTIC

Fluorides; Mass Spectroscopy; Mobility; Molecular Structure; Polymers

28
PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*; and *44 Energy Production and Conversion*.

20090001456 Library of Congress, Washington, DC USA
U.S. Assistance to North Korea: Fact Sheet
Manyin, Mark E; Oct 11, 2006; 7 pp.; In English
Report No.(s): AD-A485981; CRS-RS21834; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485981

This report summarizes U.S. aid to the Democratic People's Republic of North Korea (DPRK), also known as North Korea. It will be updated periodically to track changes in U.S. provision of aid to North Korea. Since 1995, the USA has provided over $1.1 billion, about 60% of which has paid for food aid. About 40% was energy assistance channeled through the Korean Peninsula Energy Development Organization (KEDO), the multilateral organization established in 1994 to provide energy aid in exchange for North Korea's pledge to halt its existing nuclear program. U.S. assistance to North Korea has fallen significantly over the past three years, and was zero in FY2006. The KEDO program was shut down in January 2006. Food aid has been scrutinized because the DPRK government restricts the ability of donor agencies to operate in the country. Compounding the problem is that South Korea and China, by far North Korea's two most important providers of food aid, have little to no monitoring systems in place. This may help explain why, in the summer of 2005, the North Korean government announced it would no longer need humanitarian assistance from the United Nations, including from the World Food Program (WFP), the primary channel for U.S. food aid. Part of Pyongyang's motivation appears to be a desire to negotiate a less intrusive monitoring presence. In response, the WFP shut down its operations and the USA has suspended its food aid shipments. The WFP subsequently negotiated a scaled-down 'development' assistance program with the North Korean government. The WFP says that food conditions have worsened for some groups since North Korea introduced economic reforms in 2002. U.S. officials, including President Bush, have indicated that U.S. development assistance might be forthcoming if North Korea begins dismantling its nuclear programs.
DTIC
Food; Fuel Oils; North Korea; Nuclear Weapons; United States

20090001457 Library of Congress, Washington, DC USA
U.S. Assistance to North Korea
Manyin, Mark E; Nikitin, Mary B; Jul 31, 2008; 7 pp.; In English
Report No.(s): AD-A485982; CRS-RS21834; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485982

This report summarizes U.S. assistance to the Democratic People's Republic of North Korea (DPRK), also known as North Korea. It will be updated periodically to track changes in U.S. provision of aid to North Korea. Since 1995, the USA has provided North Korea with over $1 billion in assistance, about 60% of which has paid for food aid and 40% or so paying for energy assistance. As shown in Table 1, U.S. aid fell significantly in the mid-2000s, bottoming out at zero in FY2006. The Bush Administration resumed assistance in FY2007. In the fall of 2007, when progress began to be made in the 6-party talks over North Korea's nuclear program, the USA began providing heavy fuel oil (HFO) in return for Pyongyang freezing and disabling its plutonium-based nuclear facilities in Yongbyon. The USA also is expected to provide technical assistance to North Korea to help in the disabling and dismantling processes. In May 2008, the Bush Administration announced it would resume food assistance to North Korea by providing 500,000 metric tons (MT). The first shipment was sent on June 29, 2008, after an agreement on monitoring was signed. Food aid to the DPRK has been scrutinized because Pyongyang restricts the ability of donor agencies to operate in the country. Compounding the problem is that South Korea and China, which in recent years have been North Korea's two most important providers of food aid, have little to no monitoring systems in place. In 2008, U.N. officials have called for international donations of food to avert a 'serious tragedy' in North Korea, as hunger has deepened.
DTIC
Food; Fuel Oils; North Korea; Nuclear Weapons; United States

20090001467 Library of Congress, Washington, DC USA

Department of Defense Fuel Costs in Iraq

Andrews, Anthony; Schwartz, Moshe; Jul 23, 2008; 7 pp.; In English

Report No.(s): AD-A486025; CRS-RS22923; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA486025

Since the invasion of Iraq in 2003, the average price of fuels purchased for military operations in Iraq has steadily increased. The disparity between the higher price of fuel supplied to the USA Central Command compared to Iraq's civilian population has been a point of contention. Several factors contribute to the disparity, including the different types of fuel used by the military compared to Iraqi civilians, the Iraqi government's price subsidies, and the level pricing that the DoD's Defense Logistics Agency charges for military customers around the world. The Iraqi government has been pressured to reduce its fuel subsidy and black market fuel prices remain higher than the official subsidized price.

DTIC

Costs; Defense Program; Fuels; Iraq; Petroleum Products; Procurement

20090001548 Naval Postgraduate School, Monterey, CA USA

Steaming on Convex Hulls

Brown, Gerald G; Kline, Jeffrey E; Rosenthal, Richard E; Washburn, Alan R; Aug 2007; 12 pp.; In English

Report No.(s): AD-A486135; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is a sea story about using a simple classroom example to save a great deal of money, as well as to convince beginning Postgraduate Naval School operations research students experienced, skeptical military officers-that mathematical analysis can yield immediate results. The application is planning a ship's transit from one point to another in a fixed amount of time, given that the ship can operate with one or more of its propulsion plants idled to save fuel. Simple analysis yields nonintuitive results that US Navy shipboard energy-conservation guides overlook. One of the authors (Kline) solved this homework problem as a student and subsequently applied this example when he took command of USS AQUILA, a patrol hydrofoil missile ship. AQUILA achieved results so striking in comparison to her sister ships that the squadron material of officer inspected her engineering plant to ensure that no safety settings were being overridden to achieve this record. Kline's spreadsheet decision-support tool was provided to other hydrofoil commanders. A more general version has been conveyed to the US Navy. Considering that our navy spends about a billion dollars per year on fuel for surface-combatant ships alone, this development promises substantial, long-term returns.

DTIC

Convexity; Fuels; Hulls (Structures); Patrols

20090001602 Library of Congress, Washington, DC USA

U.S. Trade Deficit and the Impact of Rising Oil Prices

Jackson, James K; Aug 12, 2008; 7 pp.; In English

Report No.(s): AD-A486251; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Petroleum prices have continued to rise sharply in 2008, at one time reaching more than $140 per barrel of crude oil. At the same time the average monthly volume of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated $50 billion to the nation's trade deficit in 2006 and another $28 billion in 2007. The prices of energy imports have been on a steady rise since summer of 2007, defying the pattern of declining energy import prices in the fall. This report provides an estimate of the initial impact of the rising oil prices on the nation's merchandise trade deficit. This report will be updated as warranted by events.

DTIC

Costs; International Trade; Oils

20090001607 Naval Surface Warfare Center, Dahlgren, VA USA

Identification and Development of a Gelled Fuel through the Use of Liquid Gelling Agents

Wells, Claire; Lee, James R; Hooban, Christopher; Vo, Wynn; Feb 2008; 48 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486263; NSWCDD/TR-08/31; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA Forestry Service (USFS) currently uses solid powder gelling agents to create gelled gasoline for controlled burns. Because these gelling agents are difficult to mix with gasoline, nonhomogeneous solutions result. The inconsistency in

the gelled gasoline results in larger quantities of it being used for controlled burns and also worsens the safety hazards associated with gel dispersion. Therefore, the project objective was to solve these problems by producing a better, thickened or gelled gasoline using liquid gelling agents. Laboratory tests were performed and a number of products were recommended for field test and evaluation.
DTIC
Fuels; Gasoline; Gelled Propellants; Gels

20090001774 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Assessment of Advanced Coal Gasification Processes
McCarthy, John; Ferrall, Joseph; Charng, Thomas; Houseman, John; June 1981; 187 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): DE-A121-77ET-13032
Report No.(s): JPL Publication 81-45; DOE/ET-13032-2; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40036

This report represents a technical assessment of the following advanced coal gasification processes: AVCO High Throughput Gasification (HTG) Process; Bell Single-Stage High Mass Flux (HMF) Process; Cities Service/Rockwell (CS/R) Hydrogasification Process; Exxon Catalytic Coal Gasification (CCG) Process. Each process is evaluated for its potential to produce SNG from a bituminous coal. In addition to identifying the new technology these processes represent, key similarities/differences, strengths/weaknesses, and potential improvements to each process are identified. The AVCO HTG and the Bell HMF gasifiers share similarities with respect to: short residence time (SRT), high throughput rate, slagging and syngas as the initial raw product gas. The CS/R Hydrogasifier is also SRT but is non-slagging and produces a raw gas high in methane content. The Exxon CCG gasifier is a long residence time, catalytic, fluidbed reactor producing all of the raw product methane in the gasifier. The report makes the following assessments: 1) while each process has significant potential as coal gasifiers, the CS/R and Exxon processes are better suited for SNG production; 2) the Exxon process is the closest to a commercial level for near-term SNG production; and 3) the SRT processes require significant development including scale-up and turndown demonstration, char processing and/or utilization demonstration, and reactor control and safety features development.
Author
Coal Gasification; Technology Assessment

20090001829 NASA Marshall Space Flight Center, Huntsville, AL, USA
Electromagnetic Flow Sensor for Liquid Metal-Fed Electric Propulsion
Polzin, Kurt A.; Markusic, Thomas E.; Stanojev, Boris J.; Dodson, Chris; DeHoyos, Amado; Journal of Propulsion and Power; [2007]; Volume: 24, No. 5, pp. 1141 - 1143; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNM05AA25C; Copyright; Avail.: Other Sources

Liquid metals have been used as propellants in almost all major categories of electric propulsion (EP) devices. These have included lithium-fed arcjets, lithium and gallium-fed magnetoplasmadynamic (MPD) thrusters, bismuth-fed Hall thrusters, and mercury, cesium, and indium-fed electrostatic thrusters (both ion engines and field emission electric propulsion). The use of liquid metal propellants in high power Hall and MPD thrusters has recently been investigated as a potentially promising path toward the development of high-performance, long-lifetime electric thrusters. The ability to accurately control and measure small liquid-metal propellant flow rates (O (10 - 100) mg/s) is necessary to assess the performance of thrusters in a laboratory environment; flight-rated flow systems will have the added demands of high reliability and low system mass. In this note we address the problem of attaining high measurement accuracy at low mass flow rates, deferring the material compatibility issues associated with high-temperature reactive propellants to later studies. Tests were performed using gallium, which possesses a low melting temperature, is non-reactive with many materials, including plastics and polymers, and is non-toxic. We demonstrate an electromagnetic flow sensor that can accurately measure the propellant mass flow rate at levels commensurate with operation of an electric thruster..
Derived from text
Electric Propulsion; Electrostatics; Liquid Metals; Magnetoplasmadynamic Thrusters; Sensors; Feed Systems

31
ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20090001096 Istituto Elettrotecnico Nazionale (Galileo Ferraris), Turin, Italy
Evaluation of MITREX Modem Transmit and Receive Delay Instability
Mascarello, M; Tavella, P; Pettiti, V; Cordara, F; Dec 1999; 11 pp.; In English
Report No.(s): AD-A489834; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489834

The IEN time and frequency laboratory has developed an automated TWSTFT station to join the experimenters network on INTELSAT satellite already operative. The hardware and software that were first checked in April 1999 when the IEN station participated in the international measuring sessions using the OCA code and time slot are still under test. The chance of having three MITREX modems available at the laboratory, allowed us to measure transmitting and receiving delays by suitable cross-connections between the modems. In the measurement setup a common reference frequency has been applied to the modems and all the possible combinations of (Tx + Rx) time interval measurements have been performed. Unfortunately, the measurement scheme doesn't allow the estimation of the values of the separate transmitting and receiving delays but, under suitable assumptions, it may be shown that the variances and covariances of the individual delays may be estimated from the variances and covariances of the measured quantities. This estimation requires a noise de-coupling technique similar to the known N-cornered-hat method used to evaluate the noises of the individual clocks in comparison measures. This can give an insight of the instabilities of the modem channels both in the short term and in the long term as one of the instability contribution in the calculation of the TWSTT uncertainty budget.
DTIC
Modems; Time Measurement

20090001185 Michigan State Univ., East Lansing, MI USA
A Shock-Tube-Based Facility for Impact Testing
Li, Qi; Liu, Dahsin; Templeton, Douglas; Raju, Basavarju; Jan 1, 2007; 13 pp.; In English
Report No.(s): AD-A490183; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Many dynamic testing techniques use gas guns as a pressure generator. The pressure generated from the gas guns is often of low velocity and low energy and has a relatively random or short duration of a uniform pressure level. This kind of pressure is not well defined and cannot be converted into other application conditions. With aims at improving experimental capability and expanding the research horizon, a shock tube was designed and constructed; and innovative applications were explored. With proper adjustments of gas components and gas pressures, well-defined pressure sources could be produced. With appropriate designs of a force transformer, various testing parameters required for different, dynamic experiments could also be simulated. In this paper, a piston-like impactor was inserted into the shock tube as a pressure transformer. The feasibility of using the shock-tube-based facility for impact testing was demonstrated.
DTIC
Impact Tests; Shock Tubes

20090001355 Lange Electronic G.m.b.H., Gernlinden, Germany
A System to Compare and Evaluate the Quality of Precise Frequency and Timing Systems
Lange, Werner R; Jan 2002; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485719; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485719

Larger scientific and commercial sites like military test ranges or satellite ground stations very often use several sets of independently operating PTFS (Precise Timing & Frequency Systems). Very often these systems are separated by several hundreds of meters and synchronized to different sources that make it difficult to compare the quality in terms of on-time accuracy and frequency precision between these independent systems. This paper describes a 'tool' to measure and evaluate up to eight independently operating PTFS by measuring the differences between the 1pps-signals and the phase relations of frequencies. This 'tool' is designed for a satellite ground station with six independent PTFS, most of them based on GPS receivers using UTC as time scale. The PTFS are located on a campus; the distance between the systems is up to several hundred meters. The frequency pan of the 'tool' continuously measures the phase difference between the multiple frequencies of the external PTFS, which must not necessarily be of the same nominal frequency and outputs the data to a PC. The accuracy

of the measurement is about 10 to 50 ps. The timing part of the system compares the difference between 1 pps signals with an accuracy of 100ps and also outputs the data to the same PC. This unit has some more functions - distribute the information to external sites for monitoring and alarm functions as well as act as an NTP-server. The data derived from the system can be used as well for immediate control, as well for long-term evaluation of the behavior of each independent PTFS.
DTIC
Frequencies; Frequency Standards; Ground Stations; Precision; Time Measurement; Timing Devices

20090001389 TrueTime, Inc., Santa Rosa, CA USA
Primary Reference Clocks Using Indoor Antennas
Mitchell, Don; Jan 2001; 5 pp.; In English
Report No.(s): AD-A485793; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485793

This paper discusses a new technology of synchronizing clocks and disciplining oscillators using CDMA cellular transmissions. Like cellular telephones, these receivers will operate in most buildings without rooftop antennas. They are reported accurate to within microseconds of UTC with stable frequencies available.
DTIC
Antennas; Clocks

20090001390 Zyfer, Inc. and Odetics Co., Anaheim, CA USA
Fast Direct-P(Y) GPS Signal Acquisition Using a Special Portable Clock
Fruehauf, Hugo; Jan 2002; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485794; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485794

'What goes around comes around,' we have heard it said, and it seems that this is the case for precision Portable Clocks as well. Twenty years ago, the only effective way to transfer Universal Coordinated Time (UTC) from one geographic location to another was with a Portable Clock. Since the advent of GPS however, UTC dissemination is done via satellites, virtually eliminating Portable Clocks. But now a new element is looming on the horizon, which may breathe new life into applications of such devices. This relates to the GPS P(Y)-Code, which is the secure military crypto-keyed signal providing what is referred to as the 'Precise Positioning Service' (PPS). More specifically, however, is what a Portable Clock can do to enhance the new functionality of the P(Y)-Code signal acquisition called 'Direct-P(Y)', in an environment where the civil C/A-Code signal is not available. Direct-P(Y) refers to the ability for the military receiver to come online without the aid of the civil (in the clear) C/A-Code signal. The Portable Clock can play an important role in quick acquisition of the P(Y)-Code signal, a significant crew safety consideration for our soldiers in the field. No matter what the operational scenario may be, the Portable Clock proves to be an invaluable tool for Direct-P(Y) terminals. For those about to enter hostile territory, 'no-one should leave home without one.'
DTIC
Clocks; Global Positioning System; Portable Equipment

20090001391 Femtosecond Systems, Inc., Wheat Ridge, CO USA
Practical Problems Involving Phase Noise Measurements
Walls, Warren F; Nov 2001; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485797; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485797

RADAR systems, secure communications, space-based applications, precision navigation, and computer timing applications are among some of the increasingly large number of modern electronic systems with phase noise performance requirements. Making these measurements is not always as easy as using the ubiquitous multi-meter. The topology or measurement configuration can significantly impact the speed, level of accuracy, and noise floor of the measurement itself. Careful attention must be paid to many different details in order to ensure the best possible and most accurate measurement. The inherent presence of various noise types and the interaction of amplitude and phase noise can cause a user, who blindly characterizes signals, to possibly misrepresent or misinterpret the performance and other issues. A survey of various phase noise measurement techniques is presented with their associated qualities. A few specific measurement requirements are

shown with examples of actual measurements in order to illustrate current technology capability. Drawbacks of various configurations, as well as typical 'gotchas,' are mentioned.
DTIC
Measurement; Noise Measurement; Problem Solving

20090001399 National Standard Time and Frequency Lab., Taoyuan, Taiwan, Province of China
Clock Synchronization Using GPS/Glonass Carrier Phase
Tu, K Y; Peng, H M; Liao, C S; Nov 2000; 10 pp.; In English
Report No.(s): AD-A485817; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485817

Clock synchronization by means of GPS/GLONASS is proposed. The GPS/GLONASS receivers with the external frequency input interface are used in our system. While the remote OCXO (Oven- Controlled Crystal Oscillator) clock and the primary H-maser clock are connected to the receivers, the frequency offset of the remote clock with respect to the primary clock can be estimated by performing the linear-least-square fit on carrier-phase single-difference observables. The proportional controller is adopted in our system for tuning the remote clock in real time. Through the D/A converter, the remote clock is then steered to synchronism with the primary clock. For averaging times of 1 day under the configuration of about a 30-meter baseline, our experimental results show that the accuracy of the remote clock can be improved from about 2 x 10(-9) to about 6 x 10(-14), and the stability of the remote clock can be improved from about 2 x 10(-10) to about a few parts in 10(14). Based on the proposed architecture, the frequency traceability can be achieved. The potential applications include a frequency source system for calibration laboratories, telecommunication networks, and power transmission systems.
DTIC
Clocks; Crystal Oscillators; Global Positioning System; GLONASS; Synchronism

20090001402 Aerospace Corp., Los Angeles, CA USA
Influence of Laser Noise on the Optically Pumped, Atomic-Beam Clock
Camparo, J C; Nov 2001; 11 pp.; In English
Report No.(s): AD-A485828; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485828

The optically pumped atomic-beam clock offers the potential for orders-of-magnitude improvement over conventional beam clocks. In part, this improvement stems from the use of diode lasers to efficiently prepare the atoms prior to entering the Ramsey cavity region and then to efficiently probe the atoms after they have passed through the cavity. However, while the diode lasers typically used in these beam clocks are single-in ode devices, the quantum-noise associated with the single-in ode is often non-negligible. Here, we describe our efforts to construct a realistic computer model of the clock, taking into account the multilevel nature of the atom along with the pump and probe lasers' amplitude and frequency fluctuations. Our goal is to develop a numerical means for generating the clock signal's time series, and in this way to isolate those laser-related processes that may play an important role in the clock's performance.
DTIC
Atomic Beams; Atomic Clocks; Clocks; Lasers; Time Series Analysis

20090001419 Quartzlock (UK) Ltd., Devon, UK
Development of a Primary Reference Clock
Green, Clive; Nov 2000; 12 pp.; In English
Report No.(s): AD-A485887; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485887

Quartzlock is engaged in research to improve the generation, measurement, and distribution of accurate frequency sources that are stable with environmental changes. The elements in this progress report are both active and passive masers, quartz frequency standards, measurement systems, GPS/Glonass receiver, GPS CVTT, and rubidium standards. Space-qualified passive hydrogen masers and rubidium oscillators are considered. A new measurement system is detailed and the first noise floor results are reported.
DTIC
Clocks; Global Positioning System

20090001421 Naval Observatory, Washington, DC USA

Time and Frequency Activities at the U.S. Naval Observatory

Matsakis, Demetrios; Aug 2005; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A485889; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485889

The U.S. Naval Observatory (USNO) has provided timing for the Navy and the Department of Defense since 1830 and, in cooperation with other institutions, has also provided timing for the USA and the international community. Its Master Clock (MC) is the source of UTC (USNO), the USNO's realization of Coordinated Universal Time (UTC), which has stayed within 5 ns RMS of UTC since 1999. The data used to generate UTC (USNO) are based upon 73 cesium and 21 hydrogen maser frequency standards in three buildings at two sites. The USNO disseminates time via voice, telephone modem, LORAN, Network Time Protocol (NTP), GPS, and Two-Way Satellite Time Transfer (TWSTT). The USNO would not be able to meet all the requirements of its users had it kept to the same technology it had 10 years ago; this paper describes some of the changes being made to meet the future needs for precision, accuracy, and robustness. Further details and explanations of our services can be found on-line at http://tycho.usno.navy.mil, or by contacting the author directly.

DTIC

Frequencies; Frequency Standards; Observatories; United States

20090001424 Royal Observatory, Brussels, Belgium

Testing the Capabilities of GPS Receivers for Time Transfer

Defraigne, Pascale; Bruyninx, Carine; Aug 2005; 4 pp.; In English; Original contains color illustrations

Report No.(s): AD-A485901; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485901

Based on a carrier phase analysis of GPS measurements, we investigate how a geodetic GPS receiver reproduces the variations of the frequency delivered to him by an external clock. For this purpose, two PolaRx2 GPS receivers have been connected to the same antenna, and were driven by two separate Hydrogen Masers. The time and frequency transfer between these two Masers is computed through a combined code and carrier phase GPS data analysis, and the results are compared with the measurements delivered by a phase comparator. The differences between both comparison techniques are of the order of tens of picoseconds for the short-term comparisons. On the long term, 3 weeks in our case, the maximum differences reach 180 picoseconds peak-to-peak 'after correction for the day boundary jumps'

DTIC

Clocks; Global Positioning System; Radio Receivers; Receivers; Testing Time

20090001431 Kharkov State Univ., Ukraine

Phase Radio Meteor Equipment for Time and Frequency Standards Comparison

Kundjukov, S G; Bavykiha, V V; Koval, Y A; Trambovetskiy, S V; Nov 2001; 12 pp.; In English

Report No.(s): AD-A485915; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485915

The main results of the work on radio meteor channel application for high-precision time and frequency standards comparison carried out at Kharkov are described. The error sources, ways of decreasing them, and the method's potential are analyzed. Samples of equipment developed and introduced are considered.

DTIC

Frequency Standards; Radio Meteors; Time Measurement

20090001434 Communications Research Lab., Tokyo, Japan

Detection of the Gravitational Redshift of the Cesium Frequency Standard at CRL

Hosokawa, Mizuhiko; Imamura, Noboru Kotake; uniyasu; Kurihara, Noriyuki; Nov 2000; 9 pp.; In English

Report No.(s): AD-A485918; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485918

We have detected the gravitational redshift of a Cs frequency standard that has been transported from CRL Tokyo headquarters, at an altitude of 80 m, to Mt. Ohtakadoya LF standard frequency station, located at an altitude of 794 m, about 250 km far from the CRL Tokyo headquarters. In the Mt. Ohtakadoya LF station, three Cs clocks are equipped to be the references of standard frequency radio signal emission, and they are linked with UTC(CRL) by the GPS common-view time transfer. By using this link, we can compare the frequency of any standards in CRL Tokyo and the Mt. Ohtakadoya LF station

with UTC(CRL). An HPS071A Cs frequency standard with a normal tube has been transported by car from the CRL Tokyo headquarters to the LF station on 27 April 2000. After the transport, we observed that the frequency of the Cs standard became higher by about 4.6 x 10(exp -14). According to General Theory of Relativity, a 700-m altitude difference will cause a 7.8 x 10(exp -14) frequency difference. Considering the stability of the Cs standard and the accuracy of time transfer, the observed frequency shift shows an agreement with the theoretically predicted gravitational redshift.
DTIC
Cesium; Frequency Shift; Frequency Standards; Red Shift

20090001436 National Inst. of Information and Communications Technology, Tokyo, Japan
Update of Research Activities on Time and Frequency at the National Institute of Information and Communications Technology (NICT)
Hama, Shin'ichi; Hosokawa, Mizuhiko; Takahashi, Yukio; Toriyama, Hiroshi; Morikawa, Takao; Aug 2005; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485920; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485920

The National Institute of Information and Communications Technology (NICT) in Japan has five time and frequency research and service groups. Those are: Atomic Frequency Standards Group, Time and Frequency Measurements Group, Japanese Standard Time Group, Quasi-Zenith Satellite System Group, and Time Applications Group. In this paper, we introduce the recent activities of these five groups.
DTIC
Frequencies; Frequency Standards; Information Systems

20090001440 Politecnico di Turin, Turin, Italy
Tracking Nonstationarities in Clock Noises Using the Dynamic Allan Variance
Galleani, Lorenzo; Tavella, Patrizia; Aug 2005; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485927; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485927

In a previous paper [4] we have introduced the concept of dynamic Allan variance, an extension of the classical Allan variance that is commonly used to evaluate the stability of atomic clocks. The Allan variance assumes the stationarity of the (increment of the) clock error signal, a condition that is valid for ideal clocks only. For real clocks one has to pay attention in the evaluation of the clock stability, because even for short time intervals the clock can exhibit a nonstationary behavior. Possible reasons for the lack of stationarity are sudden breakdowns, or, in the long term, clock ageing. Even cyclostationary behaviors can be observed due to daily or seasonal variation of temperature, humidity and other physical quantities that have a direct influence on the clock behavior. The main purpose of the Dynamic Allan variance is to describe the variation in time of the clock stability. In this paper we give a mathematical definition of this quantity. We apply our method to simulated data and to real data coming from a Rubidium clock. The results are very interesting, and they show that the proposed method can track and reveal in a clear and intuitive manner the changes in the behavior of atomic clock data.
DTIC
Atomic Clocks; Clocks

20090001448 Symmetricom, Inc., Beverly, MA USA
The MAC - A Miniature Atomic Clock
Lutwak, R; Vlitas, P; Varghese, M; Mescher, M; Serkland, D K; Peake, G M; Aug 2005; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NBCHC020050; DE-AC04-94AL85000
Report No.(s): AD-A485942; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485942

The authors are developing a chip-scale atomic clock (CSAC), more than two orders of magnitude smaller and lower power than any existing technology. As an intermediate milestone, en route to the ultimate CSAC objectives, we have developed a Miniature Atomic Clock (MAC), combining the low-power CSAC physics package with a low-parts count, low-power digital control and microwave system. The MAC is a complete packaged atomic clock, with overall size of 10 cm(3), power consumption <200 mW, and short-term stability sigma(y)(Tau) = 4x10(-10) (Tau)(-1/2). The MAC provides a valuable testbed for the further development and refinement of the CSAC physics package as well as for the development of

the CSAC control electronics prior to undertaking the costly and time-consuming size-reduction effort which will be necessary to meet the ultimate CSAC objectives. The MAC itself may find applications in commercial and military timing systems which require the relatively small size and power consumption of the MAC now, rather than wait for the evolution of the 1 cm(3), 30 mW CSAC.
DTIC
Atomic Clocks; Miniaturization

20090001454 National Measurement Inst., Lindfield, Australia
Time and Frequency Activities at the National Measurement Institute, Australia
Warrington, R B; Fisk, P T; Wouters, M J; Lawn, M A; Thorn, J S; Quigg, S; Gajaweera, A; Park, S J; Aug 2005; 5 pp.; In English
Report No.(s): AD-A485968; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485968

The Time and Frequency group of the National Measurement Institute, Australia, (NMIA) maintains the Australian national standards for time of day and for frequency. Research and development activities of the group include: development of microwave frequency standards in the 10(exp -15) accuracy range based on trapped Yb(+) ions; development of GPS common-view time transfer systems, and the use of these systems to deliver traceable time and frequency to a client's premises by continuous remote calibration; two-way satellite time and frequency transfer; and time and frequency dissemination around Australia by means including the recently developed NMIA 'speaking clock' telephone service.
DTIC
Australia; Frequencies; Frequency Standards; Global Positioning System; Time Measurement

20090001455 Academia Sinica, Shanghai, China
Theoretical Studying About the Measurement of the C-Field Intensity In the Optical Pumped Cesium Frequency Standard
Zhang, Junhai; Wang, Fengzhi; Yang, Donghai; Aug 2005; 5 pp.; In English
Report No.(s): AD-A485969; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485969

In the paper the measurement of the C-field intensity is analyzed theoretically in optical pumped Cesium frequency standard. The transition probability from the F=3 m(F) = 0 level state to the F=4 m(F)=0 level state has been discussed as the function of the frequency and power of the signal injected to the low frequency coils. The result shows out the fluorescence intensity in the probing region increases to 1.37 time of the normal condition without the low frequency signal at the Ramsey cavity.
DTIC
Cesium; Field Strength; Frequency Standards; Optical Pumping

20090001539 Space and Naval Warfare Systems Center, San Diego, CA USA
Monitoring of Water and Contaminant Migration at the Groundwater-Surface Water Interface (ER200422)
Chadwick, B; Hawkins, A; Jan 1, 2008; 326 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486109; SSC-TR-1967; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this project was to field, demonstrate and evaluate the effectiveness of two technologies for characterizing coastal contaminate migration, specifically (1) that the Trident probe can be used to help delineate areas where groundwater seepage is occurring and Contaminant of Concern concentrations in those areas, (2) that the UltraSeep system can be used to quantify the flow of groundwater and concentration of contaminants that may be impinging on the surface water system, (3) demonstrate the technology to end-users to determine the utility of these tools for making decisions at DoD coastal landfills and hazardous waste sites, and (4) the quantify the costs associated with the operation of each technology. The Trident probe was used successfully at NSA Panama City to identify areas of groundwater discharge from site to surface waters of St. Andrews Bay, and the UltraSeep was used successfully to quantify groundwater discharge rates and volatile organic compound (VOC) discharge concentrations in two discharge zones identified with the Trident probe. At the former Naval Training Center Orlando, the Trident probe successfully identified areas of groundwater discharge from the site to the surface waters of Druid Lake and the UltraSeep successfully quantified groundwater discharge rates and VOC discharge concentrations in two discharge zones identified with the Trident probe. The cost analysis indicated that the cost of an integrated Trident probe/UltraSeep survey is expected to be on the order of $120K, which represents a cost savings of about

42% relative to the estimated cost for the baseline technology of about $210K. The demonstration at the NSA Panama City documented additional cost avoidance of about $1.25M based on support for selection of Monitored Natural Attenuation as the corrective action at the site. The Trident probe and UltraSeep have generally found strong acceptance by stakeholders and end-users.
DTIC
Coasts; Contaminants; Ground Water; Migration; Surface Water; Water; Water Quality

20090001567 Naval Observatory, Washington, DC USA
Robust Control of Frequency Standards in the Presence of Systematic Disturbances
Skinner, Jim; Koppang, Paul; Johns, David; Aug 2005; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486160; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Frequency steer limits are important aspects that influence the overall response and design of a robust control system. We study the effects that frequency steer limits have on the response of a control system when underlying components of the system have undergone non-stochastic perturbations. Examples of the disturbances include environmental changes and hardware anomalies. Additionally, we attempt to find a balance between the performance of the control system and the robustness of maintaining parameter limits in the presence of outlying events. Performance of design strategies are evaluated utilizing both simulated and archived measured data.
DTIC
Control; Frequency Standards; Steering

20090001580 Poznan Univ. of Technoloy, Poland
Testing of the Methods of Real-Time MTIE Calculation
Dobrogowski, Andrzej; Kasznia, Michal; Jan 2005; 8 pp.; In English
Report No.(s): AD-A486204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper the experimental tests of the methods enabling real-time quasi-parallel assessment of Maximum Time Interval Error (MTIE) are presented. The idea of real-time quasi-parallel computation of MTIE is introduced first. Then two methods enabling real-time MTIE calculation are described. The results of computation experiments performed using several different data sequences and different computers are included.
DTIC
Errors; Estimates; Real Time Operation; Time Signals

20090001583 Endrun Technologies, Santa Rosa, CA USA
A New Class of Precision UTC and Frequency Reference Using IS-95 CDMA Base Station Transmissions
Penrod, Bruce M; Jan 2002; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486210; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper introduces a new class of precision timing and frequency reference that indirectly receives GPS timing and frequency information via the transmissions from Code Division Multiple Access 'CDMA' mobile telecommunications base stations operating in compliance with Telecommunications Industry Association 'TINEIA' StandQrd IS-95. Like cell phones, these products operate indoors without external antennas and provide unprecedented value to a large class of users in terms of accuracy, cost, and ease of installation. The technology fits particularly well in IP network synchronization and quality-of-service monitoring applications where rooftop antenna installation is often impossible. EndRun Technologies has developed and is manufacturing a proprietary time and frequency engine specifically optimized to faithfully reproduce the inherent precision time and frequency characteristics of the IS-95 CDMA sprea- spectrum signals. The Pracis family of time and frequency products uses this engine, and hundreds of these units have been deployed throughout North America since October of 2000. The salient characteristics of the IS-95 CDMA signals which make it so well suited to this use and a general receiver architecture are described. Performance data versus similar references that use conventional GPS reception are also presented.
DTIC
Code Division Multiple Access; Frequencies; Global Positioning System; Precision

20090001584 Lne-Syrte, Paris, FL France

Testing Lorentz Invariance Using Zeeman Transitions in Atomic Fountains

Wolf, Peter; Chapelet, Frederic; Bize, Sebastien; Clairon, Andre; Aug 2005; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486211; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Lorentz Invariance (LI) is the founding postulate of Einstein's 1905 theory of relativity, and therefore at the heart of all accepted theories of physics. It characterizes the invariance of the laws of physics in inertial frames under changes of velocity or orientation. This central role, and indications from unification theories hinting toward a possible LI violation, have motivated tremendous experimental efforts to test LI. A comprehensive theoretical framework to describe violations of LI has been developed over the last decade: the Lorentz violating Standard Model Extension (SME). It allows a characterization of LI violations in all fields of present day physics using a large (but finite) set of parameters which are all zero when LI is satisfied. All classical tests can be analyzed in the SME, but it also allows the conception of new types of experiments, not thought of previously. We have carried out such a conceptually new LI test, by comparing particular atomic transitions (particular orientations of the involved nuclear spins) in the (133)Cs atom using a cold atomic fountain clock. This allows us to test LI in a previously largely unexplored region of the SME parameter space, corresponding to first measurements of four proton parameters and an improvement by 11 and 12 orders of magnitude on the determination of four others. In spite of the attained accuracies and of having extended the search into a new region of the SME, we still find no indication of LI violation. DTIC

Atomic Clocks; Atoms; Cesium; Invariance; Particle Spin; Quantum Numbers; Zeeman Effect

20090001619 Divisao Servico da Hora do Oservatorio Nacional, Rio de Janeiro, Brazil

The Establishment of a Brazilian Atomic Time Scale

Jose de Carvalho, Richardo; Aug 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486320; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Atomic Time Scale at the Time Service Division of the National Observatory in Rio de Janeiro (ONRJ) has been carried out by commercial cesium clocks. The UTC(ONRJ) time scale based on a single commercial cesium clock selected from the ensemble of clocks is not suitable to attain the bounds of uncertainty recommended by the ITU-R and by the CCTF. The recommendation has suggested to the national time primary laboratories to coordinate with UTC within 0.1 s. The development of atomic time scale system was divided in two parts: the construction of an automated data acquisition system and the implementation of the time scale algorithm that generated a time scale based on the clock ensemble. The present work will describe the atomic time scale system and report the results obtained using real clocks data from September 27, 2004 to August 15, 2005.

DTIC

Atomic Clocks; Brazil

20090001620 National Metrology Inst. of Japan, Ibaraki, Japan

Time and Frequency Transfer and Dissemination Methods Using Optical Fiber Network

Amemiya, Masaki; Imae, Michito; Fuji, Yasuhisa; Suzuyama, Tomonari; Ohshima, Shin-ichi; Aug 2005; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486321; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the time and frequency transfer and dissemination field, it is important to provide cost effective remote frequency calibration services with an uncertainty of around 10(-12) for end users. It is also required to develop ultra precise transfer methods with an order of 10(exp-15) or better uncertainty for the comparison between ultra stable frequency standards which are under developing. This study shows two methods using optical fiber networks to satisfy these demands. First, it is an economical remote calibration method using existing synchronous optical fiber communication networks. The measured frequency stability, (the Allan deviation) of the transmission clock is 2x10(-13) for an averaging time of one day. The result indicates the method is promising for the simple remote frequency calibration service. Second, it is an ultra precise two-way optical fiber time and frequency transfer method using a newly proposed bi-directional optical amplifier. In this method, wavelength division multiplexing (WDM) signals are transmitted along a single optical fiber. The preliminary measured frequency stability, is less than 10(-15) (Tau = 10(4) s) for a 100-km-long fiber with the bi-directional amplifier. It suggests that the method has capability for improving TAI (International Atomic Time) and UTC (Coordinated Universal Time). DTIC

Fiber Optics; Frequencies; Frequency Standards; Optical Fibers; Optical Properties; Transmission Lines

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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*.

20090000981 Center for Mathematics and Computer Science, Amsterdam, Netherlands
MoCha: A Framework for Coordination Using Mobile Channels
Arbab, F.; De Boer, F. S.; Bonsangue, M. M.; Guillen Scholten, J. V.; Dec. 31, 2001; 18 pp.; In English
Report No.(s): PB2009-102742; SEN-R0128; Copyright; Avail.: National Technical Information Service (NTIS)

In this paper we describe 'MoCha', an infrastructure for distributed communication and collaboration using mobile channels as its medium. Channels allow directed, anonymous, and peer-to-peer communication among entities, while mobility ensures that the structure of their connections can change over time in arbitrary ways. MoCha provides a distributed middle-ware designed for communication and collaboration without requiring central servers or fixed network infrastructures. NTIS

Coordination; Architecture (Computers); Distributed Parameter Systems

20090000986 Congressional Research Service, Washington, DC, USA
Siting of Wireless Communications Facilities: An Overview of Federal, State, and Local Law (Updated). CRS Report for Congress
Ruane, K.; Sep. 04, 2008; 6 pp.; In English
Report No.(s): PB2009-102866; RS-20783; No Copyright; Avail.: CASI: A02, Hardcopy

The siting of wireless communications facilities has been a topic of controversy in communities all over the USA. Telecommunications carriers need to place towers in areas where coverage is insufficient or lacking to provide better service to consumers, while local governing boards and community groups often oppose the siting of towers in residential neighborhoods and scenic areas. The Telecommunications Act of 1996 governs federal, state, and local regulation of the siting of communications towers by placing certain limitations on local zoning authority without totally preempting state and local law. This report provides an overview of the federal, state, and local laws governing the siting of wireless communications facilities.
NTIS

Telecommunication; Wireless Communication

20090001051 Commerce Dept., Washington, DC, USA
Office of the Chief Information Officer: Use of Internet 'Cookies' and 'Web Bugs' on Commerce Web Sites Raises Privacy and Security Concerns. Inspection Report No. OSE-14257
Apr. 2001; 15 pp.; In English
Report No.(s): PB2009-102812; No Copyright; Avail.: CASI: A03, Hardcopy

Persistent Internet cookies are data stored on web users hard drives that can identify users computers and track their browsing habits. Web bugs are software code that can monitor who is reading a web page. In addition to being able to track a users browsing habits, web bugs can also download files from and upload files to a users computer. Although these technologies have uses that do not raise privacy concerns, they are capable of being employed in a way that would violate the privacy of individuals visiting the Departments web sites. Web bugs can also be security threats. This report documents our evaluation of the use of persistent Internet cookies and web bugs by departmental Internet sites, as well as the adequacy of the privacy statements posted on the main web pages of the Department and its operating units. We conducted our evaluation in response to Public Law 106-554, the Consolidated Appropriations Act of 2001, which requires the Inspector General of each department or agency to submit a report to the Congress disclosing any activity regarding the collection of information relating to any individuals access or viewing habits on the departments or agencys Internet sites.
NTIS

Commerce; Inspection; Internets; Privacy; Security; Websites

20090001065 Commerce Dept., Washington, DC, USA
Department's Privacy Impact Assessment Is Generally Implement Well, But Some Improvements Are Needed
Sep. 2008; 13 pp.; In English
Report No.(s): PB2009-102670; FINAL-RPT-OSE-19047; No Copyright; Avail.: CASI: A03, Hardcopy

Federal agencies obtain and maintain significant amounts of personally identifiable information (PII) about individuals

that must be safeguarded from loss or misuse. The E-Government Act of 2002 requires agencies to conduct privacy impact assessments (PIAs) of information systems and collections containing PII and, if practicable, to make them publicly available to assure the public that personal information is well protected. The act also requires agencies to post privacy policies on their public Web sites in a machine-readable format. The Departments Information Technology (IT) Privacy Policy, last revised January 29, 2007, sets out Commerces policies for implementing the privacy provisions in the E-Government Act and the requirements of the Office of Management and Budgets (OMBs) M-03-22, Guidance for Implementing the Privacy Provisions of the E-Government Act of 2002. The Departments IT privacy policy defines the responsibilities Commerce operating units have for conducting PIAs and posting PIAs and privacy policies on Commerce Web sites.
NTIS
Damage Assessment; Impact; Privacy

20090001384 Shearwater Human Engineering, North Vancouver, British Columbia Canada
Evaluation of Head Mounted and Head Down Information Displays During Simulated Mine-Countermeasures Dives to 42 msw
Morrison, J B; Zander, J K; Apr 2008; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W7711-997606
Report No.(s): AD-A485780; DRDC-TORONTO-CR-2008-035; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485780

Despite recent advancements in diver communications, there is little information on the ability of divers to use a multi-function head down display (HDD) or head mounted display (HMD) for routine underwater tasks. Three information displays (HDD, and a monocular and binocular HMD) were tested by nine mine counter-measures (MCM) divers at the surface and during simulated dives to 42 metres in 6 deg C water. Divers used the displays to report depth and alarms and to perform navigation, object location and target identification tasks. Task performance was analyzed for speed and accuracy. Subjective data were collected on the usability of the displays in conjunction with other MCM tasks and equipment. Performance was slower and less accurate ($p<0.05$) at 42 msw than at the surface. At 42 msw, response times were faster ($p<0.05$) when using the HDD to report depths and locate objects; otherwise there were no significant differences between displays. Subjective data showed a slight preference for the HDD. Some divers reported eye fatigue or nausea when using a HMD. Although MCM divers were capable of using both the HDD and HMD effectively during dives to 42 msw, each display presented unique design and usability problems.
DTIC
Countermeasures; Display Devices; Diving (Underwater)

20090001388 Symmetricom, Inc., Beverly, MA USA
New Issues in Telecommunications
Butterline, Ed; Jan 2001; 5 pp.; In English
Report No.(s): AD-A485792; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485792

There are two new issues that are currently causing concern in telecommunications. These issues are the introduction of pure optic systems for transmission and switching and the Federal Communications Commission (FCC) edict that wireless network operators must provide a precise location of wireless emergency E-911 callers.
DTIC
Light Transmission; Telecommunication

20090001463 Army War Coll., Carlisle Barracks, PA USA
Structural Vulnerabilities of Networked Insurgencies: Adapting to the New Adversary
Muckian, Martin J; Dec 2007; 13 pp.; In English
Report No.(s): AD-A485998; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485998

The ongoing conflict in Iraq has sparked a renewed interest in the study of counterinsurgency, leading many to comb the wars of the twentieth century, the ‘golden age of insurgencies,’ for lessons that can be applied to today. Much of this recent analysis has focused on the knowledge gained from fighting Marxist revolutionaries. The insurgent of today, however, is not the Maoist of yesterday. His organization and methods are strikingly different from his twentieth century predecessors. The

modern insurgent aims to defeat his opponent by psychological warfare and terrorism instead of military action. He draws his support from criminal networks as opposed to popular mobilization. He fights a netwar not a People's War. These dissimilarities raise the question of just how much of twentieth century counterinsurgency thought can be applied to twenty-first century conflicts. Methods from past wars are put forth as guiding principles with only a nod towards these differences. Applying these principles without examination could lead, at best, to wasted effort, at worst, to defeat. Sun Tzu said, 'Know your enemy.' The structure of a movement, meaning its organization and methods, is the key to understanding it. Modern and Maoist insurgencies are structurally different. In order to be effective, those conducting counterinsurgencies must take into consideration these differences and adapt their methods to the structure of modern adversaries.
DTIC
Communication Networks; Vulnerability

20090001609 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Should the Concept of Network-Centric Warfare Form a Central Pillar of the Australian Army's Transformation, as Articulated in the Hardened and Networked Army Concept?
McDonald, Jamie; May 8, 2007; 64 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486270; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Australian Army has commenced a process of transformation to meet the demands of the increasingly complex operational environment in which it is currently operating, and will continue to operate in the foreseeable future. The Australian Government in 2000 significantly amended strategic guidance for the Australian Defence Force (ADF). The Australian Government's 2000 Defense White Paper, 'Defending Australia,' tasked the ADF to prepare for operations not only in defense of the Australian homeland, but as an expeditionary force that could be seamlessly employed in coalition operations with its allies throughout the world. The Australian Army has responded to this strategic guidance by annunciating the transformation of the force according to the 'Hardened and Networked Army' concept. As part of this transformation, the Australian Army aims to gain advantage through the concept of a 'network-enabled' Army. This approach is only a slight modification of that proposed in the Australian Department of Defence document entitled 'Network-Centric Warfare Roadmap,' which describes how the concept of Network-Centric Warfare (NCW) will be incorporated into the ADF. The U.S. Department of Defense's Office of Force Transformation's vision of future warfare, as described in its pamphlet 'The Implementation of Network-Centric Warfare,' places much greater emphasis on the 'centrality' of NCW to all future warfighting concepts. This monograph addresses whether the Australian Army's vision of a network-enabled force is a pragmatic response to the challenges of the future operating environment, or if NCW is truly 'an emerging theory of war in the Information Age' as articulated by the theory's supporters. While the delineation between network-enabled and network-centric may seem trivial to some observers, it is fundamental when considering how the Australian Army plans to conduct military operations in the future.
DTIC
Australia; Military Operations; Warfare

20090001621 Coast Guard, Washington, DC USA
Command, Control, Communication, Computers and Information Technology (C4&IT). Strategic Plan, FY2008 - 2012
Jan 2008; 60 pp.; In English
Report No.(s): AD-A486322; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Assistant Commandant for Command, Control, Communications, Computers, and Information Technology (C4&IT)/CG-6, Chief Information Officer (CIO), for the Coast Guard publishes this C4&IT Strategic Plan. The purpose of this plan is to provide a unifying strategy to better integrate and synchronize Coast Guard C4&IT and maximize operational capabilities. SCOPE This plan is intended to be used cooperatively by members of the C4&IT community to establish and prioritize recommendations for implementing improvements to the Coast Guard's C4&IT infrastructure and enterprise applications, and processes for information assurance, enterprise architecture, data privacy, and resource management. The focus of this document is on activities that must occur in the next five years to progress toward achieving the long term goals of the Coast Guard and the Department of Homeland Security (DHS). While the end-state goals in this plan may not be fully realized in the next 5 years, it is clear that coordinated activity must occur now to improve the Coast Guard's operational capabilities.
DTIC
Command and Control; Computers; Information Systems

20090001637 Tennessee Technological Univ., Cookeville, TN USA

Time-Reversal Based Range Extension Technique for Ultra-Wideband (UWB) Sensors and Applications in Tactical Communications and Networking

Qiu, Robert C; Guo, Nan; Hu, Zhen; Zhang, Peng; Song, Yu; Saini, Amanpreet S; Cooke, Corey; Jul 16, 2008; 43 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-07-1-0529

Report No.(s): AD-A486383; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This technical report (quarterly) details the work for Office of Naval Research (ONR) by Tennessee Tech. The goal of this project -- jointly funded by ONR, NSF, and ARO -- is to build a general purpose testbed with time reversal capability at the transmitter side. The envisioned application is for UWB sensors and tactical communications in RF harsh environments where multipath is rich and can be exploited through the use of time reversal. In the past quarter, we focused on rethinking about the role of the radio test-bed and on preparing for improving the test-bed. Bit rate scalability is preferred for reliable transmission in different channel conditions. To transmit over a longer distance, current bit rate of 6.35 Mb/s is too high.

DTIC

Broadband; Communication Networks

20090001776 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

The Prospects of SAS Interferometry for Detection and Classification

vanVossen, R.; Quesson, B. A. J.; Sabel, J. C.; October 2008; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): TNO Proj. 015.34736

Report No.(s): TNO-DV-2008-A176; TD2008-0067; Copyright; Avail.: Other Sources

Processing for interferometric synthetic aperture sonar has been developed, and tested with both measured and simulated data. Interferometry is based on data from two vertically separated receive arrays. Subtle phase differences between the images from both arrays provide information on the relative height of objects in the observed scene. The results give confidence in the processing and provide insight into the limitations and options for improvement of the current processing suite. Eventually, the developed processing is expected to improve the detection of objects buried in the sea bottom.

Author

Synthetic Apertures; Sonar; Interferometry; Detection; Classifications; Remote Sensing

20090001783 Defence Science and Technology Organisation, Edinburgh, Australia

Speaker Localisation Using Time Difference of Arrival

Thai, Derek Z; Trinkle, Matthew; Hashemi-Sakhtsari, Ahmad; Pattison, Tim; Apr 2008; 105 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486226; DSTO-TR-2126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the research and development of speaker localisation to locate the position of a person speaking. Two closed-form localisation techniques were analysed, the first was developed by Schau and Robinson (1987) based on spherical intersection and the other developed by Chan and Ho (1994). Both techniques are based on time difference of arrival measurements. Accordingly three time delay estimators, namely cross-correlation, generalised cross-correlation, and an eigenvalue decomposition based algorithm were analysed. The implementation of the algorithms in Matlab and the results from the analyses are discussed.

DTIC

Position (Location); Speech Recognition; Time Response

20090001877 Army Research Lab., Adelphi, MD USA

Secure Link Middleware

Luu, Brian B; Aug 2008; 14 pp.; In English

Report No.(s): AD-A486006; ARL-TR-4535; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA486006

One of the challenges for the U.S. National Archives and Records Administration (NARA) is to provide essential information assurance (IA) services for sensitive electronic records archives (ERA) in transit between networked computer systems. Current software technologies for securing data in transit rely on cryptographic algorithms and protocols provided in IP Security (IPSec), Virtual Private Network (VPN), or Secure Shell (ssh). The general difficulties of using IPSec and VPN are the complexity and compatibility. IPSec has been evolved and updated with new standards since 1995 (with RFC

1825-1829) to 2005 (with RFC 4301-4309). VPN are generally designed and built based on proprietary algorithms. Usually, they should be acquired, installed, and operated from the same manufacturer. Therefore, typically, IPSec and VPN are implemented and operated at network routers by network administrator to provide security for network traffic between local area networks (LAN) rather than being used by end users at system level. For example, IPSec or VPN are used to connect internal LANs of different sites of an organization through a public network such as the Internet. But with this type of operation, there are no end-to-end encryptions between any two networked computers in the same LAN or in different LANs. Hence, communication traffic of two computers in a same LAN or communication traffic from a local node to its router has no protection. To meet NARA's technical requirements for having end-to-end encryption and authentication at the computer system level, Army Research Laboratory (ARL) developed a secure communication network middleware called 'Secure Link' capable of providing essential IA services for accessing or transferring sensitive ERA between any two networked computers. This report documents the development of ARL Secure Link.
DTIC
Applications Programs (Computers); Data Links

20090001905 Alabama Univ., Huntsville, AL, USA
Dual Polarimetric and Dual Wavelength Radar Characteristics of an Apartment Fire
Jones, Thomas A.; Christopher, Sundar A.; Petersen, Walt; [2008]; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NA06NES4400008; NA07NES4280005; Copyright; Avail.: Other Sources

Dual polarimetric and microwave wavelength radar observations of an apartment fire in Huntsville, Alabama on 3 March 2008 are examined to determine the radar-observable properties of ash and fire debris lofted into the atmosphere. Dual polarimetric observations were collected at close range (less than 20 km) by the 5 cm (C-band) ARMOR research radar operated by the University of Alabama in Huntsville. The fire was also evident from the WSR-88D Doppler radar located at Hytop, Alabama approximately 65 km east of the fire. The WSR-88D operates at 10 cm (S8 band) allowing for comparison of 5 and 10 cm scattering properties of the fire signature. Precipitation radars such as those used here are not sensitive to aerosol sized (D less than 10 m) smoke particles. However, they are sensitive to the larger ash and burnt debris embedded within the smoke plume. It has been postulated that turbulent eddies caused by the heat of the fire cause Bragg scattering to occur, especially for wavelengths greater than 10 cm. In this example, reflectivity values greater than 20 dBZ were observed near the fire, with lower reflectivities visible up to 2 km above ground level. If Bragg scattering were present, a wavelength dependence should exist between 5 and 10 cm data, but sampling differences between the two radars make differences due to Bragg scattering difficult to resolve from difference sue to sampling alone. Bragg scattering is also polarization insensitive meaning differential reflectivity should be near zero. Dual polarimetric observations show that backscattered radiation is dominated by non-spherical, including large oblate targets as indicated by large non-zero differential reflectivity values (greater than 5 dB) and low correlation coefficients (approximately 0.5). Thus, it is very likely that the radar observed particle scattering from ash and debris. Observed reflectivity values match well with estimated reflectivity based on ash-particle sizes derived using the maximum detection range of the smoke plume coupled with radial velocity data Particles large enough to be detected by the radars remain in the atmosphere 20 to 30 minutes corresponding to effective diameters of between 0.1 and 0.5 mm. For a number density of 1000 0.25 mm ash-like particles per unit volume (m-3), estimated reflectivity is -10 dBZ, which is similar to that observed at the most downstream portions of the plume.
Author
Fires; Polarimetry; Doppler Radar; Microwaves; Wavelengths

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*.

20090001197 Air Force Research Lab., Wright-Patterson AFB, OH USA; Ohio State Univ., OH, USA; University of North Texas, Denton, TX, USA
Direct Atomic Scale Observation of the Structure and Chemistry of Order/Disorder Interfaces
Srinivasan, R; Banerjee, R; Hwang, J Y; Viswanathan, G B; Tiley, J; Fraser, H L; Feb 2008; 13 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A490077; AFRL-RX-WP-TP-2008-4327; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The high strength of many metallic alloys, including nickel base superalloys used in aircraft jet engines, especially at

elevated temperatures, is often attributed to the presence of homogeneously distributed ordered intermetallic precipitates within a disordered matrix. The structure and chemistry at the precipitate/matrix interface plays a critical role in determining the effectiveness of the strengthening mechanism. Combining aberration-corrected high resolution scanning transmission electron microscopy (HRSTEM) with three-dimensional atom probe (3DAP) tomography the atomic scale structure and chemistry across the order/disorder interface in nickel base superalloys has been determined. While, the order/disorder interface is ~4 atomic layers thick, the width of the compositional gradient across the same interface is ~10 atomic layers thick. Such atomic resolution pictures of these interfaces raises fundamental questions regarding their definition and is essential for understanding both their high temperature stability as well as their role in strengthening by obstructing dislocation motion. DTIC

Atomic Structure; Atoms; Observation; Order-Disorder Transformations; Tomography

20090001201 Universal Energy Systems, Inc., Dayton, OH USA

Electron Channeling: A Problem for X-Ray Microanalysis in Materials Science

Meisenkothen, F; Wheeler, R; Kerns, R D; Scheltens, F J; Uchic, M D; May 2008; 18 pp.; In English

Contract(s)/Grant(s): F33615-03-C-5206; Proj-4347

Report No.(s): AD-A489998; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Electron channeling effects, within the scanning electron microscope, are expected to create measurable signal intensity variations in all product signals that result from the scattering of the electron beam within a crystalline specimen. Of particular interest to the x-ray microanalyst, are any variations that occur within the characteristic x-ray signal that are not directly related to a specimen composition variation. Thus many researchers have worked to document the effect of crystallographic orientation on the local x-ray yield produced by a specimen. However, the vast majority of these studies were carried out in regards to thin foil specimens examined in transmission. Only a few x-ray microanalysis studies specifically addressed these effects in bulk specimen materials, and the analyses were generally carried out 35 to 40 years ago, at common scanning electron microscope, microanalysis overvoltage (>1.5). At these overvoltage levels, the anomalous transmission effect is generally very weak (typically <5% difference between intensity maxima and minima).
DTIC

Microanalysis; Scanning Electron Microscopy; X Rays

20090001205 Stanford Univ., Stanford, CA USA

Structured Application-Specific Integrated Circuit (ASIC) Study

Dally, William; Balfour, James; Black-Schaffer, David; Hartke, Paul; Jun 2008; 38 pp.; In English

Contract(s)/Grant(s): FA8650-07-C-7726; Proj-ARPS

Report No.(s): AD-A489820; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Many of the digital electronic subsystems in defense applications require the small-size and power efficiency of application-specific integrated circuits (ASICs). Unfortunately, the high price and long design time of ASICs make them prohibitively expensive for low-volume DoD applications or systems requiring a rapid response time. This study introduces the concept of a 'structured ASIC' that is an array of building blocks (microprocessors, signal processors, logic blocks, and memories) connected by an interconnection network. The vast majority of demanding DoD applications can be realized by configuring and connecting these building blocks with efficiency comparable to an ASIC but with a fraction of the development time and expense. This study also proposes a programming system that maps a high-level description of an application to a structured ASIC component. While this study has demonstrated the feasibility of structured ASICs, much work remains to mature this technology. This report closes with a set of recommendations for a program to develop this technology further.
DTIC

Application Specific Integrated Circuits; Computer Techniques; Digital Systems; Integrated Circuits; Signal Processing

20090001218 Air Force Research Lab., Rome, NY USA

Design and Development of a Package for a Diluted Waveguide Electro-Absorption Modulator

Tan, Songsheng; Stoffel, Nancy; Shick, Charles; McDonald, Terrance; Whitbeck, Al; Erdmann, Reinhard; Michalak, Richard J; Bussajer, Rebecca; Shubin, Ivan; Yu, Paul K; Nov 2008; 10 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A490249; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Externally coupled electro-absorption modulators (EAM) are commonly used in order to transmit Radio-Frequency (RF)

signals on optical fibers. Recently an alternative device design with diluted waveguide structures has been developed. Bench tests show benefits of lower propagation loss, higher power handling (100 mW), and higher normalized slope efficiency. This paper addresses the specific issues involved in packaging the diluted waveguide EAM devices. An evaluation of the device requirements was done relative to the standard processes. Bench tests were performed in order to characterize the optical coupling of the EAM. The photo current maximum was offset from the optical power output maximum. The transmissions vs bias voltage curves were measured, and an XY scanner was used to record the mode field of the light exiting from the EAM waveguide in each position. The Beam Propagation Method was used to simulate the mode field and the coupling efficiency. A design including mechanical, optical and RF elements was developed. A Newport Laser Welding system was utilized for fiber placement and fixation.
DTIC
Absorption; Dilution; Modulators; Waveguides

20090001340 NASA Glenn Research Center, Cleveland, OH, USA
Effect of Excess Lead and Bismuth Content on the Electrical Properties of High-Temperature Bismuth Scandium Lead Titanate Ceramics
Sehirlioglu, Alp; Sayir, Ali; February 24, 2008; 14 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNC07TA77T; Copyright; Avail.: CASI: A03, Hardcopy

Aeronautic and aerospace applications require piezoelectric materials that can operate at high temperatures. The air-breathing aeronautic engines can use piezoelectric actuators for active combustion control for fuel modulation to mitigate thermo-acoustic instabilities and/or gas flow control to improve efficiency. The principal challenge for the insertion of piezoelectric materials is their limitation for upper use temperature and this limitation is due low Curie temperature and increasing conductivity. We investigated processing, microstructure and property relationship of (1-x)BiScO3-(x)PbTiO3 (BS-PT) composition as a promising high temperature piezoelectric. The effect of excess Pb and Bi and their partitioning in grain boundaries were studied using impedance spectroscopy, ferroelectric, and piezoelectric measurement techniques. Excess Pb addition increased the grain boundary conduction and the grain boundary area (average grain size was 24.8 m, and 1.3 m for compositions with 0at.% and 5at.% excess Pb, respectively) resulting in ceramics with higher AC conductivity (tan d= 0.9 and 1.7 for 0at.% and 5at.% excess Pb at 350 C and at 10kHz) that were not resistive enough to pole. Excess Bi addition increased the resistivity (rho= 4.1x10(exp 10) Omega cm and 19.6 x10(exp 10) Omega.cm for compositions with 0at.% and 5at.% excess Bi, respectively), improved poling, and increased the piezoelectric coefficient from 137 to 197 pC/N for 5at.% excess Bi addition. In addition, loss tangent decreased more than one order of magnitude at elevated temperatures (greater than 300 C). For all compositions the activation energy of the conducting species was similar (approximately equal to 0.35-0.40 eV) and indicated electronic conduction.
Author
Bismuth; Ceramics; Electrical Properties; High Temperature; Lead Titanates; Microstructure; Piezoelectricity; Scandium

20090001405 TEMEX Time Neuchatel, Switzerland
A New Synchronized Miniature Rubidium Oscillator with an Auto-Adaptive Disciplining Filter
Rochat, Pascal; Leuenberger, Bernard; Nov 2001; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485835; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485835

A new rubidium line (SRO) integrating timing functions and time interval measurements was developed using an auto-adaptive disciplining algorithm. This led to an ultra-stable time & frequency machine usable for many applications such as: synchronization of telecommunications systems (SDH, SONET, CDMA), military communications, navigation, and instrumentation. The frequency and phase-time correction is calculated from an internal phase-time error signal measured within 1 ns resolution issued from an internal PPS signal (PPSINT) aligned to the PPS reference signal (PPSREF). Furthermore, the SRO itself analyzes the stability of the PPSREF signal. Thanks to the very good mid-term frequency stability offered by the rubidium technology. The PPS reference of a GPS engine can be directly applied to the SRO without specific analysis of the internal parameters of the engine (number of satellites in view, signal-to-noise ratio, etc.). When the 'track' mode is selected, the PPSINT is aligned to the PFSREF. Then midterm frequency stability analysis of the PPSREF (learning phase) may start providing an internal crystal oscillator locked to the rubidium atomic resonance. Such analysis is performed continuously and the PPSINT will then be phase-locked to the PPSREF as long as the Allan variance of the PPSREF is lower than a pre-defined value stored in EEPROM memory. The phase-lock loop time constant t is automatically selected as a function of PPSREF short-term stability. When a standard GFS receiver is used, being affected by selective availability, the typical time constant will be 10,000 to 100,000 sec. Without SA, the typical selected time constant is 1,000 sec. Details of

the principles of the disciplining algorithm are presented as step response and holdover performance data.
DTIC
Adaptive Filters; Crystal Oscillators; Disciplining; Miniaturization; Rubidium; Synchronized Oscillators; Telecommunication

20090001428 Space and Naval Warfare Systems Command, San Diego, CA USA
Time and Frequency Synchronization (T&F Sync) Common and Standardized Architecture for DOD Shore Communication Stations
Stevens, Ilya; Dinh, Son; Church, Keith; Castello, Robert; Beard, Ron; White, Joe; Dec 2004; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485907; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485907

Time synchronization and frequency syntonization are vital to all mission-critical DOD C4ISR systems to ensure accurate data processing and timely information transmission and reception. Existing Time and Frequency Synchronization (T&F Sync) systems at Navy shore communication stations have evolved over many years and are often unique, stand-alone, site-specific configurations having been implemented for a number of specific system designs to meet a variety of specifications, standards, and requirements. These systems are composed of an eclectic and varied mixture of military and Commercial-Off-The-Shelf (COTS) equipment, many of which are legacy, obsolete, or discontinued models. Under the sponsorship of SPAWAR 05 and PEO C4I & Space/PMW-170 (formerly PMW-156), SSC-SD has evaluated available COTS T&F Sync equipment configurations. These configurations were evaluated for potential operation in accordance with JCS (Joint Chiefs of Staff) requirements, as well as current and future military requirements. From this evaluation the architecture for a common T&F Sync equipment configuration for shore communication stations was determined. Coordination of this proposed architecture with personnel from the sponsoring activities, the Defense Information Systems Agency (DISA) and the Naval Research Laboratory (NRL) has resulted in a final T&F Sync architecture solution that has been proposed for implementation. The proposed architecture is the subject of this paper. The goal of implementing this T&F Sync architecture is to provide a common technical architecture for all DOD shore communication stations that can satisfy current requirements and be expanded to meet future requirements.
DTIC
Commercial Off-the-Shelf Products; Frequency Synchronization; Standardization; Stations; Telecommunication; Time Synchronization

20090001433 Naval Research Lab., Washington, DC USA
Remote Frequency Measurement of TV 5 Rubidium
Boehm, Doug; Gross, Rachel; Aug 2005; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485917; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485917

This paper describes a method for remotely measuring oscillator frequency using an easily accessible carrier signal. The measurement was based on a system currently used onsite to compare time at the Naval Research Laboratory (NRL) versus USNO via a remotely accessible system. In our case, we are interested in characteristics of the remote system itself. The Washington DC Channel 5 TV station stabilizes the tenth frame of their color sub carrier frequency to a 1PPS signal from USNO with a rubidium oscillator. By performing a high accuracy phase comparison of the 2250 Hz TV5 signal to the 2250 Hz of our local house maser, we can determine the frequency drift of the TV5 rubidium oscillator in real time, to a few parts in 1010 to 1011 . A Windows-compatible computer program was written to facilitate this process. Due to the measured drift, the oscillator will be physically adjusted according to our recommendation during a trip to the TV 5 station this summer.
DTIC
Carrier Frequencies; Frequency Measurement; Oscillators; Remote Sensing; Rubidium; Television Systems

20090001437 Corporation for National Research Initiatives, Reston, VA USA
Transfer of Fabrication of Universal MEMS Integrated Dual-Spring (UMIDS) Process to a Distributed Fabrication Network
Huff, Michael A; Ozgur, Mehmet; Aug 15, 2008; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N66001-06-C-0013
Report No.(s): AD-A485921; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485921

Spawar has been developing a process sequence called the ‘Universal MEMS Integrated Dual-Spring"(UMlDS) for

several years. This process has shown promise for the fabrication of extremely sensitive inertial sensor devices. Under this effort, Spawar researchers were tasked with the transfer of the UMIDS process to the DARPA-established MEMS Exchange program at the Corporation for National Research Initiatives (CNRI) in Reston Virginia. Specifically, Spawar provided to the MEMS Exchange the process sequence, device designs, and various process details and parameters to provide a starting point to allow the MEMS Exchange to fabricate accelerators using the UMIDS process. This final report outlines our efforts and the results of the fabrication of the accelerator devices made using the Spawar UMIDS process. The UMIDS process was successfully transferred to the MEMS Exchange.
DTIC
Fabrication; Microelectromechanical Systems

20090001524 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
The Electronic Structure and Field Effects of an Organic-Based Room Temperature Magnetic Semiconductor
Lincoln, Derek M; Jan 2007; 148 pp.; In English
Report No.(s): AD-A486069; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The future of spin-electronics or 'spintronics' lies in the development of viable magnetic semiconductors that can effectively operate at room temperature Vanadium tetracyanoethylene (V[TCNE]~2) is a magnetic semiconductor with an ordering temperature well above that of room. Its highly disordered structure has hampered a comprehensive description of the interactions between the V and TCNE sublattices that give rise to its magnetic and electrical properties. We report the results of high-resolution x-ray absorption (XAS) and magnetic circular dichrosim (MCD) studies probing the electronic structure of V[TCNE]~2 in an effort to elucidate the nature of these interactions. Included in this study are the first reports of gas phase neutral TCNE XAS spectra as well as the first reports of MCD spectra of the carbon and nitrogen absorption edges for the V[TCNE]~2 system. The vanadium spectrum reveals a spin split L3 and L2 spectrum that is qualitatively modeled for V(II) using crystal field multiplet (CFM) theory calculations except for a region of excess intensity on the high energy side of both the L3 and L2 absorption edges. We speculate that the origin of this excess intensity is vanadium present in valence states higher than V(II) and antibonding states from the hybridization of the V centers and TCNE. Despite the localized nature of the x-ray absorption process the C and N spectra of the TCNE suggest that we are probing molecular final states of TCNE from different sites rather atomically isolated states. In addition, the carbon and nitrogen absorption spectra reveal that this molecular orbital structure remains largely intact in going from the gas phase to the condensed phase in V[TCNE]~2.
DTIC
Electrical Properties; Electronic Structure; Room Temperature; Semiconductors (Materials); Vanadium

20090001746 Brookhaven National Lab., Upton, NY USA
Recent Advances in Developing Platinum Monolayer Electrocatalysts for the O(sub 2) Reduction Reaction
Vukmirovic, M. B.; Sasaki, K.; Zhou, W. P.; Li, M.; Liu, P.; Aug. 2008; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-937157; BNL-81437-2008-CP; No Copyright; Avail.: Department of Energy Information Bridge

For Pt, the best single-element catalyst for many reactions, the question of content and loading is exceedingly important because of its price and availability. Using platinum as a fuel-cell catalyst in automotive applications will cause an unquantifiable increase in the demand for this metal. This big obstacle for using fuel cells in electric cars must be solved by decreasing the content of Pt, which is a great challenge of electrocatalysis Over the last several years we inaugurated a new class of electrocatalysts for the oxygen reduction reaction (ORR) based on a monolayer of Pt deposited on metal or alloy carbon-supported nanoparticles. The possibility of decreasing the Pt content in the ORR catalysts down to a monolayer level has a considerable importance because this reaction requires high loadings due to its slow kinetics. The Pt-monolayer approach has several unique features and some of them are: high Pt utilization, enhanced (or decreased) activity, enhanced stability, and direct activity correlations. The synthesis of Pt monolayer (ML) electrocatalysts was facilitated by our new synthesis method which allowed us to deposit a monolayer of Pt on various metals, or alloy nanoparticles for the cathode electrocatalyst. In this synthesis approach Pt is laid down by the galvanically displacing a Cu monolayer, which was deposited at underpotentials in a monolayer-limited reaction on appropriate metal substrate, with Pt after immersing the electrode in a K(sub 2)PtCl(sub 4) solution.
NTIS
Electrocatalysts; Energy Conversion; Fuel Cells; Platinum

20090001751 Department of Energy, Washington, DC, USA
Energy Tips--Motor: Minimize Adverse Motor and Adjustable Speed Drive Interactions. Motor Tip Sheet No. 15
Jul. 2008; 2 pp.; In English
Report No.(s): DE2008-937336; DOE/GO-102008-2621; No Copyright; Avail.: Department of Energy Information Bridge

Electronic adjustable speed drives (ASDs) are an extremely efficient and valuable asset to motor systems. They allow precise process control and provide energy savings within systems that do not need to continuously operate at full output. The most common ASD design sold today is the pulse-width modulated (PWM) ASD with a fast rise-time insulated gate bipolar transistor (IGBT) to reduce switching losses and noise levels. However, higher carrier frequencies and faster rise time transistors on PWM ASDs can produce voltage spikes or overshoots that can stress motor windings and bearings. These problems can be eliminated through proper design and equipment selection.

NTIS
Adjusting; Electric Motors; Electronic Control; Mechanical Drives

20090001753 Department of Energy, Washington, DC, USA
Energy Tips--Motor: When Should Inverter-Duty Motors be Specified. Motor Tip Sheet No. 14
Jul. 2008; 2 pp.; In English
Report No.(s): DE2008-937338; DOE/GO-102008-2620; No Copyright; Avail.: Department of Energy Information Bridge

Electronic adjustable speed drives (ASDs) used to be marketed as usable with any standard motor. However, premature failures of motor insulation systems began to occur with the introduction of fast-switching pulse-width modulated (PWM) drives. The switching rates of modern power semiconductors can lead to voltage overshoots. These voltage spikes can rapidly damage a motor's insulation system, resulting in premature failure of the motor.

NTIS
Electric Motors; Energy Conservation; Inverters

20090001805 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Embedded ESD Protection Proof of Concept
Gerke, David; Herrmann, Bill; August 2008; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 939904.01.11.20; JPL Proj. 102197
Report No.(s): JPL Publication 08-25; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40937

The purpose of this project is to characterize and correlate Electrostatic Discharge (ESD) sensitivity levels of an Integrated Circuit (IC) package using Transmission Line Pulse (TLP) and Human Body Model (HBM) methods. This characterization will be used as a baseline ESD sensitivity level to demonstrate improvement to the ESD sensitivity of the IC package through the use of EPI-FLO(Trade Mark) Polymer Voltage Suppression (PVS) protection devices developed and manufactured by Electronic Polymers, Inc. (EPI).

Author
Electrostatics; Integrated Circuits; Embedding; Circuit Protection; Transmission Lines; Electric Potential; Electrical Engineering

20090001826 NASA Goddard Space Flight Center, Greenbelt, MD, USA
NASA Electronic Parts and Packaging (NEPP) Program - Radiation Activities
LaBel, Kenneth A.; Sampson, Michael J.; October 22, 2008; 16 pp.; In English; Radiation Hardened Electronics Technology (RHET), 22-23 Oct. 2008, Colorado Springs, CO; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001826

The NEPP mission is to provide guidance to NASA for the selection and application of microelectronics technologies, to improve understanding of the risks related to the use of these technologies in the space environment and to ensure that appropriate research is performed to meet NASA mission assurance needs.

Derived from text
Aerospace Environments; Microelectronics; Electronic Packaging

20090001828 National Inst. of Standards and Technology, Boulder, CO USA

W-band Dual Channel AM/PM Noise Measurement System - An Update

Hati, A; Nelson, C W; Nava, J F; Howe, D A; Walls, F L; Ascarrunz, H; Lanfranchi, J; Riddle, B; Aug 2005; 7 pp.; In English

Report No.(s): AD-A485923; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485923

We discuss the performance of a W-band '92-96' GHz amplitude modulated (AM) and phase modulated (PM) noise measurement system. The system uses two nearly identical channels to measure the residual noise in amplifiers in pulsed mode with a duty cycle of 10 % to 100 % (CW) at a given pulse repetition frequency (PRF). We describe details of the dual-channel measurement test set system and several design considerations that are essential for accurately extracting the device noise from measurement-system noise. We also discuss the modifications made to the synthesis scheme of the (92-96) GHz signal compared to the previous scheme. Finally, we present updated results for the source noise and the noise floor of the measurement system.

DTIC

Channel Noise; Noise Measurement; Phase Shift Circuits; Pulse Rate

20090001837 Army Research Lab., Adelphi, MD USA

Calibration Data for the Leaky Coaxial Cable as a Transmitting Antenna for HEMP Shielding Effectiveness Testing

Ly, Canh; Podlesak, Thomas; Aug 2008; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A485790; ARL-TN-0330; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485790

Leaky coaxial cables are coaxial cables with gaps in their shielding, which allows the center conductor to radiate. We will use a new technique for HEMP shielding effectiveness testing in which the cables function as antennas, not transmission lines, replacing the conventional method in which the normal transmitting antennas, which are loops and bi-logical arrays. This report presents the calibration data for the leaky coaxial cable as a transmitting antenna for HEMP shielding effectiveness testing for both low frequency band from 10 KHz to 20 MHz, and high frequency band from 20 MHz to 1 GHz with different orientations.

DTIC

Antennas; Calibrating; Coaxial Cables; Shielding; Transmission

20090001852 L-3 Communications Display Systems, Alpharetta, GA USA

Flexible Display and Integrated Communication Devices (FDICD) Technology. Volume 2

Huffman, David; Tognoni, Keith; Anderson, Robert; Jun 2008; 58 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-6436; Proj-7184

Report No.(s): AD-A485734; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485734

This flexible display and integrated communication device (FDICD) technology program sought to create a family of powerful visualization technologies that would reduce the weight, volume, and power while increasing usability by integrating many of the functions of present mission equipment into a small form factor. The goals included a network comprised of a worn main computer, a hand-held or knee-worn large display system and a wrist-worn small display. The large display was to be eventually rollable to provide soldiers with a large image of at least super video graphics adapter (SVGA) color resolution when needed, but small form factor when stowed, for viewing of and team collaboration with tactical information such as battlefield maps, GIS imaging data, command/control plots, and global positioning system (GPS)-assisted navigational maps. The wrist system was to provide a readily viewable unit in situations where the larger unit cannot be deployed and without resorting to headgear, which blocks battlespace view-ability. This final phase of the program resulted in two separate wrist demonstration devices. The first device built upon the results of the first phase of the project to raise the technology readiness level (TRL) of the commercial personal digital assistant (PDA)-based unit to a level suitable for the intended military environment, including full water-immersion capability. The second device was a custom designed wrist display intended to demonstrate additional capability on the wrist, including GPS maps.

DTIC

Communication Equipment; Display Devices; Systems Integration

20090001884 NASA Marshall Space Flight Center, Huntsville, AL, USA

Charging of the International Space Station as Observed by the Floating Potential Measurement Unit: Initial Results

Wright, Kenneth H., Jr.; Swenson, Charles; Thompson, Don; Barjatya, Arho; Koontz, Steven L.; Schneider, Todd; Vaughn, Jason; Minow, Joseph; Craven, Paul; Coffey, Victoria; Parker, Linda N.; Bui, Them; [2008]; 47 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The Floating Potential Measurement Unit (FPMU) is a multi-probe package designed to measure the floating potential of the International Space Station (ISS) as well as the density and temperature of the local ionospheric plasma environment. The role of the FPMU is to provide direct measurements of ISS spacecraft charging as continuing construction leads to dramatic changes in ISS size and configuration. FPMU data are used for refinement and validation of the ISS spacecraft charging models used to evaluate the severity and frequency of occurrence of ISS charging hazards. The FPMU data and the models are also used to evaluate the effectiveness of proposed hazard controls. The FPMU consists of four probes: a floating potential probe, two Langmuir probes, and a plasma impedance probe. These probes measure the floating potential of the ISS, plasma density, and electron temperature. Redundant measurements using different probes support data validation by inter-probe comparisons. The FPMU was installed by ISS crewmembers, during an Extra-Vehicular Activity, on the starboard (S1) truss of the ISS in early August 2006, when the ISS incorporated only one 160V US photovoltaic (PV) array module. The first data campaign began a few hours after installation and continued for over five days. Additional data campaigns were completed in 2007 after a second 160V US PV array module was added to the ISS. This paper discusses the general operational characteristics of the FPMU as integrated on ISS, the functional performance of each probe, the charging behavior of the ISS before and after the addition of a second 160V US PV array module, and initial results from model comparisons.
Author

Floating; Impedance Probes; International Space Station; Spacecraft Charging; Mathematical Models; Plasma Potentials

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*.

20090001179 Idaho National Lab., Idaho Falls, ID, USA

Idaho National Laboratory Program to Obtain Benchmark Data on the Flow Phenomena in a Scaled Model of a Prismatic Gas-Cooled Reactor Lower Plenum for the Validation of CFD Codes

McIlroy, H. M.; McEligot, D. M.; Sep. 01, 2008; 15 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID-13727

Report No.(s): DE2008-936618; INL/CON-08-14081; No Copyright; Avail.: National Technical Information Service (NTIS)

The experimental program that is being conducted at the Matched Index-of-Refraction (MIR) Flow Facility at Idaho National Laboratory (INL) to obtain benchmark data on measurements of flow phenomena in a scaled model of a typical prismatic gas-cooled (GCR) reactor lower plenum using 3-D Particle Image Velocimetry (PIV) is presented. A detailed description of the model, scaling, the experimental facility, 3-D PIV system, measurement uncertainties and analysis, experimental procedures and samples of the data sets that have been obtained are included. Samples of the data set that are presented include mean-velocity-field and turbulence data in an approximately 1:7 scale model of a region of the lower plenum of a typical prismatic GCR design. This experiment has been selected as the first Standard Problem endorsed by the Generation IV International Forum. Results concentrate on the region of the lower plenum near its far reflector wall (away from the outlet duct). Inlet jet Reynolds numbers (based on the jet diameter and the time-mean average flow rate) are approximately 4,300 and 12,400. The measurements reveal undeveloped, non-uniform flow in the inlet jets and complicated flow patterns in the model lower plenum. Data include three-dimensional vector plots, data displays along the coordinate planes (slices) and charts that describe the component flows at specific regions in the model. Information on inlet flow is also presented.
NTIS

Computational Fluid Dynamics; Gas Cooled Reactors; Information Flow

20090001287 Florida Univ., Gainesville, FL, USA

Incipient Cavitation Studied under Strong Thermodynamic Effect

Dorney, Daniel J.; Gustavsson, Jonas P. R.; Denning, Kyle C.; Segal, Corin; [2008]; 17 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Incipient cavitation was studied under simulated cryogenic conditions on a NACA0015 hydrofoil in a water tunnel filled

with the perfluorinated ketone 2-trifluoromethyl- 1,1,1,2,4,4,5,5,5-nonafluoro-3-pentanone. Through pressure measurements on the hydrofoil, laser-illuminated high-speed photography and flash-illuminated photography, the extent of cavitation and the characteristic frequencies of its oscillation were studied under varying speeds in the range 1.7-6.7 m/s and several angles of attack. The results presented in this paper are limited to 5.1 degree angle of attack. It was found that the vapor formation was much stronger in fluoroketone than in cold water tests at similar cavitation number. The formed bubbles were significantly smaller and there existed an extended speed range over which fluctuation amplitudes grew with no well-defined frequency peaks as was observed in water.
Author
Turbine Pumps; Cavitation Flow; Thermodynamics; Hydrofoils; Cryogenics; Simulation

20090001309 NASA Glenn Research Center, Cleveland, OH, USA
The Effect of Spray Initial Conditions on Heat Release and Emissions in LDI CFD Calculations
Iannetti, Anthony C.; Liu, Nan-Suey; Davoudzadeh, Farhad; October 2008; 28 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2008-215422; E-16591; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001309

The mass and velocity distribution of liquid spray has a primary effect on the combustion heat release process. This heat release process then affects emissions like nitrogen oxides (NOx) and carbon monoxide (CO). Computational Fluid Dynamics gives the engineer insight into these processes, but various setup options exist (number of droplet groups, and initial droplet temperature) for spray initial conditions. This paper studies these spray initial condition options using the National Combustion Code (NCC) on a single swirler lean direct injection (LDI) flame tube. Using laminar finite rate chemistry, comparisons are made against experimental data for velocity measurements, temperature, and emissions (NOx, CO).
Author
Computational Fluid Dynamics; Mass Distribution; Heat of Combustion; Carbon Monoxide; Velocity Distribution; Sprayers; Injection

20090001313 NASA Glenn Research Center, Cleveland, OH, USA
Preliminary Test Results of a Non-Contacting Finger Seal on a Herringbone-Grooved Rotor
Proctor, Margaret P.; Degado, Irebert R.; November 2008; 23 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2008-215475; AIAA Paper-2008-4506; E-16560-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001313

Low leakage, non-contacting finger seals have potential to reduce gas turbine engine specific fuel consumption by 2 to 3 percent and to reduce direct operating costs by increasing the time between engine overhauls. A non-contacting finger seal with concentric lift-pads operating adjacent to a test rotor with herringbone grooves was statically tested at 300, 533, and 700 K inlet air temperatures at pressure differentials up to 576 kPa. Leakage flow factors were approximately 70 percent less than state-of-the-art labyrinth seals. Leakage rates are compared to first order predictions. Initial spin tests at 5000 rpm, 300 K inlet air temperature and pressure differentials to 241 kPa produced no measurable wear.
Author
Leakage; Labyrinth Seals; Brush Seals; Gas Pressure; Inlet Temperature; Gas Turbine Engines; Fuel Consumption

20090001348 NASA Stennis Space Center, Stennis Space Center, MS, USA
Computational Analyses of Pressurization in Cryogenic Tanks
Ahuja, Vineet; Hosangadi, Ashvin; Mattick, Stephen; Lee, Chun P.; Field, Robert E.; Ryan, Harry; July 21, 2008; 27 pp.; In English; 44rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 21-23 Jul. 2008, Hartford, CT, USA; Original contains color illustrations
Contract(s)/Grant(s): NNSO6AA12C
Report No.(s): SSTI-8080-0022; Copyright; Avail.: CASI: A03, Hardcopy

A) Advanced Gas/Liquid Framework with Real Fluids Property Routines: I. A multi-fluid formulation in the preconditioned CRUNCH CFD(Registered TradeMark) code developed where a mixture of liquid and gases can be specified: a) Various options for Equation of state specification available (from simplified ideal fluid mixtures, to real fluid EOS such as SRK or BWR models). b) Vaporization of liquids driven by pressure value relative to vapor pressure and combustion of

vapors allowed. c) Extensive validation has been undertaken. II. Currently working on developing primary break-up models and surface tension effects for more rigorous phase-change modeling and interfacial dynamics B) Framework Applied to Run-time Tanks at Ground Test Facilities C) Framework Used For J-2 Upper Stage Tank Modeling: 1) NASA MSFC tank pressurization: a) Hydrogen and oxygen tank pre-press, repress and draining being modeled at NASA MSFC. 2) NASA AMES tank safety effort a) liquid hydrogen and oxygen are separated by a baffle in the J-2 tank. We are modeling pressure rise and possible combustion if a hole develops in the baffle and liquid hydrogen leaks into the oxygen tank. Tank pressure rise rates simulated and risk of combustion evaluated.
Derived from text
Liquid Hydrogen; Gas Mixtures; Interfacial Tension; J-2 Engine; Vapor Pressure; Combustion; Equations of State; Analysis (Mathematics)

20090001368 Army Engineer Research and Development Center, Vicksburg, MS USA
A Hydrodynamic Study of Davis Pond, Near New Orleans, LA
McAlpin, Tate O; Letter Jr , Joseph V; Martin, S K; Aug 2008; 109 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485740; ERDC/CHL-TR-08-11; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA485740

This study characterizes water levels in the Davis Pond floating marsh created by the diversion of fresh water from the Mississippi River. The model was validated to observed field data collected from November 2003 to January 2004. After model validation, eight alternatives were tested to determine the benefits of extending the diversion canal (Alternatives 1 3), increasing the size of the cuts through the gabion weir (Alternatives 4 6), and creating breaches in the Cypress Lumber Canal (Alternatives 7 8). These eight initial alternatives were analyzed and used to create four additional alternatives (Alternatives 9 12) consisting of the most beneficial aspects of each of the initial alternatives. The final four alternatives were tested to determine their expected benefits to the system.
DTIC
Hydrodynamics; Ponds

20090001415 Massachusetts Inst. of Tech., Cambridge, MA USA
Observations of Turbulent Fluxes and Turbulence Dynamics in the Ocean Surface Boundary Layer
Gerbi, Gregory P; Jun 2008; 117 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0409; N00014-01-1-0029
Report No.(s): AD-A485866; MIT/WHOI-2008-04; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA485866

This study presents observations of turbulence dynamics made during the low winds portion of the Coupled Boundary Layers and Air-Sea Transfer experiment (CBLAST-low) in the ocean surface boundary layer. Observations include turbulent fluxes, turbulent kinetic energy, and the length scales of flux-carrying and energy-containing eddies. The observations of turbulent fluxes allowed the closing of heat and momentum budgets across the air-sea interface. The flux-carrying eddies are similar in size to those expected in rigid-boundary turbulence, but energy-containing eddies are smaller than those in rigid boundary turbulence. The observations confirm previous speculation that surface wave breaking provides a surface source of turbulent kinetic energy that dissipates as it is transported to depth. A model that includes the effects of shear production, transport, and dissipation is able to reproduce the enhancement of turbulent kinetic energy near the ocean surface. The ocean surface boundary layer is observed to have small but finite temperature gradients that are related to the boundary fluxes of heat and momentum, as assumed by closure models. However, the turbulent diffusivity of heat in the surface boundary layer is larger than predicted by rigid-boundary closure models. This discrepancy can be explained by the addition of wave breaking to the rigid-boundary model.
DTIC
Atmospheric Boundary Layer; Boundary Layers; Ocean Surface; Turbulence

20090001890 NASA Marshall Space Flight Center, Huntsville, AL, USA
Effect of Chamber Backpressure on Swirl Injector Fluid Mechanics
Kenny, R. Jeremy; Hulka, James R.; Moser, Marlow D.; Rhys, Noah O.; July 21, 2008; 27 pp.; In English; 44th AIAA Joint Propulsion Conference, 21-24 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A common propellant combination used for high thrust generation is GH2/LOX. Historical GH2/LOX injection elements

have been of the shear-coaxial type. Element type has a large heritage of research work to aid in element design. The swirl-coaxial element, despite its many performance benefits, has a relatively small amount of historical, LRE-oriented work to draw from. Design features of interest are grounded in the fluid mechanics of the liquid swirl process itself, are based on data from low-pressure, low mass flow rate experiments. There is a need to investigate how high ambient pressures and mass flow rates influence internal and external swirl features. The objective of this research is to determine influence of varying liquid mass flow rate and ambient chamber pressure on the intact-length fluid mechanics of a liquid swirl element.
Derived from text
Swirling; Fluid Mechanics; Liquid Flow; Flow Chambers; Pressure Effects

20090001891 NASA Marshall Space Flight Center, Huntsville, AL, USA
Effect of Chamber Backpressure on Swirl Injector Fluid Mechanics
Kenny, R. Jeremy; Hulka, James R.; Moser, Marlow D.; Rhys, Noah O.; July 21, 2008; 16 pp.; In English; 44th AIAA/ASME/SAE Joint Propulsion Conference, 21-23 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNM05AB50C; Copyright; Avail.: Other Sources

Through a research program funded by the Constellation University Institutes Project, the fluid mechanics of a liquid swirl injector element under varying backpressures was investigated. The center-jet swirling element features were designed using typical liquid propellant rocket engine parameters, then manufactured and tested in a high-pressure, optically-accessible, cold flow facility located at the NASA MSFC East Test Area. A constant swirl injector flow rate of 0.09 kg/s was subjected to varying chamber backpressures ranging from 0.10 MPa to 4.83 MPa. The exit film thickness and spray angle near the nozzle exit were measured by shadowgraphs. The film thickness was also measured for seven nozzle diameters upstream of the exit by shadowgraphs through a transparent nozzle tube section. Increasing the backpressure for this fixed mass flow rate increased the film thickness from predicted design values. Measured discharge coefficient values increased with increasing chamber pressure, reflecting the observed increase in internal nozzle film thickness. The spray angle decreased for increasing chamber pressure, but at a diminishing rate.
Author
Liquid Propellant Rocket Engines; Mass Flow Rate; Spray Nozzles; Flow Velocity; Fluid Mechanics; Injectors; High Pressure; Swirling

20090001906 NASA Marshall Space Flight Center, Huntsville, AL, USA
Dynamics of Gas Evacuation from a Honeycomb Structure Having Common Wall Perforations
Lee, Chun P.; Anilkumar, Amrutur V.; Grugel, Richard N.; [2008]; 26 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

A model has been developed to provide insight regarding the time to evacuate gas from a structure consisting of hexagonal cells whose common walls share a relatively small pinhole. Gas flow from a single cell to a vacuum environment is first considered. The analysis is then applied to a linear string of connected cells to evaluate the pressure drop from the center cell to the edge cell as a function of time and the total number of cells. Both adiabatic and isothermal conditions were investigated, with the latter resulting in faster drain times. A scaling relationship between the rate of pressure drop in time and the total number of cells was found. The relationship was then applied to the solution of the more complicated, two-dimensional, hexagonal array problem. Considering an array based on a typical common bulkhead geometry, and assuming the isothermal condition, a best case evacuation time for argon was predicted.
Author
Gas Flow; Gas Dynamics; Argon; Honeycomb Structures; Hexagonal Cells; Walls; Pinholes

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20090000005 Air Force Research Lab., Mesa, AZ USA

Head and Eye Movements in Visual Search Using Night Vision Goggles

Geri, George A; Martin, Elizabeth L; Wetzel, Paul A; Aug 2002; 10 pp.; In English

Contract(s)/Grant(s): F41624-97-C-5000; Proj-1123

Report No.(s): AD-A489158; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA489158

Night-vision goggles (NVGs) provide only a restricted field of view and have other characteristics that may affect the head and eye movements used in visual search. METHODS: We measured head scan patterns, the magnitude and duration of gaze saccades, and fixation duration as subjects searched computer generated imagery either with or without NVGs. Subjects searched for either a large (6 degrees) target on a low-detail background (high conspicuity condition) or a small (2 degrees) target on a high-detail background (low conspicuity condition). RESULTS: All subjects displayed head-scan patterns that were qualitatively similar to those reported in the literature. Although both head-scan speed and amplitude were higher for the NVG condition as compared with the no-NVG condition, the difference was not statistically significant. Head-scan speed did vary significantly with target conspicuity, however. Gaze saccade amplitude varied with target conspicuity but only when NVGs were used. Fixation duration did not vary with either NVG use or target conspicuity. A two-parameter (exponent and scaling parameter) power function was fitted to the amplitude-duration data. The power-function exponents varied from about 0.30 to 0.44, but there was a concommitant variation in the scaling parameter, and the result was no significant difference in the form of the power functions fitted to the data. CONCLUSIONS: NVG use did not significantly affect any of the individual head or eye movement variables involved in searching the computer-generated imagery studied here. However, the decrease in gaze-saccade amplitude with increased target conspicuity when NVGs were used is evidence of the sensitivity of the head and eye movement measurement techniques used here, and suggests that all available measures of response efficiency be considered when evaluating NVGs using complex stimuli.

DTIC

Eye Movements; Goggles; Head Movement; Night Vision; Visual Perception

20090000006 Air Force Research Lab., Mesa, AZ USA

Binocular Rivalry and Head Worn Displays

Patterson, Robert; Winterbottom, Marc; Pierce, Byron; Dec 2007; 16 pp.; In English

Contract(s)/Grant(s): FA8650-05-D-6502; Proj-1123

Report No.(s): AD-A488987; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA488987

Objective: We provide a review and analysis of much of the published literature on binocular rivalry that is relevant to the design and use of head-worn displays ‘HWDs’. Background: This review draws heavily from both the basic vision literature and applied HWD literature in order to help provide insight for minimizing the effects of binocular rivalry when HWDs are worn. Method: Included in this review are articles and books found cited in other works as well as articles and books obtained from an Internet search. Results: Issues discussed and summarized are ‘a’ characteristics of binocular rivalry, ‘b’ stimulus factors affecting rivalry, ‘c’ cognitive variables affecting rivalry, and ‘d’ tasks affected by rivalry. Conclusion: This paper offers a set of recommendations for minimizing the effects of binocular rivalry when HWDs are used as well as recommendations for future research. Application: Considerations of the basic vision literature on binocular rivalry will provide insight for future design solutions for HWDs.

DTIC

Binocular Vision; Binoculars; Display Devices; Helmet Mounted Displays

20090001378 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Het SOWNet Experiment (The SOWNet Experiment)

Ruizenaar, M G; Boekema, R B; van Hoof, H A; van Voorthuijsen, G P; Jul 2008; 46 pp.; In Dutch; Original contains color illustrations

Report No.(s): AD-A485756; TNO-DV-2008-A243; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485756

The Self Organising Wireless Network (SOWNet), developed by TNO, was used in a field experiment to ascertain the possible performance benefits when applied to unattended ground sensors (UGS). Detection probability, false alarm rate (FAR), and battery life-time were compared for both the conventional communications method (i.e. one-way communication) and a networked communications approach. The conclusion as a result of this experiment is that networking the UGS led to a considerable reduction in false alarms and energy consumption.

DTIC

Communication Networks; HET Experiment; Remote Sensors

20090001530 National Inst. of Standards and Technology, Gaithersburg, MD USA

Implementing a Multiplexed System of Detectors for Higher Photon Counting Rates

Schettini, Valentina; Polyakov, Sergey V; Degiovanni, Ivo P; Brida, Giorgio; Castelletto, Stefania; Migdall, Alan; Jan 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486091; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Photon counting applications are typically limited by detector deadtime to operate at count rates of a few MHz, at best, and often at significantly lower levels. This limitation is becoming more critical with the advance of photon counting applications such as photon-based quantum information. We present a first experimental proof of principle and review the theoretical foundation of a multiplexed detection scheme that allows photons to be counted at higher rates than is possible with individual detectors or simple detector trees. In addition to this deadtime improvement, we discuss the impact of this scheme on other relevant characteristics such as afterpulsing and dark count rates.

DTIC

Counting; Detectors; Multiplexing; Photons

20090001784 Zebra Imaging, Inc., Austin, TX, USA

Evaluation of Holographic Technology in Close Air Support Mission Planning and Execution

Martin, John J; Holzbach, Mark; Riegler, Joseph; Tam, Chin-Ki; Smith, Adam; Mar 18, 2008; 47 pp.; In English

Contract(s)/Grant(s): FA8650-05-D-6502; Proj-1123

Report No.(s): AD-A486177; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force Research Laboratory (AFRL) initiated BAA-05-04-HE with an objective to assess human performance in identifying patterns or subtle targets, comparing the effectiveness of 2D and 3D static visual stimuli based on identical example data sets. The research was tailored to the mission and task of the Joint Terminal Attack Controller (JTAC), and was a joint effort between AFRL/RHA in Mesa, AZ, its on-site support contractors (L-3 Communications and The Boeing Company), and Zebra Imaging of Austin, TX. Nine experienced JTACs participated in the evaluation. They first read through a written scenario similar to ones used both in actual combat and also in training exercises. The JTACs then were shown conventional 2D imagery and 3D holograms relating to the scenario, and participated in a detailed survey interview. During the survey they verbally answered questionnaire questions including comparison ratings of various aspects of the 2D and 3D imagery on a scale of 1 to 10. All nine JTACS rated the 3D holograms as more effective than 2D photos for all mission planning and execution tasks and subtasks. The most frequently cited benefits of the holograms were relative height information, enhanced collateral damage estimation (CDE), and determining lines of sight and lines of fire. The 1':15m scale was considered the most useful for JTAC purposes. The success of this research leads to the primary recommendation that a proof-of-concept field deployment be undertaken. Other recommendations concerning mission applications, formats and night implementations also are cited.

DTIC

Holography; Mission Planning; Planning; Support Systems

20090001788 Engineering Research and Consulting, Inc., Edwards AFB, CA USA; University of Southern California, Los Angeles, CA, USA

Analysis of Physical and Numerical Factors for Prediction of UV Radiation from High Altitude Two-Phase Plumes

Gimelshein, Natalia E; Lyons, Robert B; Reuster, James G; Gimelshein, Sergey F; May 30, 2008; 18 pp.; In English

Report No.(s): AD-A486078; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Numerical study of a 5,900 lb solid propellant thruster plume at an altitude of 118 km is performed using a combined multi-step continuum/kinetic approach. The Navier-Stokes equations are solved for the flow inside the nozzle and the first several meters into the plume. The DSMC method is used to simulate the remaining plume and the plume-free stream interaction. A Monte Carlo based radiation code is applied in an overlay mode to calculate UV radiation in the near and far field of the plume. The computations take into account both alumina particles and soot. The effect of alumina particle emissivities and size distribution, as well as soot concentration, on UV radiation is clarified. Comparison of numerical results with available UV measurements is conducted.

DTIC

High Altitude; Mathematical Models; Physical Factors; Plumes; Prediction Analysis Techniques; Ultraviolet Radiation

20090001853 Air Force Research Lab., Hanscom AFB, MA USA

Optical/Infrared Signatures for Space-Based Remote Sensing

Picard, R H; Dewan, E M; Winick, J R; O'Neil, R R; Nov 1, 2007; 76 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2301

Report No.(s): AD-A485718; AFRL-RV-HA-TR-2008-1008; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485718

This report describes work carried out under the Air Force Research Laboratory's basic research task in optical remote-sensing signatures, entitled Optical / Infrared Signatures for Space-Based Remote Sensing. The work was carried out during the period 20 Mar 2000 - 30 Sep 2007 and was supported by funding from AFOSR's Physics and Electronics Directorate (AFOSR/NE). The objective of the program was to increase understanding of remotely sensed signatures, particularly as seen by spaceborne optical/infrared sensors. Emphasis was placed on understanding the radiance environment of the structured upper atmosphere of the earth (mesosphere and thermosphere) in terms of the structure of the underlying medium. Advances in non-LTE radiative transfer and atmospheric waves and localized excitations are detailed, as well as analysis and modeling of the databases resulting from two groundbreaking space infrared experiments, DoD MSX/SPIRIT III and NASA TIMED/SABER.

DTIC

Infrared Signatures; Remote Sensing; Signatures

20090001867 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Fast Plasma Instrument for MMS: Data Compression Simulation Results

Barrie, A.; Adrian, Mark L.; Yeh, P.-S.; Winkert, G. E.; Lobell, J. V.; Vinas, A.F.; Simpson, D. J.; Moore, T. E.; November 13, 2008; 1 pp.; In English; American Geophysical Union Meeting, 13-20 Dec. 2008, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Magnetospheric Multiscale (MMS) mission will study small-scale reconnection structures and their rapid motions from closely spaced platforms using instruments capable of high angular, energy, and time resolution measurements. To meet these requirements, the Fast Plasma Instrument (FPI) consists of eight (8) identical half top-hat electron sensors and eights (8) identical ion sensors and an Instrument Data Processing Unit (IDPU). The sensors (electron or ion) are grouped into pairs whose 6 deg x 180 deg fields-of-view (FOV) are set 90 deg apart. Each sensor is equipped with electrostatic aperture steering to allow the sensor to scan a 45 deg x 180 deg fan about its nominal viewing (0 deg deflection) direction. Each pair of sensors, known as the Dual Electron Spectrometer (DES) and the Dual Ion Spectrometer (DIS), occupies a quadrant on the MMS spacecraft and the combination of the eight electron/ion sensors, employing aperture steering, image the full-sky every 30-ms (electrons) and 150-ms (ions), respectively. To probe the results in the DES complement of a given spacecraft generating 6.5-Mbs(exp -1) of electron data while the DIS generates 1.1-Mbs(exp -1) of ion data yielding an FPI total data rate of 6.6-MBs(exp -1). The FPI electron/ion data is collected by the IDPU then transmitted to the Central Data Instrument Processor (CIDP) on the spacecraft for science interest ranking. Only data sequences that contain the greatest amount of temporal/spatial structure will be intelligently down-linked by the spacecraft. Currently, the FPI data rate allocation to the CIDP is 1.5-Mbs(exp -1). Consequently, the FPI-IDPU must employ data/image compression to meet this CIDP telemetry allocation. Here, we present simulations of the CCSDS 122.0-B-1 algorithm-based compression of the FPI-DES electron data. Compression

analysis is based upon a seed of re-processed Cluster/PEACE electron measurements. Topics to be discussed include: review of compression algorithm; data quality; data formatting/organization; and, implications for data/matrix pruning. To conclude a presentation of the base-lined FPI data compression approach is provided.
Author
Spacecraft Instruments; Imaging Spectrometers; Data Acquisition; Data Compression; Telemetry; Algorithms; Sensors; Data Simulation

20090001895 NASA Marshall Space Flight Center, Huntsville, AL, USA
HERO: A Balloon-Borne Focusing Hard X-Ray Telescope
Ramsey, Brian D.; Stahl, H. Philip; July 07, 2008; 1 pp.; In English; ICO-21 2008 Congress 'Optics for the 21st Century' (International Commission for Optics), 7-10 Jul. 2008, Sydney, Australia; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001895
This viewgraph presentation describes the HERO balloon-borne payload configuration, instrument specifications, flight operations, sensitivity analyses, and future flight plans.
Derived from text
Balloon-Borne Instruments; X Ray Telescopes; Payloads; Fabrication; Systems Engineering

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*.

20090001578 Lne-Syrte, Paris, FL France
Recent Results on a Pulsed CPT Clock
Zanon, T; Tremine, S; Guerandel, S; Dahes, F; Clercq, E de; Clairon, A; Dimarcq, N; Aug 2005; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486195; No Copyright; Avail.: Defense Technical Information Center (DTIC)
CPT clocks are very attractive for their miniaturization potentiality. Nevertheless, two main effects limit today their performance: the optical pumping associated with circularly polarized lasers and the line broadening due to saturation effects. We propose to overcome these limitations by the use of orthogonal linear laser polarizations and a pulsed interrogation sequence. The optimization of the time sequence leading to the best characteristics (contrast, linewidth) of the dark resonance is discussed. Very preliminary measurements of the frequency stability demonstrate an interesting performance of 3.5 10(exp -12) tau (exp -1/2).
DTIC
Atomic Clocks; Clocks; Interrogation; Laser Beams; Linear Polarization; Populations; Trapping

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*.

20090000001 Missouri Univ., Rolla, MO USA
Ergonomic Impact of Fastening Operation (Preprint)
Joshi, A; Leu, M; Murray, S; Sep 2008; 12 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865
Report No.(s): AD-A489655; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Fastener installation is a major operation on the assembly shop floor of manufacturing industries. The operator often performs fastening operations at awkward postures depending upon the workplace layout and assembly requirement. These factors combined with the forces involved in the fastening operation put the operator at risk of ergonomics related injuries. In order to design safer workplaces and tools it is necessary to identify the causes of injuries by quantifying the risk factors

involved. To quantify the effect of dynamic force, a single-degree-of-freedom dynamic system model is developed to understand the dynamic characteristics of the hand-arm, which is measured using a fixtured experimental setup. Subjects in the experiments were asked to perform fastening operations at different postures using two types of tools: pistol-grip tools and inline tools. The measured data was used to develop a hand-arm dynamic model, which can predict the angular objective measure to assess the dynamic effect of fastening operation with different tools at different postures.
DTIC
Human Factors Engineering; Fasteners

20090001041 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Analysis of a Distributed System for Lifting Trucks
Groote, J. F.; Pang, J.; Wouters, A. G.; May 2001; 40 pp.; In English
Report No.(s): PB2009-102725; SEN-R0111; Copyright; Avail.: National Technical Information Service (NTIS)
The process-algebraic language muCRL is used to analyse an existing distributed system for lifting trucks. Four errors are found in the original design. We propose solutions for these problems and show by means of model-checking that the modified system meets the requirements.
NTIS
Trucks; Analyzing

20090001192 Air Force Research Lab., Wright-Patterson AFB, OH USA
Feature Extraction for Bearing Prognostics and Health Management
Yan, Weizhong; Qiu, Hai; Iyer, Naresh; May 2008; 13 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A490114; AFRL-RX-WP-TP-2008-43; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Feature extraction in bearing PHM involves extracting characteristic signatures from the original sensor measurements, which are sensitive to bearing conditions and thus most useful in determining bearing faults. The quality of extracted features directly affects the performance and the effectiveness of bearing PHM. Feature extraction is therefore a critical component in bearing PHM. To optimally improve PHM effectiveness and minimize maintenance costs of bearings, a large amount research has been conducted in extracting salient features for PHM, which leads to a considerable number of feature extraction techniques. Our main effort in this paper is to survey some major techniques explored so far, focusing on more recent advancements. Our endeavor also includes pointing out the advantages and disadvantages of each of those techniques. This paper attempts to serve as a general reference for bearing PHM practitioners and as a general guide for choosing proper feature extraction methods for bearing PHM systems.
DTIC
Fault Detection; Health; Maintenance; Pattern Recognition; Surveys

20090001750 Department of Energy, Washington, DC, USA
Energy Tips--Motor: Turn Motors Off When Not in Use. Motor Tip Sheet No. 10
Jul. 2008; 2 pp.; In English
Report No.(s): DE2008-937334; DOE/GO-102008-2616; No Copyright; Avail.: Department of Energy Information Bridge
This is one in a series of tip sheets to help manufacturers optimize their industrial motor and motor-driven systems.
NTIS
Energy Conservation; Motors

20090001758 Oak Ridge National Lab., TN USA; National Renewable Energy Lab., Golden, CO USA; Battelle Memorial Inst., Arlington, VA, USA
Effects of Intermediate Ethanol Blends on Legacy Vehicles and Small Non-Road Engines, Report One
West, H.; Knoll, K.; Clark, W.; Graves, R. L.; Orban, J.; Oct. 01, 2008; 136 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Report No.(s): DE2008-939401; ORNL/TM-2008/117; No Copyright; Avail.: National Technical Information Service (NTIS)
In summer 2007, the U.S. Department of Energy (DOE) initiated a test program to evaluate the potential impacts of intermediate ethanol blends on legacy vehicles and other engines. The purpose of the test program is to assess the viability

of using intermediate blends as a contributor to meeting national goals in the use of renewable fuels. Through a wide range of experimental activities, DOE is evaluating the effects of E15 and E20--gasoline blended with 15 and 20% ethanol--on tailpipe and evaporative emissions, catalyst and engine durability, vehicle driveability, engine operability, and vehicle and engine materials. This first report provides the results available to date from the first stages of a much larger overall test program. Results from additional projects that are currently underway or in the planning stages are not included in this first report. The purpose of this initial study was to quickly investigate the effects of adding up to 20% ethanol to gasoline on the following: (1) Regulated tailpipe emissions for 13 popular late model vehicles on a drive cycle similar to real-world driving and 28 small non-road engines (SNREs) under certification or typical in use procedures. (2) Exhaust and catalyst temperatures of the same vehicles under more severe conditions. (3) Temperature of key engine components of the same SNREs under certification or typical in-use conditions. (4) Observable operational issues with either the vehicles or SNREs during the course of testing. As discussed in the concluding section of this report, a wide range of additional studies are underway or planned to consider the effects of intermediate ethanol blends on materials, emissions, durability, and driveability of vehicles, as well as impacts on a wider range of nonautomotive engines, including marine applications, snowmobiles, and motorcycles.
NTIS
Diesel Engines; Engine Design; Ethyl Alcohol; Exhaust Emission; Mixtures; Roads

39
STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20090001289 NASA Marshall Space Flight Center, Huntsville, AL, USA
Probability of Detection Study on Impact Damage to Honeycomb Composite Structure using Thermographic Inspection
Hodge, Andrew J.; Walker, James L., II; September 08, 2008; 6 pp.; In English; SAMPE 2008 Fall Technical Conference, 8-11 Sep. 2008, Memphis, TN, USA; Original contains color and black and white illustrations; No Copyright; Avail.:
CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001289

A probability of detection study was performed for the detection of impact damage using flash heating infrared thermography on a full scale honeycomb composite structure. The honeycomb structure was an intertank structure from a previous NASA technology demonstration program. The intertank was fabricated from IM7/8552 carbon fiber/epoxy facesheets and aluminum honeycomb core. The intertank was impacted in multiple locations with a range of impact energies utilizing a spherical indenter. In a single blind study, the intertank was inspected with thermography before and after impact damage was incurred. Following thermographic inspection several impact sites were sectioned from the intertank and cross-sectioned for microscopic comparisons of NDE detection and actual damage incurred. The study concluded that thermographic inspection was a good method of detecting delamination damage incurred by impact. The 90/95 confidence level on the probability of detection was close to the impact energy that delaminations were first observed through cross-sectional analysis.
Author
Detection; Impact Damage; Honeycomb Structures; Composite Structures; Thermography

20090001894 Lockheed Martin Space Systems Co., New Orleans, LA, USA
Applications of Computed Tomography to Evaluate Cellular Solid Interfaces
Maisano, Josephine; Marse, Daryl J.; Schilling, Paul J.; July 21, 2008; 29 pp.; In English; ASNT Digital Imaging XI, 21-23 Jul. 2008, Mashantucket, CT, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS8-00016; Copyright; Avail.: CASI: A03, Hardcopy

The major morphological features - foam cells, voids, knit lines, and the bondline interface were evaluated. The features identified by micro-CT correlate well to those observed by SEM. 3D reconstructions yielded volumetric dimensions for large voids (max ~ 30 mm). Internal voids and groupings of smaller cells at the bondline are concluded to be the cause of the indications noted during the NDE prescreening process.
Derived from text
Solid Surfaces; Tomography; Nondestructive Tests; Radiography; Mechanical 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*.

20090000973 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Soil Moisture Memory in AGCM Simulations: Analysis of Global Land-Atmosphere Coupling Experiment (GLACE) Data
Seneviratne, Sonia I.; Koster, Randal D.; Guo, Zhichang; Dirmeyer, Paul A.; Kowalczyk, Eva; Lawrence, David; Liu, Ping; Lu, Cheng-Hsuan; Mocko, David; Oleson, Keith W.; Verseghy, Diana; [2006]; 52 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

Soil moisture memory is a key aspect of land-atmosphere interaction and has major implications for seasonal forecasting. Due to a severe lack of soil moisture observations on most continents, existing analyses of global-scale soil moisture memory have relied previously on Atmospheric General Circulation Models (AGCMs) experiments, with derived conclusions that are probably model-dependent. The present study is the first survey examining and contrasting global-scale (near) monthly soil moisture memory characteristics across a broad range of AGCMs. The investigated simulations, performed with 8 different AGCMs, were generated as part of the Global Land-Atmosphere Coupling Experiment. Overall, the AGCMs present relatively similar global patterns of soil moisture memory. Outliers are generally characterized by anomalous water-holding capacity or biases in radiation forcing. Water-holding capacity is highly variable among the analyzed AGCMs and is the main factor responsible for inter-model differences in soil moisture memory. Therefore, further studies on this topic should focus on the accurate characterization of this parameter for present AGCMs. Despite the range in the AGCMs' behaviour, the average soil moisture memory characteristics of the models appear realistic when compared to available in-situ soil moisture observations. An analysis of the processes controlling soil moisture memory in the AGCMs demonstrate that it is mostly controlled by two effects: evaporation's sensitivity to soil moisture, which increases with decreasing soil moisture content, and runoff's sensitivity to soil moisture, which increases with increasing soil moisture content. Soil moisture memory is highest in regions of medium soil moisture content, where both effects are small.
Author
Atmospheric General Circulation Models; Moisture Content; Simulation; Soil Moisture

20090001072 Coast Guard, Washington, DC USA
Short Range Aids to Navigation Servicing Guide
January 2008; 159 pp.; In English
Report No.(s): PB2009-102794; No Copyright; Avail.: National Technical Information Service (NTIS)

This Manual is a field guide for U.S. Coast Guard personnel who service minor aids to navigation hardware powered by direct current (DC). This guide provides servicing personnel the information needed to install, maintain and troubleshoot 12-volt minor aids to navigation.
NTIS
Coasts; Marine Transportation; Navigation Aids; Shoran

20090001223 NASA Johnson Space Center, Houston, TX, USA
Experimental Constraints on the Partitioning and Valence of V and Cr in Garnet and Coexisting Glass
Righter, K.; Sutton, S.; Berthet, S.; Newville, M.; December 15, 2008; 1 pp.; In English; American Geophysical Union, 15 - 19 Dec. 2008, California, USA; Copyright; Avail.: Other Sources; Abstract Only

A series of experiments with garnet and coexisting melt have been carried out across a range of oxygen fugacities (near hematite-magnetite (HM) to below the iron-wustite (IW) buffers) at 1.7 GPa to study the partitioning and valence of Cr and V in both phases. Experiments were carried out in a non end loaded piston cylinder apparatus, and the run products were analyzed with electron microprobe and xray absorption near edge structure (XANES) analysis at beamline 13-ID at the Advanced Photon Source of Argonne National Lab. The valence of vanadium and chromium were determined using the position and intensity of the Ka pre-edge peaks, calibrated on a series of Cr and Vbearing standard glasses. This technique has been applied to V and Cr in glasses and V in spinels previously, and in these isotropic phases there are no orientational effects on the XANES spectra (Righter et al., 2006, Amer. Mineral. 91, 1643-1656). We also now demonstrate this to be true for V and Cr in garnet. Also, previous work has shown that V has a higher valence in the glass (or melt) than in the coexisting spinel. This is also true for V in garnet-glass pairs in this study. Vanadium valence in garnets varies from 2.7 below the IW buffer to 3.7 near HM, and for coexisting glass it varies from 3.2 to 4.3. Vanadium valence measured in some natural garnets

from mantle localities indicates V in the more reduced range at 2.5. Comparisons will be made between fO2 estimated from V valence and other methods for garnet-bearing mantle samples. In contrast, Cr valence measured in garnet and coexisting glass for all experimental and natural samples is 2.9- 3.0, suggesting that the valence of Cr does not vary within either phase across a large fO2 range. These results demonstrate that while V varies from 2+ to 3+ to 4+ in garnet-melt systems, Cr does not, and this will ultimately affect the partitioning behavior of these two elements in natural systems. Garnet/melt D(Cr) are between 12 and 17 across this range of fO2, whereas D(V) has the highest partition coefficient approx.3, near the IW buffer where the valence of V is almost entirely 3+.
Author
Hematite; Magnetite; Garnets; Vanadium; Chromium; Glass; Minerals

20090001292 NASA Langley Research Center, Hampton, VA, USA
Optimizing Societal Benefit using a Systems Engineering Approach for Implementation of the GEOSS Space Segment
Killough, Brian D., Jr.; Sandford, Stephen P.; Cecil, L DeWayne; Stover, Shelley; Keith, Kim; November 17, 2008; 9 pp.; In English; SPIE Asia Pacific Remote Sensing 2008, 17-21 Nov. 2008, Noumea, New Caledonia; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 144598.01.02.03
Report No.(s): 7151-1; Copyright; Avail.: CASI: A02, Hardcopy

The Group on Earth Observations (GEO) is driving a paradigm shift in the Earth Observation community, refocusing Earth observing systems on GEO Societal Benefit Areas (SBA). Over the short history of space-based Earth observing systems most decisions have been made based on improving our scientific understanding of the Earth with the implicit assumption that this would serve society well in the long run. The space agencies responsible for developing the satellites used for global Earth observations are typically science driven. The innovation of GEO is the call for investments by space agencies to be driven by global societal needs. This paper presents the preliminary findings of an analysis focused on the observational requirements of the GEO Energy SBA. The analysis was performed by the Committee on Earth Observation Satellites (CEOS) Systems Engineering Office (SEO) which is responsible for facilitating the development of implementation plans that have the maximum potential for success while optimizing the benefit to society. The analysis utilizes a new taxonomy for organizing requirements, assesses the current gaps in spacebased measurements and missions, assesses the impact of the current and planned space-based missions, and presents a set of recommendations.
Author
Systems Engineering; Geophysics; Climatology; Satellite Imagery; Earth Observations (From Space)

20090001331 Remote Sensing Systems, Inc., Santa Rosa, CA, USA
Polarization Rotation and the Third Stokes Parameter: The Effects of Spacecraft Attitude and Faraday Rotation
Meissner, Thomas; Wentz, Frank J.; IEEE Transactions on Geoscience and Remote Sensing; March 2006; Volume 44, No. 3, pp. 506 - 515; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNH06CC29C; Copyright; Avail.: Other Sources
ONLINE: 10.1109/TGRS.2005.858413

The third Stokes parameter of ocean surface brightness temperatures measured by the WindSat instrument is sensitive to the rotation angle between the polarization vectors at the ocean surface and the instrument. This rotation angle depends on the spacecraft attitude (roll, pitch, yaw) as well as the Faraday rotation of the electromagnetic radiation passing through the Earth's ionosphere. Analyzing the WindSat antenna temperatures, we find biases in the third Stokes parameter as function of the along-scan position of up to 1.5 K in all feedhorns. This points to a misspecification of the reported spacecraft attitude. A single attitude correction of -0.16deg roll and 0.18deg pitch for the whole instrument eliminates all the biases. We also study the effect of Faraday rotation at 10.7 GHz on the accuracy of the third Stokes parameter and the sea surface wind direction retrieval and demonstrate how this error can be corrected using values from the International Reference Ionosphere for the total electron content when computing Faraday rotation.
Author
Sea Surface Temperature; Brightness Temperature; Wind Direction; Rotation; Polarization; Roll; Yaw; Pitch; Faraday Effect

20090001332 Remote Sensing Systems, Inc., Santa Rosa, CA, USA

Geolocation and Pointing Accuracy Analysis for the WindSat Sensor

Meissner, Thomas; Wentz, Frank J.; Purdy, William E.; Gaiser, Peter W.; Poe, Gene; Uliana, Enzo A.; IEEE Transactions on Geoscience and Remote Sensing; March 2006; Volume 44, No. 3, pp. 496 - 505; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNH06CC29C; Copyright; Avail.: Other Sources

Geolocation and pointing accuracy analyses of the WindSat flight data are presented. The two topics were intertwined in the flight data analysis and will be addressed together. WindSat has no unusual geolocation requirements relative to other sensors, but its beam pointing knowledge accuracy is especially critical to support accurate polarimetric radiometry. Pointing accuracy was improved and verified using geolocation analysis in conjunction with scan bias analysis. nvo methods were needed to properly identify and differentiate between data time tagging and pointing knowledge errors. Matchups comparing coastlines indicated in imagery data with their known geographic locations were used to identify geolocation errors. These coastline matchups showed possible pointing errors with ambiguities as to the true source of the errors. Scan bias analysis of U, the third Stokes parameter, and of vertical and horizontal polarizations provided measurement of pointing offsets resolving ambiguities in the coastline matchup analysis. Several geolocation and pointing bias sources were incfementally eliminated resulting in pointing knowledge and geolocation accuracy that met all design requirements.

Author

Position (Location); Polarimetry; Beams (Radiation); Accuracy; Resolution

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*.

20090001427 Massachusetts Inst. of Tech., Cambridge, MA USA

The Dynamics of Oceanic Transform Faults: Constraints from Geophysical, Geochemical and Geodynamical Modeling

Gregg, Patricia M; Jun 2008; 135 pp.; In English; Original contains color illustrations

Report No.(s): AD-A485905; MIT/WHOI-2008-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485905

Segmentation and crustal accretion at oceanic transform fault systems are investigated through a combination of geophysical data analysis and geodynamical and geochemical modeling. In Chapter 1, results of thermal modeling suggest that fault segmentation by intra-transform spreading centers (ITSC) drastically reduces the available brittle area of a transform fault and thus limits the available earthquake rupture area. Coulomb stress models illustrate that long ITSCs will prohibit static stress interaction between segments of a transform system and further limit the maximum possible magnitude of a given transform fault earthquake. In Chapter 2, residual mantle Bouguer gravity anomalies are investigated from a global set of oceanic transform fault systems. Negative anomalies are found within fast-slipping transform fault domains suggesting a mass deficit in these sellings, which may be due to crustal thickness excesses in these locations. Finally, in Chapter 3, mantle thermal models for a viscoplastic rheology are developed to investigate the process of mantle melting and crustal accretion at ITSCs within segmented transform faults, and applied to the Siqueiros transform fault. Models in which melt migrates into the transform fault domain from a large region of the mantle best explain the gravity-derived crustal thickness variations observed at the Siqueiros transform.

DTIC

Geochemistry; Geodynamics; Geophysics

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*.

20090000975 NASA Johnson Space Center, Houston, TX, USA
NASA Johnson Space Center's Energy and Sustainability Efforts
Ewert, Michael K.; September 2008; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 439906; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090000975

This viewgraph presentation reviews the efforts that NASA is making to assure a sustainable environment and energy savings at the Johnson Space Center. Sustainability is defined as development that meets the needs of present generations without compromising the ability of future generations to meet their own needs. The new technologies that are required for sustainable closed loop life support for space exploration have uses on the ground to reduce energy, greenhouse gas emissions, and water use. Some of these uses are reviewed.
CASI
Energy Conservation; Exhaust Emission; Habitability; Environments; Energy Policy; Technology Utilization; NASA Programs

20090001120 Augustine Band of Cahuilla Indians, Coachella, CA, USA
Augustine Band of Cahuilla Indians Energy Conservation and Options Analysis - Final Report
Turne, P.; Jul. 11, 2008; 116 pp.; In English
Contract(s)/Grant(s): DE-FG36-06GO16018
Report No.(s): DE2008-934737; DOE/GO/16018; No Copyright; Avail.: National Technical Information Service (NTIS)

The Augustine Band of Cahuilla Indians was awarded a grant through the Department of Energy First Steps program in June of 2006. The primary purpose of the grant was to enable the Tribe to develop energy conservation policies and a strategy for alternative energy resource development. All of the work contemplated by the grant agreement has been completed and the Tribe has begun implementing the resource development strategy through the construction of a 1.0 MW grid-connected photovoltaic system designed to offset a portion of the energy demand generated by current and projected land uses on the Tribe's Reservation. Implementation of proposed energy conservation policies will proceed more deliberately as the Tribe acquires economic development experience sufficient to evaluate more systematically the interrelationships between conservation and its economic development goals.
NTIS
Energy Conservation; Photovoltaic Conversion; Energy Consumption

20090001136 National Renewable Energy Lab., Golden, CO USA; Delaware Univ., Newark, DE, USA
Development of a Wide Bandgap Cell for Thin Film Tandem Solar Cells. Final Technical Report 6 November 2003 - 5 January 2007
Shafarman, W.; McCandless, B.; Aug. 2008; 40 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2008-937358; NREL/SR-520-42388; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this research program was to develop approaches for a transparent wide-bandgap cell to be used in a thin-film tandem polycrystalline solar cell that can ultimately attain 25% efficiency. Specific goals included the research and development of Cu(InGa)(SeS)2 and Cd1-xZnxTe alloys with a bandgap from 1.5 to 1.8 eV, demonstrating the potential of a 15% cell efficiency with a transparent contact, and supporting the High Performance PV Program. This Final Report presents results that emphasize the 3rd phase of the program.
NTIS
Cadmium; Cadmium Tellurides; Energy Gaps (Solid State); Solar Cells; Thin Films; Zinc

20090001396 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Fire for Effect: Calling for a More Potent Energy System
Jeckell, Jonathan E; May 22, 2008; 114 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485807; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485807

The USA and its allies depend heavily on energy for their way of life and key capabilities in warfare. The current energy system has served us well for nearly 100 years, but is now shifting out of our favor and is creating strategic liabilities and tactical vulnerabilities. Our leaders are becoming increasingly concerned about these issues, but most of the attention is focused on alternative sources for the civilian economy. Some of these alternatives may not be suitable for expeditionary military forces deployed in distant theaters of war. This inquiry employed a confluence of technical and logistical analysis with an assessment of the strategic and political environment. This study not only examines what is technically and physically possible, but examines the way the energy is used, where it comes from, how the military distributes it, and how that impacts the range of desirable choices. These conditions create an opportunity for the military to fundamentally change the way it uses energy and make comprehensive changes to the way we sustain deployed forces. Rather than merely introducing an adequate substitute for oil, or using less of it, we should transcend our current energy system and unshackle our forces from the lethargic, vulnerable logistics infrastructure. Renewable power generation systems could immediately alleviate the largest single fuel burden for deployed ground forces, particularly remote outposts. Meanwhile mobile, tactical nuclear power generation could provide for all other ground energy needs, such as electrically powered or hybrid ground vehicles. This would eliminate bulk fuel requirements for ground systems, while water recycling and use of local resources would alleviate bulk liquid distribution requirements. This would reduce or eliminate our reliance on predictable lines of communication associated with delivering fuel to the last mile, facilitate greater resilience, operational flexibility, agility, innovation and save lives.
DTIC
Fires; Supplying

20090001754 National Renewable Energy Lab., Golden, CO USA
Solar Energy Technologies Program: Concentrating Solar Power
Sep. 01, 2008; 2 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2008-939307; DOE/GO-102008-2649; No Copyright; Avail.: Department of Energy Information Bridge

Summarizes the goals and activities of the DOE Solar Energy Technologies Program efforts within its concentrating solar power subprogram.
NTIS
Energy Technology; Solar Energy

20090001755 National Renewable Energy Lab., Golden, CO USA
Solar Energy Technologies Program: Photovoltaics, (DE2008-939305)
Sep. 01, 2008; 2 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2008-939305; DOE/GO-102008-2648; No Copyright; Avail.: National Technical Information Service (NTIS)

Summarizes the goals and activities of the DOE Solar Energy Technologies Program efforts within its photovoltaics subprogram.
NTIS
Energy Technology; Photovoltaic Conversion; Solar Energy

45
ENVIRONMENT POLLUTION

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

20090001053 Forest Service, Juneau, AK, USA
Air Quality Monitoring on the Tongass National Forest: Methods and Baselines Using Lichens
Geiser, L. H.; Derr, C. C.; Dillman, K. L.; Sep. 1994; 101 pp.; In English
Report No.(s): PB2009-102765; USFS-R10-TB-46; No Copyright; Avail.: CASI: A06, Hardcopy

An air quality biomonitoring program for the Tongass National Forest was initiated to (1) establish baseline conditions,

(2) develop sensitive, easily repeatable methods for continued monitoring, and (3) provide methods and information to help Forest Supervisors meet Forest Service responsibilities described by the Forest Service Air Resource Handbook and the Clean Air Act. Baseline conditions were described through (1) element analysis of 366 samples of four lichens common to the forests and muskegs of the Tongass National Forest ('Alectoria sarmentosa, Cladina rangiferina, Hypogymnia enteromorpha, and Lobaria oregana'), (2) a forest-wide inventory of the macrolichens and their habitat characteristics at 176 temporary and permanent standardized sites evenly distributed in clusters over the Tongass and more than 45 additional collecting areas, and (3) a quantitative community analysis of branch lichen abundance in two common old growth forested habitats: shorepine ('Pinus contorta'), and western hemlock ('Tsuga heterophylla').
NTIS
Air Quality; Forests; Lichens

20090001054 National Energy Technology Lab., Pittsburgh, PA USA
Carbon Dioxide Selective Supported Ionic Liquid Membranes: The Effect of Contaminants
Luebke, D. E.; Ilconich, J. E.; Myers, C. E.; Pennline, H. W.; Apr. 01, 2008; 6 pp.; In English
Report No.(s): DE2008-938455; DOE/NETL-IR-2008-115; NETL-TPR-1978; No Copyright; Avail.: Department of Energy Information Bridge

The integrated gasification combined cycle (IGCC) is widely viewed as a promising technology for the large scale production of energy in a carbon constrained world. These cycles, which include gasification, contaminant removal, water-gas shift, CO2 capture and compression, and combustion of the reduced-carbon fuel gas in a turbine, often have significant efficiency advantages over conventional combustion technologies. A CO2 selective membrane capable of maintaining performance at conditions approaching those of low temperature water-gas shift (260C) could facilitate the production of carbon-neutral energy by simultaneously driving the shift reaction to completion and concentrating CO2 for sequestration. Supported ionic liquid membranes (SILMs) have been previously evaluated for this application and determined to be physically and chemically stable to temperatures in excess of 300oC. These membranes were based on ionic liquids which interacted physically with CO2 and diminished considerably in selectivity at higher temperatures. To alleviate this problem, the original ionic liquids were replaced with ionic liquids able to form chemical complexes with CO2. These complexing ionic liquid membranes have a local maximum in selectivity which is observed at increasing temperatures for more stable complexes. Efforts are currently underway to develop ionic liquids with selectivity maxima at temperatures greater than 75C, the best result to date, but other practical concerns must also be addressed if the membrane is to be realistically expected to function under water-gas shift conditions. A CO2 selective membrane must function not only at high temperature, but also in the presence of all the reactants and contaminants likely to be present in coal-derived fuel gas, including water, CO, and H2S. A study has been undertaken which examines the effects of each of these gases on both complexing and physically interacting supported liquid membranes. In a joint project, researchers at the University of Notre Dame synthesized and characterized ionic liquids, and researchers at the National Energy Technology Laboratory incorporated candidate ionic liquids into supports and evaluated the resulting materials for membrane performance.
NTIS
Carbon Dioxide; Contaminants; Liquids; Membranes

20090001070 Noblis, Inc., Falls Church, VA, USA
Increasing Security and Reducing Carbon Emissions of the U.S. Transportation Sector: A Transformational Role for Coal with Biomass
Gray, D.; White, C.; Tomlinson, G.; Aug. 24, 2007; 84 pp.; In English
Contract(s)/Grant(s): DOD/AF-NBCH-D-02-0039/0051
Report No.(s): PB2009-102800; No Copyright; Avail.: National Technical Information Service (NTIS)

The Air Force has set a goal to supply fifty percent of its CONUS (lower 48 USA) fuel requirements from domestic synthetic sources by 2016. One option for doing this is the production of liquid fuels from coal via gasification and Fischer-Tropsch (FT) synthesis, a process known as coal-to-liquids (CTL). In addition, the Department of Defense (DoD) will require that providers of synthetic fuel practice carbon dioxide (CO2) emissions capture, sequestration or reuse/reform. Although CTL, when coupled with carbon capture and sequestration during fuel production, can limit CO2 emissions to a level approximately equivalent (+4% to -5%) to that of the existing petroleum-based fuel supply chain, the DoD wishes to explore options that will further improve its environmental performance by reducing the carbon footprint of the plant to be below that of a conventional petroleum refinery. The coconversion of coal and biomass to liquid fuels (CBTL) has been recently proposed

as a possible option to accomplish this. The option to use various process (including algae) for reuse/reform of CO2 emissions with CTL/CBTL process has been proposed, but is not in the scope of this report.
NTIS
Biomass; Carbon; Coal; Security; Transportation

20090001078 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
China's Top-1000 Energy-Consuming Enterprises Program:Reducing Energy Consumption of the 1000 Largest Industrial Enterprises in China
Price, D.; Wang, X.; Yun, J.; Jun. 02, 2008; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-935322; LBNL-519E; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2005, the Chinese government announced an ambitious goal of reducing energy consumption per unit of GDP by 20% between 2005 and 2010. One of the key initiatives for realizing this goal is the Top-1000 Energy-Consuming Enterprises program. The energy consumption of these 1000 enterprises accounted for 33% of national and 47% of industrial energy usage in 2004. Under the Top-1000 program, 2010 energy consumption targets were determined for each enterprise. The objective of this paper is to evaluate the program design and initial results, given limited information and data, in order to understand the possible implications of its success in terms of energy and carbon dioxide emissions reductions and to recommend future program modifications based on international experience with similar target-setting agreement programs. Even though the Top-1000 Program was designed and implemented rapidly, it appears that--depending upon the GDP growth rate--it could contribute to somewhere between approximately 10% and 25% of the savings required to support China's efforts to meet a 20% reduction in energy use per unit of GDP by 2010.
NTIS
China; Commerce; Energy Consumption

20090001079 National Security Technologies, LLC, Las Vegas, NV, USA
Monitoring/Verification using DMS: TATP Example
Weeks, S.; Kyle, K.; Manard, M.; May 30, 2008; 5 pp.; In English
Contract(s)/Grant(s): DE-AC52-06NA25946
Report No.(s): DE2008-935266; DOE/NV/25946--403; No Copyright; Avail.: National Technical Information Service (NTIS)

Field-rugged and field-programmable differential mobility spectrometry (DMS) networks provide highly selective, universal monitoring of vapors and aerosols at detectable levels from persons or areas involved with illicit chemical/biological/explosives (CBE) production. CBE sensor motes used in conjunction with automated fast gas chromatography with DMS detection (GC/DMS) verification instrumentation integrated into situational operations-management systems can be readily deployed and optimized for changing application scenarios. The feasibility of developing selective DMS motes for a smart dust sampling approach with guided, highly selective, fast GC/DMS verification analysis is a compelling approach to minimize or prevent the illegal use of explosives or chemical and biological materials. DMS is currently one of the foremost emerging technologies for field separation and detection of gas-phase chemical species. This is due to trace-level detection limits, high selectivity, and small size. Fast GC is the leading field analytical method for gas phase separation of chemical species in complex mixtures.
NTIS
Aerosols; Gas Chromatography; Mobility; Vapors

20090001080 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Biologically Enhanced Carbon Sequestration: Research Needs and Opportunities
Oldenburg, C. M.; Tom, M. S.; May 21, 2008; 40 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-935342; LBNL-713E; No Copyright; Avail.: National Technical Information Service (NTIS)

Fossil fuel combustion, deforestation, and biomass burning are the dominant contributors to increasing atmospheric carbon dioxide (CO(sub 2)) concentrations and global warming. Many approaches to mitigating CO(sub 2) emissions are being pursued, and among the most promising are terrestrial and geologic carbon sequestration. Recent advances in ecology and microbial biology offer promising new possibilities for enhancing terrestrial and geologic carbon sequestration. A workshop was held October 29, 2007, at Lawrence Berkeley National Laboratory (LBNL) on Biologically Enhanced Carbon

Sequestration (BECS). The workshop participants (approximately 30 scientists from California, Illinois, Oregon, Montana, and New Mexico) developed a prioritized list of research needed to make progress in the development of biological enhancements to improve terrestrial and geologic carbon sequestration. The workshop participants also identified a number of areas of supporting science that are critical to making progress in the fundamental research areas. The purpose of this position paper is to summarize and elaborate upon the findings of the workshop. The paper considers terrestrial and geologic carbon sequestration separately.
NTIS
Biomass; Carbon; Carbon Dioxide

20090001081 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Technologies and Policies to Improve Energy Efficiency in Industry
Price, L.; Mar. 01, 2008; 16 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-935352; LBNL-710E; No Copyright; Avail.: National Technical Information Service (NTIS)

The industrial sector consumes nearly 40% of annual global primary energy use and is responsible for a similar share of global energy-related carbon dioxide (CO2) emissions. Many studies and actual experience indicate that there is considerable potential to reduce the amount of energy used to manufacture most commodities, concurrently reducing CO2 emissions. With the support of strong policies and programs, energy-efficient technologies and measures can be implemented that will reduce global CO2 emissions. A number of countries, including the Netherlands, the UK, and China, have experience implementing aggressive programs to improve energy efficiency and reduce related CO2 emissions from industry. Even so, there is no silver bullet and all options must be pursued if greenhouse gas emissions are to be constrained to the level required to avoid significant negative impacts from global climate change.
NTIS
Energy Conservation; Energy Consumption; Industries; Policies; Technology Assessment

20090001082 National Security Technologies, LLC, Las Vegas, NV, USA
Nevada Test Site Waste Acceptance Criteria (NTSWAC)
Jun. 01, 2008; 136 pp.; In English
Contract(s)/Grant(s): DE-AC52-06NA25946
Report No.(s): DE2008-935360; DOE/NV--325-REV. 7; No Copyright; Avail.: National Technical Information Service (NTIS)

This document establishes the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office, Nevada Test Site Waste Acceptance Criteria (NTSWAC). The NTSWAC provides the requirements, terms, and conditions under which the Nevada Test Site will accept low-level radioactive (LLW) and LLW Mixed Waste (MW) for disposal.
NTIS
Acceptability; Radioactive Wastes; Radiology; Waste Disposal; Waste Management

20090001084 Fluor Daniel Hanford, Inc., Richland, WA, USA
National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart H Radionuclides Potential to Emit Calculations
Earley, J. N.; Jul. 23, 2008; 79 pp.; In English
Contract(s)/Grant(s): DE-AC06-96RL13200
Report No.(s): DE2008-935396; HNF-1974 REV 2; No Copyright; Avail.: Department of Energy Information Bridge

This document provides an update of the status of stacks on the Hanford Site and the potential radionuclide emissions, i.e., emissions that could occur with no control devices in place. This review shows the calculations that determined whether the total effective dose equivalent (TEDE) received by the maximum public receptor as a result of potential emissions from any one of these stacks would exceed 0.1 millirem/year. Such stacks require continuous monitoring of the effluent, or other monitoring, to meet the requirements of Washington Administrative code (WAC) 246-247-035(1)(a)(2) and WAC 246-247-075(1), -(2), and -(6). This revised update reviews the potential-to-emit (PTE) calculations of 31 stacks for Fluor Hanford, Inc. Of those 31 stacks, 11 have the potential to cause a TEDE greater than 0.1 mrem/year.
NTIS
Effluents; Exhaust Emission; Exhaust Gases; Pollution Control; Radioactive Isotopes; Radioactivity; Standards

20090001086 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Interim Report: VOC and Aldehyde Emissions in Four FEMA Temporary Housing Units
Maddalena, R. L.; Russell, M.; Sullivan, D. P.; Apte, M. G.; May 04, 2008; 52 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-935403; No Copyright; Avail.: Department of Energy Information Bridge

Four unoccupied FEMA temporary housing units (THUs) were studied to assess their indoor emissions of volatile organic compounds including formaldehyde. Measurement of whole-THU VOC and aldehyde emission factors (mu g h-1 per m2 of floor area) for each of the four THUs were made at FEMA's Purvis MS staging yard using a mass balance approach. Measurements were made in the morning, and again in the afternoon in each THU. Steady-state indoor formaldehyde concentrations ranged from 378 mu g m-3 (0.31ppm) to 632 mu g m-3 (0.52 ppm) in the AM, and from 433 mu g m-3 (0.35 ppm) to 926 mu g m-3 (0.78 ppm) in the PM. THU air exchange rates ranged from 0.15 h-1 to 0.39 h-1. A total of 45 small (approximately 0.025 m2) samples of surface material, 16 types, were collected directly from the four THUs and shipped to Lawrence Berkeley Laboratory. The material samples were analyzed for VOC and aldehyde emissions in small stainless steel chambers using a standard, accurate mass balance method. Quantification of VOCs was done via gas chromatography -- mass spectrometry and low molecular weight aldehydes via high performance liquid chromatography. Material specific emission factors (mu g h-1 per m2 of material) were quantified. Approximately 80 unique VOCs were tentatively identified in the THU field samples, of which forty-five were quantified either because of their toxicological significance or because their concentrations were high. Whole-trailer and material specific emission factors were calculated for 33 compounds. The THU emission factors and those from their component materials were compared against those measured from other types of housing and the materials used in their construction. Whole THU emission factors for most VOCs were typically similar to those from comparative housing. The three exceptions were exceptionally large emissions of formaldehyde and TMPD-DIB (a common plasticizer in vinyl products), and somewhat elevated for phenol. Of these three compounds, formaldehyde was the only one with toxicological significance at the observed concentrations. Whole THU formaldehyde emissions ranged from 173 to 266 mu g m-2 h 1 in the morning and 257 to 347 mu g m-2 h-1 in the afternoon. Median formaldehyde emissions in previously studied site-built and manufactured homes were 31 and 45 mu g m-2 h-1, respectively. Only one of the composite wood materials that was tested appeared to exceed the HUD formaldehyde emission standard (430 mu g/m2 h-1 for particleboard and 130 mu g/m2 h-1 for plywood). The high loading factor (material surface area divided by THU volume) of composite wood products in the THUs and the low fresh air exchange relative to the material surface area may be responsible for the excessive concentrations observed for some of the VOCs and formaldehyde.

NTIS
Aldehydes; Construction; Formaldehyde; Volatile Organic Compounds

20090001114 Idaho National Lab., Idaho Falls, ID, USA
Planning, Preparation, and Transport of the High-Enriched Uranium Spent Nuclear Fuel From the Czech Republic to the Russian Federation. 15th International Symposium on the Packaging and Transportation of Radioacitve Materials (PATRAM 2007)
Tyacke, M.; Bolshinsky, I.; Svitak, F.; Oct. 2007; 9 pp.; In English
Report No.(s): DE2008-918704; INL/CON-07-13380; No Copyright; Avail.: Department of Energy Information Bridge

The USA, Russian Federation, and the International Atomic Energy Agency have been working together on a program called the Russian Research Reactor Fuel Return (RRRFR) Program, which is part of the Global Threat Reduction Initiative. The purpose of this program is to return Soviet or Russian-supplied high-enriched uranium (HEU) fuel, currently stored at Russian-designed research reactors throughout the world, to Russia. In February 2003, the RRRFR Program began discussions with the Nuclear Research Institute (NRI) in Re, Czech Republic, about returning their HEU spent nuclear fuel to the Russian Federation for reprocessing. In March 2005, the U.S. Department of Energy signed a contract with NRI to perform all activities needed for transporting their HEU spent nuclear fuel to Russia. After 2 years of intense planning, preparations, and coordination at NRI and with three other countries, numerous organizations and agencies, and a Russian facility, this shipment is scheduled for completion before the end of 2007. This paper will provide a summary of activities completed for making this international shipment. This paper contains an introduction and background of the RRRFR Program and the NRI shipment project. It summarizes activities completed in preparation for the shipment, including facility preparations at NRI in Re and FSUE Mayak in Ozyorsk, Russia; a new transportation cask system; regulatory approvals; transportation planning and

preparation in the Czech Republic, Slovakia, Ukraine, and the Russian Federation though completion of the Unified Project and Special Ecological Programs.
NTIS
Barrels (Containers); Czech Republic; Nuclear Fuels; Packaging; Radioactive Wastes; Russian Federation; Spent Fuels; Transportation; Uranium; Waste Management

20090001133 National Renewable Energy Lab., Golden, CO USA
Field Test of Room-to-Room Distribution of Outside Air with Two Residential Ventilation Systems
Hendron, R.; Anderson, R.; Barley, D.; Rudd, A.; Townsend, A.; Aug. 01, 2008; 23 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2008-937005; NREL/CP-550-41210; No Copyright; Avail.: National Technical Information Service (NTIS)

Uniform distribution of outside air is one way to ensure that residential dilution ventilation systems will provide a known amount of fresh air to all rooms.
NTIS
Air Flow; Buildings; Field Tests; Ventilation

20090001139 National Energy Technology Lab., Morgantown, WV, USA
Post-Combustion and Pre-Combustion CO(sub 2) Capture Solid Sorbents
Sirwardane, R. V.; Stevens, R. W.; Robinsons, C.; January 2008; 5 pp.; In English
Report No.(s): DE2008-937511; DOE/NETL-IR-2008-044; No Copyright; Avail.: National Technical Information Service (NTIS)

Combustion of fossil fuels is one of the major sources of the greenhouse gas CO2. Pressure swing adsorption/sorption (PSA/PSS) and temperature swing adsorption/sorption (TSA/TSS) are some of the potential techniques that could be utilized for removal of CO2 from fuel gas streams. It is very important to develop sorbents to remove CO2 from fuel gas streams that are applicable for a wide range of temperatures. NETL researchers have developed novel CO2 capture sorbents for low, moderate, and high temperature applications. A novel liquid impregnated solid sorbent was developed for CO2 removal in the temperature range of ambient to 60C. The sorbent is regenerable at 60-80C. The sorbent formulations were prepared to be suitable for various reactor configurations (i.e., fixed and fluidized bed). Minimum fluidization gas velocities were also determined. Multi-cycle tests conducted in an atmospheric bench scale reactor with simulated flue gas indicated that the sorbent retains its CO2 sorption capacity with a CO2 removal efficiency of approximately 99% and was unaffected by presence of water vapor. The sorbent was subsequently commercially prepared by S/d Chemie to determine the viability of the sorbent for mass production. Subsequent testing showed that the commercially-synthesized sorbent possesses the same properties as the lab-synthesized equivalent. An innovative solid sorbent containing mixture of alkali earth and alkali compounds was developed for CO2 removal at 200-315C from high pressure gas streams suitable for IGCC systems. The sorbent showed very high capacity for CO2 removal from a gas streams containing 28% CO2 at 200C and at 20 atm during a lab scale reactor test. This sorbent can be regenerated at 20 atm and at 375C utilizing a gas stream containing steam. High pressure enhanced the CO2 sorption process. Bench scale testing showed consistent capacities and regenerability. A unique high temperature solid sorbent was developed for CO2 capture at temperatures of 500-700C. Bench scale testing of the sorbent yielded very high CO2 capture capacity from a gas stream containing 10% CO2, 30% H2, 15% H2O, and 25% He. Regeneration of the sorbent is possible at 800-900C.
NTIS
Air Pollution; Carbon Dioxide; Combustion; Pollution Control; Sorbents

20090001414 George Washington Univ., Washington, DC USA
Department of Defense Environmental Policy in Afghanistan During Operation Enduring Freedom
Loertscher, Steven G; Aug 31, 2008; 93 pp.; In English
Report No.(s): AD-A485860; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485860

Since the September 11, 2001 terror attacks on the Pentagon and the World Trade Center, the USA has conducted military operations in Afghanistan, a nation whose environment has been ravaged by decades of conflict and governmental instability. Afghanistan's fragile environment justifies scrutiny of the policies developed by the U.S. Department of Defense (DoD) for its Afghan operations, especially in light of DoD's lackluster environmental record during the Cold War. This thesis examines

the general inapplicability of domestic U.S. environmental law to DoD's overseas contingency operations, the discretion afforded DoD in developing environmental policies for such operations, the contours of the policies that have been developed for operations in Afghanistan, and the potential impact of Afghanistan's 2007 Environmental Law. The thesis finds that DoD's Afghan environmental policies are protective of the environment, and that DoD will eventually have to take Afghan law into account when managing environmental matters in Afghanistan.
DTIC
Afghanistan; Defense Program; Environment Management; Environment Protection; Law (Jurisprudence)

20090001554 National Academy of Sciences - National Research Council, Washington, DC, USA
Combined Exposures to Hydrogen Cyanide and Carbon Monoxide in Army Operations: Final Report
January 2008; 50 pp.; In English
Report No.(s): PB2009-103592; No Copyright; Avail.: CASI: A03, Hardcopy

Military personnel in weaponized armored vehicles are exposed to combustion by-products generated from propellants used to fire the vehicles guns. Personnel may also be exposed concurrently to other substances, such as diesel exhaust, present in the vehicle compartment, despite the use of mechanical ventilation. In response, the U.S. Army assessed possible additive or synergistic toxic effects from potentially harmful substances. Specific attention was given to the combined effects of simultaneous lowlevel exposures to carbon monoxide (CO) and hydrogen cyanide (HCN), because both gases produce similar adverse effects. Weapons emissions evaluated by the Health Hazard Assessment (HHA) Program of the Armys Center for Health Promotion and Preventive Medicine (CHPPM) include CO, HCN, and other gases. These chemicals are typically evaluated on an individual basis against medical criteria, which may include military-specific standards. However, additive or synergistic toxic effects among the chemicals were also considered. Because it found an increased potential for adverse effects on personnel simultaneously exposed to HCN and CO, CHPPM prepared a report titled Assessment of Combined Health Effects of Hydrogen Cyanide and Carbon Monoxide at Low Levels for Military Occupational Exposures. The report provides guidance to assess combined exposures in HHAs of military systems. The Army found that the weight of available evidence indicates that the adverse effects of CO and HCN at lethal and incapacitating concentrations inhaled over periods of about 30 minutes or less are additive. However, for exposures occurring at lower and varying concentrations over periods of several weeks to perhaps several years, it is not known whether military personnel, while also in the presence of other combustion gases, may experience similar additive effects. No relevant chronic or low-level exposure studies were found in the literature. In 1981, a military standard established the Armys carboxyhemoglobin (COHb) limits of 5% for aviation crew members to protect against adverse visual effects and 10% for all other military personnel. The Army uses the Coburn-Forster-Kane (CFK) equation to estimate the percentage of COHb in the blood of military personnel in armored vehicles based on measurements of CO in the air inside of the vehicles. The exposure criterion for HCN is the current American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) ceiling of 4.7 parts per million (ppm) on the basis of anoxia, central-nervous-system irritation, and lung and thyroid effects.
NTIS
Carbon Monoxide; Cyanides; Exposure; Hydrogen; Toxic Hazards; Toxicity

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GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20090001190 California Univ., Santa Cruz, CA USA
Near Source Energy Partitioning for Regional Waves in 2D and 3D Models
Xie, Xiao-Bi; Lay, Thome; Wu, Ru-Shan; Apr 30, 2008; 62 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-05-C-0021; Proj-1010
Report No.(s): AD-A490131; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The complex excitation and energy partitioning mechanisms yielding regional phases are difficult to empirically separate by data analysis. Thus, numerical modeling approaches are valuable for investigating excitation and propagation of regional seismic phases. We use accurate full-wave simulations (2D and 3D finite-difference method, and 2D boundary element method) to calculate seismic wave excitation and propagation in near-source region. An embedded array slowness analysis is used for quantifying how energy will be partitioned into the long-range propagation regime. Due to its high efficiency, the method can simulate near-source processes using very fine structures. A large number of source and model parameters can be

examined for broad frequency ranges. We use this method to investigate the effect of volumetric and topographic scattering on the near-source energy partitioning for an explosion source. Different random velocity fluctuations and topographic models, variable source depth, and different Q models are investigated using numerical simulations. The responses of different phases as functions of frequency and source/model parameters are calculated and their energy budget evaluated.
DTIC
Excitation; Scattering; Seismic Waves; Seismograms; Seismology; Three Dimensional Models; Topography; Two Dimensional Models

20090001227 NASA Johnson Space Center, Houston, TX, USA
The Origin of the Terra Meridiani Sediments: Volatile Transport and the Formation of Sulfate Bearing Layered Deposits on Mars
Niles, P.B.; December 15, 2008; 1 pp.; In English; American Geophysical Union, 15 - 19 Dec. 2008, California, USA; Copyright; Avail.: Other Sources; Abstract Only

The chemistry, sedimentology, and geology of the Meridiani sedimentary deposits are best explained by eolian reworking of the sublimation residue of a large scale ice/dust deposit. This large ice deposit was located in close proximity to Terra Meridiani and incorporated large amounts of dust, sand, and SO2 aerosols generated by impacts and volcanism during early martian history. Sulfate formation and chemical weathering of the initial igneous material is hypothesized to have occurred inside of the ice when the darker mineral grains were heated by solar radiant energy. This created conditions in which small films of liquid water were created in and around the mineral grains. This water dissolved the SO2 and reacted with the mineral grains forming an acidic environment under low water/rock conditions. Subsequent sublimation of this ice deposit left behind large amounts of weathered sublimation residue which became the source material for the eolian process that deposited the Terra Meridiani deposit. The following features of the Meridiani sediments are best explained by this model: The large scale of the deposit, its mineralogic similarity across large distances, the cation-conservative nature of the weathering processes, the presence of acidic groundwaters on a basaltic planet, the accumulation of a thick sedimentary sequence outside of a topographic basin, and the low water/rock ratio needed to explain the presence of very soluble minerals and elements in the deposit. Remote sensing studies have linked the Meridiani deposits to a number of other martian surface features through mineralogic similarities, geomorphic similarities, and regional associations. These include layered deposits in Arabia Terra, interior layered deposits in the Valles Marineris system, southern Elysium/Aeolis, Amazonis Planitia, and the Hellas basin, Aram Chaos, Aureum Chaos, and Ioni Chaos. The common properties shared by these deposits suggest that all of these deposits share a common formation process which must have acted over a large area of Mars. The results of this study suggest a mechanism for volatile transport on Mars without invoking an early greenhouse. They also imply a common formation mechanism for most of the sulfate minerals and layered deposits on Mars, which explains their common occurrence.
Author
Geomorphology; Sedimentary Rocks; Sediments; Dust; Ice; Structural Basins; Topography; Volcanology; Greenhouse Effect; Mineralogy

20090001279 Tsukuba Univ., Japan; NASA Marshall Space Flight Center, Huntsville, AL, USA
Bifurcation and Hysteresis of the Magnetospheric Structure with a varying Southward IMF: Field Topology and Global Three-dimensional Full Particle Simulations
Cai, DongSheng; Tao, Weinfeng; Yan, Xiaoyang; Lembege, Bertrand; Nishikawa, Ken-Ichi; October 31, 2007; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Using a three-dimensional full electromagnetic particle model (EMPM), we have performed global simulations of the interaction between the solar wind and the terrestrial magnetosphere, and have investigated its asymptotic stability. The distance between the dayside magnetopause subsolar point and the Earth center, R(sub mp) is measured, as the intensity of southward IMF |B(sub z)| is slowly varying. Based on the field topology theory, one analyzes the variation of R(sub mp) as a reference index of the dynamics of this interaction, when IMF |B(sub z)| successively increases and decreases to its original value. Two striking results are observed. First, as the IMF |B(sub z)| increases above a critical value, the variation of R(sub mp) suddenly changes (so called ‘bifurcation’ process in field topology). Above this critical value, the overall magnetic field topology changes drastically and is identified as being the signature of magnetic reconnection at the subsolar point on the magnetopause. Second, this subsolar point recovers its original location R(sub mp) by following different paths as the IMF |B(sub z)| value increases (from zero to a maximum fixed value) and decreases (from this maximum to zero) passing through some critical values. These different paths are the signature of ‘hysteresis’ effect, and are characteristic of the so-called ‘subcritical-type’ bifurcation. This hysteresis signature indicates that dissipation processes take place via an energy transfer from the solar wind to the magnetosphere by some irreversible way, which leads to a drastic change in the magnetospheric

field topology. This hysteresis is interpreted herein as a consequence of the magnetic reconnection taking place at the dayside magnetopause. The field topology reveals to be a very powerful tool to analyze the signatures of three-dimensional magnetic reconnection without the obligation for determining the mechanisms responsible for, and the consequences of the reconnection on the overall magnetospheric dynamics.
Author
Three Dimensional Models; Interplanetary Magnetic Fields; Solar Wind; Earth Magnetosphere; Magnetic Field Reconnection

20090001316 NASA Johnson Space Center, Houston, TX, USA
Chemistry of Diogenites and Evolution of their Parent Asteroid
Mittlefehldt, D.W.; Beck, A.W.; McSween, H.Y.; Lee, C-T A.; [2009]; 2 pp.; In English; 40th Lunar and Planetary Science Conference, 23 - 27 Mar. 2009, Texas, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Diogenites are orthopyroxenite meteorites [1]. Most are breccias, but remnant textures indicate they were originally coarse-grained rocks, with grain sizes of order of cm. Their petrography, and major and trace element chemistry support an origin as crustal cumulates from a differentiated asteroid. Diogenites are genetically related to the basaltic and cumulate-gabbro eucrites, and the polymict breccias known as howardites, collectively, the HED suite. Spectroscopic observations, orbit data and dynamical arguments strongly support the hypothesis that asteroid 4 Vesta is the parent object for HED meteorites [2]. Here we discuss our new trace element data for a suite of diogenites and integrate these into the body of literature data. We use the combined data set to discuss the petrologic evolution of diogenites and 4 Vesta.
Derived from text
Achondrites; Asteroids; Meteoritic Composition; Petrography; Trace Elements; Vesta Asteroid; Meteorites; Breccia

20090001325 NASA Ames Research Center, Moffett Field, CA, USA
Validation of Aura Microwave Limb Sounder O3 and CO Observations in the Upper Troposphere and Lower Stratosphere
Livesey, N. J.; Filipiak, M. J.; Froidevaux, L.; Read, W. G.; Lambert, A.; Santee, J. L.; Jiang, J. H.; Pumphrey, H. C.; Waters, J. W.; Cofield, R. E.; Cuddy, D. T.; Daffer, W. H.; Drouin, B. J.; Fuller, R. A.; Jarnot, R. F.; Jiang, Y. B.; Knosp, B. W.; Li, Q. B.; Perun, V. S.; Schwartz, M. J.; Snyder, W. V.; Stek, P. C.; Thurstans, R. P.; Wagner, P. A.; Avery, M., et al.; Journal of Geophysical Research; March 27, 2008; ISSN 0148-0227; Volume 113; 1 pp.; In English
Contract(s)/Grant(s): NNA05CS27A; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2007JD008805

Global satellite observations of ozone and carbon monoxide from the Microwave Limb Sounder (MLS) on the EOS Aura spacecraft are discussed with emphasis on those observations in the 2 15 - 100 hPa region (the upper troposphere and lower stratosphere). The precision, resolution and accuracy of the data produced by the MLS 'version 2.2' processing algorithms are discussed and quantified. O3 accuracy is estimated at approx.40 ppbv +5% (approx.20 ppbv +20% at 215 hPa) while the CO accuracy is estimated at approx.30 ppbv +30% for pressures of 147 hPa and less. Comparisons with expectations and other observations show good agreements for the O3 product, generally consistent with the systematic errors quoted above. In the case of COY a persistent factor of approx.2 high bias is seen at 215 hPa. However, the morphology is shown to be realistic, consistent with raw MLS radiance data, and useful for scientific study. The MLS CO data at higher altitudes are shown to be consistent with other observations.
Author
Microwave Sounding; Carbon Monoxide; Ozone; Accuracy; Precision; Satellite Observation; Aura Spacecraft

20090001394 New Mexico State Univ., Las Cruces, NM USA
Propagation of Narrow Bandwidth Wavelength Radiation Through the Atmosphere
Voelz, David; Xiao, Xifeng; Adepu, Prabu; Montoya, Joseph; Aug 2008; 28 pp.; In English
Contract(s)/Grant(s): DATM05-01-C-0026
Report No.(s): AD-A485805; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485805

The analytical theories that describe the irradiance profile and scintillation index for a Gaussian beam propagating through atmospheric turbulence are reviewed. Both horizontal and slant propagation paths are considered. A turbulence strength C(n)2 model, with daytime and nighttime versions, is described that is generally consistent with our understand of White Sands Missile Range (WSMR), NM conditions. The expressions and turbulence strength model are used to generate a set of curves

that show received beam sizes and scintillation indices as a function of the initial beam size (radius), the wavelength, the path elevation angle, and the propagation distance.
DTIC
Atmospheric Circulation; Bandwidth

20090001541 Utah State Univ., Logan, UT USA
Modeling the Electrodynamics of the Low-Latitude Ionosphere
Wohlwend, Christian S; Jul 1, 2008; 201 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The electrodynamics of the Earth's low-latitude ionosphere is dependent on the ionospheric conductivity and the thermospheric neutral density, temperature, and winds present. This two-part study focused on the gravity wave seeding mechanism of equatorial plasma depletions in the ionosphere and the associated-equatorial spread F, as well as the differences between a two-dimensional flux tube integrated electrodynamics model and a three-dimensional model for the same time period. The gravity wave seeding study was based on a parameterization of a gravity wave perturbation using a background empirical thermosphere and a physics-based ionosphere for the case of 12 UT on 26 September 2002. The electrodynamics study utilized a two-dimensional flux tube integrated model in center dipole coordinates (q, p, phi), which is derived in this work. This case study examined the relative influence of the zonal wind, meridional wind, vertical wind, temperature, and density perturbations of the gravity wave. It further looked a the angle of the wave front to the field line flux tube, the most influential height of the perturbation, and the difference between planar and thunderstorm source gravity waves with cylindrical symmetry. The results indicate that, of the five perturbation components studied, the zonal wind is the most important mechanism to seed the Rayleigh-Taylor instability needed to develop plasma plumes. It also shows that the bottomside of the F-region is the most important region to perturb, but a substantial E-region influence is also seen. Furthermore, a wave front with a small angle from the field line is necessary, but the shape of the wave front is not critical if the gravity wave is well developed before nightfall. Preliminary results from the three-dimensional model indicate that the equipotential field line assumption of the two-dimensional model is not valid below 100 km and possibly higher. Future work with this model should attempt to examine the differences.
DTIC
Electrodynamics; Ionospheres; Tropical Regions

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20090000985 Commerce Dept., Washington, DC, USA
Office of the Secretary: Successful Oversight of GOES-R Requires Adherence to Accepted Satellite Acquisition Practices. Final Inspection Report No. OSE-18291
Nov. 2007; 38 pp.; In English
Report No.(s): PB2009-102862; No Copyright; Avail.: CASI: A03, Hardcopy

This memorandum transmits the final report on our review of the Geostationary Operational Environmental Satellite-Series R (GOES-R) Program. We assessed whether the Department and NOAA have established effective mechanisms for handling their expanded responsibilities to oversee and manage this complex acquisition. We found that the life-cycle process for GOES-R lacked key features of accepted satellite management practices, and this has contributed to additional cost and decreased development time. Our recommendations focus on aligning GOES-R oversight and management with accepted practices.
NTIS
Data Acquisition; GOES Satellites; Inspection; Management Planning; Procedures

20090000990 Commerce Dept., Washington, DC, USA
National Oceanic and Atmospheric Administration: Improvements Needed in Reporting of Performance for NOAA Goals--Build Sustainable Fisheries, Recover Protected Species, and Predict and Assess Decadal to Centennial Climate Change. Final Inspection Report No. FSD-15989-4-0001
Sep. 2004; 30 pp.; In English
Report No.(s): PB2009-102696; No Copyright; Avail.: CASI: A03, Hardcopy

No abstract available
Climate Change; Fisheries; Goals; Inspection; Periodic Variations

20090000991 Commerce Dept., Washington, DC, USA

National Oceanic and Atmospheric Administration: The Northeast River Forecast Center Is Well Managed, But some Improvements Are Needed. Inspection Report No. IPE-17259

Aug. 2005; 42 pp.; In English

Report No.(s): PB2009-102697; No Copyright; Avail.: CASI: A03, Hardcopy

River forecast centers are responsible for issuing The Northeast River Forecast Center Is Well Managed, But hydrometeorological forecasts and guidance to weather fore-Some Improvements Are Needed (IPE-17259) cast offices (WFOs) and water management organizations to assist with their water resource responsibilities. The Northeast River Forecast Center (NERFC) covers Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, and most of New York. We sought to assess the adequacy of NERFCs programmatic and administrative operations, determine management effectiveness, and assess how the NERFC coordinates its activities with federal, state, and local government agencies and other water management organizations.

NTIS

Forecasting; Inspection; Rivers

20090000995 Commerce Dept., Washington, DC, USA

National Oceanic and Atmospheric Administration: FY 2008 FISMA Assessment of National Weather Service Telecommunication Gateway (NOAA8871). Final Inspection Report No. OSE-19000

Sep. 2008; 36 pp.; In English

Report No.(s): PB2009-102705; No Copyright; Avail.: CASI: A03, Hardcopy

This report presents the results of our Federal Information Security Management Act (FISMA) review of the certification and accreditation of the NWS Telecommunication Gateway system. We found that the system security plan did not provide an adequate basis to conduct the security certification and NWS needs to improve its security control assessments to assure that controls are implemented correctly and operating as intended.

NTIS

Data Processing; Inspection; Meteorological Services; Security; Telecommunication; United States

20090000999 Commerce Dept., Washington, DC, USA

National Oceanic and Atmospheric Administration: The National Data Buoy Center Should Improve Data Availability and Contracting Practices. Final Inspection Report No. IPE-18585

May 2008; 84 pp.; In English

Report No.(s): PB2009-102716; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Data Buoy Center operates three major buoy systems and a network of coastal marine observing stations that provide critical data on oceanic and atmospheric conditions. We assessed whether NDBC (1) meets user needs with the data provided from the various platforms; (2) has adequate processes for maintaining and repairing the systems; (3) responds appropriately to buoy data losses; and (4) has an effective acquisition strategy and proper administration and oversight for its support services contract. We also sought to determine whether NOAA (1) provides appropriate channels for marine observation data customers to communicate their needs; (2) effectively manages transitions of buoy programs and coordinates buoy development efforts; and (3) plans to further develop multipurpose maritime observation platforms.

NTIS

Buoys; Inspection; Procedures

20090001068 National Environmental Satellite, Data, and Information Service, Washington, DC, USA

Achieving Satellite Instrument Calibration for Climate Change (ASIC3)

January 2007; 152 pp.; In English

Report No.(s): PB2009-102797; No Copyright; Avail.: National Technical Information Service (NTIS)

Current satellite systems are, for the most part, not designed to detect the small trends associated with global climate change an extremely demanding measurement challenge. The trends are indeed tiny, especially in comparison with those of day to day weather fluctuations or even seasonal to inter-annual climate variations. The Workshop on Achieving Satellite Instrument Calibration for Climate Change (ASIC3) was organized to formulate a national roadmap for developing the calibration systems to monitor long-term global climate change. ASIC3 brought together some 100 participants, including instrument calibration experts, metrology scientists from the U.S. and U.K. national standards institutes, remote sensing

specialists, and climate data analysts. The Workshop format consisted of plenary sessions with invited papers, and breakout groups that reported to plenary sessions.
NTIS
Calibrating; Climate Change; Measuring Instruments; Meteorological Satellites; Satellite Instruments

20090001069 National Oceanic and Atmospheric Administration, Washington, DC, USA
NOAA Environmental Data: Foundation for Earth Observations and Data Management System
Jul. 2003; 101 pp.; In English
Report No.(s): PB2009-102796; No Copyright; Avail.: National Technical Information Service (NTIS)

Observations are intrinsic to the mission of the National Oceanic and Atmospheric Administration (NOAA) and NOAA has a vision to see a truly integrated global observing system that will bring together all aspects of environmental monitoring on common platforms, to ensure data quality, to manage those data efficiently for the long-term, and to make these data easily and readily accessible as needed. This report summarizes plans and accomplishments in integrating data types, across disciplines, across line offices and across observational platforms, to provide capability to serve growing user demand. NOAA has a core mission to understand and predict changes in the Earth's environment, and conserve and manage coastal and marine resources to meet the Nation's economic, social, and environmental needs. To accomplish this mission, NOAA must first monitor and observe the land, sea, atmosphere, and space through a data collection network. The data and information from this network must then be organized, permanently preserved, then provided to scientists and researchers for study and tracking of the Earths constantly changing environment. This document describes the status at the end of 2002, and future challenges for the management of an ever-expanding environmental database pouring into NOAA from a world-wide data collection network and the progress towards bringing it all together to address the complex issues of today's world.
NTIS
Data Management; Earth Observations (From Space); Management Systems; NOAA Satellites

20090001146 Congressional Budget Office, Washington, DC, USA
Climate-Change Policy and CO2 Emissions from Passenger Vehicles. Economic and Budget Issue Brief
Oct. 06, 2008; 8 pp.; In English
Report No.(s): PB2009-101989; No Copyright; Avail.: CASI: A02, Hardcopy

Human activities are producing increasingly large quantities of greenhouse gases, particularly carbon dioxide (CO2), and their accumulation in the atmosphere is expected to affect the climate throughout the world. This Congressional Budget Office issue brief examines the role of passenger vehicles (cars and light trucks) in the U.S. effort to curb those emissions. In particular, the brief looks at how putting a price on CO2 emissions for example, through a cap-and-trade system would affect gasoline prices and, as a consequence, vehicle emissions. Charging a price for CO2 emissions would raise the price of gasoline, but that increase and the resulting decrease in vehicle emissions would be relatively small.Most of the reduction in CO2 emissions would occur in other sectors.
NTIS
Carbon Dioxide; Climate Change; Economics; Passengers; Policies

20090001280 NASA Marshall Space Flight Center, Huntsville, AL, USA
Impacts of High-Resolution Land Surface Initialization on Regional Sensible Weather Forecasts from the WRF Model
Case, Jonathan L.; Crosson, William L.; Kumar, Sujay V.; Lapenta, William M.; Peters-Lidard, Christa D.; [2008]; 47 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): F2BBAJ6087FF02; NASA ESTO/AIST NRA-02-OES-04; Copyright; Avail.: Other Sources

This manuscript presents an assessment of daily regional simulations of the Weather Research and Forecasting (WRF) numerical weather prediction (NWP) model initialized with high-resolution land surface data from the NASA Land Information System (LIS) software versus a Control WRF configuration that uses land surface data from the National Centers for Environmental Prediction (NCEP) Eta model. The goal of this study is to investigate the potential benefits of using the LIS software to improve land surface initialization for regional NWP. Fifty-eight individual nested simulations were integrated 24 hours for both the Control and experimental (LISWRF) configurations during May 2004 over Florida and surrounding areas -- 29 initialized at 0000 UTC and 29 initialized at 1200 UTC. The land surface initial conditions for the LISWRF runs came from an offline integration of the Noah land surface model (LSM) within LIS for two years prior to the beginning of the month-long study, on an identical grid domain as the subsequent WRF simulations. Atmospheric variables used to force the offline Noah LSM integration were provided by the North American Land Data Assimilation System and Global Data

Assimilation System gridded analyses. The LISWRF soil states were generally cooler and drier than the NCEP Eta model soil states during May 2004. Comparisons between the Control and LISWRF runs for one event suggested that the LIS land surface initial conditions led to an improvement in the timing and evolution of a sea-breeze circulation over portions of northwestern Florida. Surface verification statistics for the entire month indicated that the LISWRF runs produced a more enhanced and accurate diurnal range in 2-m temperatures compared to the Control due to the overall drier initial soil states, which resulted from a reduction in the nocturnal warm bias in conjunction with a reduction in the daytime cold bias. Daytime LISWRF 2-m dewpoints were correspondingly drier than the Control dewpoints, again a manifestation of the drier initial soil states in LISWRF. The positive results of the LISWRF experiments help to illustrate the importance of initializing regional NWP models with high-quality land surface data generated at the same grid resolution.
Author
Numerical Weather Forecasting; Models; High Resolution; Land Management; Computer Programs; Computerized Simulation

20090001327 NASA Ames Research Center, Moffett Field, CA, USA
Quantifying the Impact of the North American Monsoon and Deep Midlatitude Convection on the Subtropical Lowermost Stratosphere using in Situ Measurements
Weinstock, E. M.; Pittman, J. V.; Sayres, D. S.; Smith, J. B.; Anderson, J. G.; Wofsy, S. C.; Xueref, I.; Gerbig, C.; Daube, B. C.; Pfister, L.; Richard, E. C.; Ridley, B. A.; Weinheimer, A. J.; Jost, H.-J.; Lopez, J. P.; Lowenstein, M.; Thompson, T. L.; Journal of Geophysical Research; 26 Sep. 2007; ISSN 0148-0227; Volume 112; 1 pp.; In English
Contract(s)/Grant(s): NNA05CS27A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1029/2007JD008554

The chemical composition of the lowermost stratosphere exhibits both spatial and temporal variability depending upon the relative strength of (1) isentropic transport from the tropical tropopause layer (TTL), (2) diabatic descent from the midlatitude and northern midlatitude stratosphere followed by equatorward isentropic transport, and (3) diabatic ascent from the troposphere through convection. In situ measurements made in the lowermost stratosphere over Florida illustrate the additional impact of equatorward flow around the monsoon anticyclone. This flow carries, along with older stratospheric air, the distinct signature of deep midlatitude convection. We use simultaneous in situ measurements of water vapor (H2O), ozone (O3), total odd nitrogen (NOy), carbon dioxide (CO2), and carbon monoxide (CO) in the framework of a simple box model to quantify the composition of the air sampled in the lowermost stratosphere during the mission on the basis of tracer mixing ratios ascribed to the source regions for these transport pathways. The results show that in the summer, convection has a significant impact on the composition of air in the lowermost stratosphere, being the dominant source of water vapor up to the 380 K isentrope. The implications of these results extend from the potential for heterogeneous ozone loss resulting from the increased frequency and lifetime of cirrus near the local tropopause, to air with increased water vapor that as part of the equatorward flow associated with the North American monsoon can become part of the general circulation.
Author
Ozone; Water Vapor; Carbon Monoxide; Carbon Dioxide; Chemical Composition; Temporal Distribution; Spatial Distribution; Mixing Ratios

20090001328 NASA Ames Research Center, Moffett Field, CA, USA
Measurements of Trace Gases in the Tropical Tropopause Layer
Marcy, T. P.; Popp, P. J.; Gao, R. S.; Fahey, D. W.; Ray, E. A.; Richard, E. C.; Thompson, T. L.; Atlas, E. L.; Lowenstein, M.; Wofsy, S. C.; Park, S.; Weinstock, E. M.; Swartz, W. H.; Mahoney, M. J.; Atmospheric Environment; January 22, 2008; ISSN 1352-2310; Volume 41, Issue 34, pp. 7253-7361; In English
Contract(s)/Grant(s): NNA05CS27A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1016/j.atmosenv.2007.05.032

A unique dataset of airborne in situ observations of HCl, O3, HNO3, H2O, CO, CO2 and CH3Cl has been made in and near the tropical tropopause layer (TTL). A total of 16 profiles across the tropopause were obtained at latitudes between 10degN and 3degs from the NASA WB-57F high-altitude aircraft flying from Costa Rica. Few in situ measurements of these gases, particularly HCl and HNO3, have been reported for the TTL. The general features of the trace gas vertical profiles are consistent with the concept of the TTL as distinct from the lower troposphere and lower stratosphere. A combination of the tracer profiles and correlations with O3 is used to show that a measurable amount of stratospheric air is mixed into this region. The HCl measurements offer an important constraint on stratospheric mixing into the TTL because once the contribution from halocarbon decomposition is quantified, the remaining HCl (>60% in this study) must have a stratospheric source.

Stratospheric HCl in the TTL brings with it a proportional amount of stratospheric O3. Quantifying the sources of O3 in the TTL is important because O3 is particularly effective as a greenhouse gas in the tropopause region.
Author
Nitric Acid; Carbon Dioxide; Carbon Monoxide; Greenhouse Effect; Gas Analysis; Trace Elements; Methyl Chloride; Hydrochloric Acid; Halocarbons; Atmospheric Composition

20090001329 NASA Ames Research Center, Moffett Field, CA, USA
Single-Particle Measurements of Midlatitude Black Carbon and Light-Scattering Aerosols from the Boundary Layer to the Lower Stratosphere
Schwartz, J. P.; Gao, R. S.; Fahey, D. W.; Thomson, D. S.; Watts, L. A.; Wilson, J. C.; Reeves, J. M.; Darbeheshti, M.; Baumgardner, D. G.; Kok, G. L.; Chung, S. H.; Schulz, M.; Hendricks, J.; Lauer, A.; Kaercher, B.; Slowik, J. G.; Rosenlof, K. H.; Thompson, T. L.; Langford, A. O.; Loewenstein, M.; Aikin, K. C.; Journal of Geophysical Research Atmospheres; 29 Aug. 2006; ISSN 0148-0227; Volume 111; 1 pp.; In English
Contract(s)/Grant(s): NNA05CS27A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1029/2006JD007076

A single-particle soot photometer (SP2) was flown on a NASA WB-57F high-altitude research aircraft in November 2004 from Houston, Texas. The SP2 uses laser-induced incandescence to detect individual black carbon (BC) particles in an air sample in the mass range of approx.3-300 fg (approx.0.15-0.7 microns volume equivalent diameter). Scattered light is used to size the remaining non-BC aerosols in the range of approx.0.17-0.7 microns diameter. We present profiles of both aerosol types from the boundary layer to the lower stratosphere from two midlatitude flights. Results for total aerosol amounts in the size range detected by the SP2 are in good agreement with typical particle spectrometer measurements in the same region. All ambient incandescing particles were identified as BC because their incandescence properties matched those of laboratory-generated BC aerosol. Approximately 40% of these BC particles showed evidence of internal mixing (e.g., coating). Throughout profiles between 5 and 18.7 km, BC particles were less than a few percent of total aerosol number, and black carbon aerosol (BCA) mass mixing ratio showed a constant gradient with altitude above 5 km. SP2 data was compared to results from the ECHAM4/MADE and LmDzT-INCA global aerosol models. The comparison will help resolve the important systematic differences in model aerosol processes that determine BCA loadings. Further intercomparisons of models and measurements as presented here will improve the accuracy of the radiative forcing contribution from BCA.
Author
Mixing Ratios; Carbon; Light Scattering; Boundary Layers; Aerosols; Atmospheric Models

20090001333 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Climate Signal in Regional Moisture Fluxes: A Comparison of Three Global Data Assimilation Products
Min, Wei; Schubert, Siegfried D.; June 1997; 33 pp.; In English; Original contains color illustrations
Report No.(s): DAO Office Note 97-10; Copyright; Avail.: CASI: A03, Hardcopy

This study assesses the quality of estimates of climate variability in moisture flux and convergence from three assimilated data sets: two are reanalysis products generated at the Goddard Data Assimilation Office (DAO) and the National Centers for Environmental Prediction/National Centers for Atmospheric Research (NCEPJNCAR), and the third consists of the operational analyses generated at the European Center for Medium Range Forecasts (ECMWF). The regions under study (the USA Great Plains, the Indian monsoon region, and Argentina east of the Andes) are characterized by frequent low level jets (LLJs) and other interannual low level wind variations tied to the large-scale flow. While the emphasis is on the reanalysis products, the comparison with the operational product is provided to help assess the improvements gained from a fixed analysis system. All three analyses capture the main moisture flux anomalies associated with selected extreme climate (drought and flood) events during the period 1985-93. The correspondence is strongest over the Great Plains and weakest over the Indian monsoon region reflecting differences in the observational coverage. For the reanalysis products, the uncertainties in the lower tropospheric winds is by far the dominant source of the discrepancies in the moisture flux anomalies in the middle latitude regions. Only in the Indian Monsoon region, where interannual variability in the low level winds is comparatively small, does the moisture bias play a substantial role. In contrast, the comparisons with the operational product show differences in moisture which are comparable torhe differences in the wind in all three regions. Compared with the fluxes, the anomalous moisture convergences show substantially larger differences among the three products. The best agreement occurs over the Great Plains region where all three products show vertically-integrated moisture convergence during the floods and divergence during the drought with differences in magnitude of about 25%. The reanalysis products, in particular, show good agreement in depicting the different roles of the mean flow and transients during the flood and drought periods. Differences between the three products in the other two regions exceed 100% reflecting differences in the low level jets and the large scale circulation

patterns. The operational product tends to have locally larger amplitude convergence fields which average out in area-mean budgets: this appears to be at least in part due to errors in the surface pressure fields and aliasing from the higher resolution of the original ECMWF fields. On average, the reanalysis products show higher coherence with each other than with the operational product in the estimates of interannual variability. This result is less clear in the Indian monsoon region where differences in the input observations appears to be an important factor. The agreement in the anomalous convergence patterns is, however, still rather poor even over relatively data dense regions such as the USA Great Plains. These differences are attributed to deficiencies in the assimilating GCM's representations of the planetary boundary layer and orography, and a global observing system incapable of resolving the highly confined low level winds associated with the climate anomalies. Author

Annual Variations; Climate; Wind Variations; Variability; Convergence; Estimates; Weather Forecasting

20090001400 Council for Scientific and Industrial Research, Pretoria, South Africa

Time and Frequency Activities at the CSIR - National Metrology Laboratory

Marais, E L; Nov 2000; 8 pp.; In English

Report No.(s): AD-A485821; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485821

The Time and Frequency Laboratory of the CSIR-National Metrology Laboratory (CSIR-NML) is responsible for the maintenance and development of the national standards in time and frequency. Specific responsibilities include time and frequency, phase angle, fast electrical-pulse characterization, and time-interval measurements. The fiber-optics laboratory also resides within the Time and Frequency Laboratory. This paper will discuss the various activities within the Laboratory. DTIC

Frequencies; Metrology; Telephones

20090001401 Council for Scientific and Industrial Research, Pretoria, South Africa

The Development of Multi-Channel GPS Receivers at the CSIR - National Metrology Laboratory

Marais, E L; Nov 2000; 8 pp.; In English

Report No.(s): AD-A485823; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485823

The primary responsibility of the Time and Frequency laboratory of the CSIR-National Metrology Laboratory (CSIR-NML) is the maintenance of the South African time scale. To perform this duty, the highest level of accuracy in time transfer is required. To this end a multi-channel GPS receiver was developed in the Time and Frequency Laboratory, as a replacement for the NBS-type single-channel receivers. This paper discusses the development of this Motorola-based GFS receiver.

DTIC

Global Positioning System; Metrology; Radio Receivers; Receivers

20090001406 Kharkov State Univ., Ukraine

Results of Radio Meteor Comparison of Scales of the Russian UTC (SU) and Ukranian UTC (UA) Time Standards

Bavikina, Veronika V; Koval, Yurey A; Tkachuk, Alexander A; Nov 2001; 8 pp.; In English

Report No.(s): AD-A485836; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485836

The analysis of outcomes of radio meteoric comparisons of the State time measurement standards of the Russia and Ukraine scales is carried out in the paper. A check of statistical hypotheses about a normality of allocation of sampling, their homogeneity, and equal precision is realized. On sampling measurement outcomes for a session by classical and robust of procedures, we discovered ratings of a distribution central value and dispersion of samplings, determined their stability to

contamination, and worked out the guidelines on application of these ratings. Linear regression analysis of a mutual course of the time standards scales by the first- and second-order models is carried out.
DTIC
Meteorological Satellites; Radio Meteors; Radio Signals; Time Measurement

20090001418 George Washington Univ., Washington, DC USA
Global Climate Change and NEPA: The Difficulty with Cumulative Impacts Analysis
Tubbs, II, Marvin W; May 18, 2008; 69 pp.; In English
Report No.(s): AD-A485880; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485880

This paper will provide a survey of the current requirements under the law for addressing global climate change in NEPA documents, along with various methodologies for quantifying the potential global climate change impacts of federal actions subject to NEPA.
DTIC
Climate; Climate Change; Climatology; Environment Management; Environment Protection; Environmental Surveys; Law (Jurisprudence); United States

20090001422 Hawaii Univ., Honolulu, HI USA
The Influence of TUTT Cells on Tropical Cyclone Motion in the Northwest Pacific Ocean
Patla, Jason E; Aug 2008; 197 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485892; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485892

Eleven tropical cyclones (TCs) are examined using the latest ECMWF reanalysis (ERA-40) and JTWC best track data to determine how tropical upper tropospheric trough (TUTT) cells influence TC tracks. This type of interaction has led to enormous TC track forecast errors at 72 hour (2000+ km) in the northwest Pacific and are often overlooked and under-forecast frequently due to poor numerical model TUTT cell forecasts. Cases are selected because a TC exhibited a 'non-standard' track, a TUTT cell was the sole large-scale transient feature within 2000 km of the TC's center, and the TC intensity was >17 m s(-1). Analysis shows that the circulations' separation distance, orientation, intensity, and the depth and breadth of the TUTT cell's closed circulation are critical characteristics in determining the likelihood of a TUTT cell influencing a TC's track. Interactions occur at distances greater than 1700 km, continue for periods ranging from 24 to 48 hours and happen 2-3 times per year in this active TC basin. Examination of the TC's deep layer mean (DLM), upper, middle and lower layers along with various quadrants of the upper layer (100-500 hPa) demonstrate a link between the TUTT cell's wind field and the non-standard TC tracks. The TC's 5 deg -7 deg mass-weighted DLM steering environment is found to be closest to actual TC motion in most cases. TC intensity variations and circulation proximity sometimes results in the DLM's 3 deg - 5 deg radial band being closer to actual TC motion. A conceptual model of how a TUTT cell can influence TC track is presented. The model provides quantified, decision-grade operational guidance for TC forecasters using pattern recognition scenarios. Application of the conceptual model at the JTWC is currently underway.
DTIC
Atmospheric Circulation; Cyclones; Pacific Ocean; Tropical Regions; Tropical Storms; Troposphere; Troughs

20090001425 New South Wales Univ., Sydney, Australia
Validation Study of Wave Breaking Influence in a Coupled Wave Model for Hurricane Wind Conditions
Banner, Michael L; Morison, Russel P; Leslie, Lance M; Aug 27, 2008; 34 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0288
Report No.(s): AD-A485902; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485902

As marine winds strengthen, wave breaking becomes increasingly widespread with potentially important consequences for offshore operations. Wave breaking is not included in present marine forecasts. This project addressed the incorporation of wave breaking physics into coupled sea state marine weather forecasting models, with aim of adding accurate wave breaking forecasts to the standard sea state variables. Our approach combined observational and modeling efforts. New results from our field data analyses were synthesized into accurate parameterizations for wave breaking occurrence and strength. The wind input source term was modified for compatibility with the other source terms and physical constraints. These refinements were incorporated in the dissipation and wind input source terms in the spectral wave evolution models used to generate

forecasts. The model output results were evaluated critically in systematic tests from moderate to severe wind speeds. After extensive iterations, the model framework is ready for implementation and further testing in operational prototype models. DTIC

Air Water Interactions; Hurricanes; Mathematical Models; Ocean Surface; Sea States; Water Waves; Wind (Meteorology); Wind Direction; Wind Velocity

20090001763 Government Accountability Office, Washington, DC, USA

International Climate Change Programs: Lessons Learned from the European Union's Emissions Trading Scheme and the Kyoto Protocol's Clean Development Mechanism

Nov. 2008; 69 pp.; In English

Report No.(s): PB2009-102442; GAO-09-151; No Copyright; Avail.: National Technical Information Service (NTIS)

International policies to address climate change have largely relied on market-based programs; for example, under the European Union's Emissions Trading Scheme (ETS) phase I (2005 to 2007) carbon dioxide emissions reductions were sought by setting a cap on each member state's allowable emissions and distributing tradable allowances to covered entities, such as power plants. Beginning operation in 2002, the Kyoto Protocol's Clean Development Mechanism (CDM) has relied on offsets, allowing certain industrialized nations to pay for emission reduction projects in developing countries--where the cost of abatement may be less expensive--in addition to reducing emissions within their borders. Legislative proposals to limit greenhouse gas emissions are under consideration in the USA. In this context, GAO was asked to examine the effects of and lessons learned from (1) the ETS phase I and (2) the CDM. GAO worked with the National Academy of Sciences to identify experts in market-based programs and gathered their opinions through a questionnaire, interviewed stakeholders, and reviewed available information.

NTIS

Air Pollution; Climate Change; Exhaust Emission; Exhaust Gases; Greenhouse Effect; Lessons Learned; Policies; Pollution Control; Protocol (Computers)

20090001767 National Oceanic and Atmospheric Administration, Washington, DC, USA

Improvements Needed in the Reporting of Performance Measure Performance Measures Related to Goals for Advancing Short-Term Warnings and Implementing Seasonal to Interannual Climate Forecasts

Sep. 2003; 57 pp.; In English

Report No.(s): PB2009-102660; AUDIT-RPT-FSD-15643-3-0001; No Copyright; Avail.: CASI: A04, Hardcopy

The National Oceanic and Atmospheric Administration (NOAA) is charged with assessing and predicting changes in the Earth's environment, and protecting and managing marine and coastal resources to ensure sustainable economic opportunities-missions that support the Department's strategic goal of observing and managing the Earth' s environment to promote sustainable growth. As such, NOAA's performance plans, program results, and financial information are integral components of Commerce annual performance plans and reports submitted to meet the requirements ofthe Government Performance and Results Act (GPRA) of 1993. NOAA maintains seven performance goals to support the Department' s strategic goal: (1) build sustainable fisheries, (2) sustain healthy coasts, (3) recover protected species (4) advance short-term warnings and forecasts, (5) implement seasonal to interannual climate forecasts, (6) predict and assess decadal to centennial change, and (7) promote safe navigation. It has established a number of measures to gauge its success at achieving each goal. We conducted a performance audit of select measures that support two of these goals-advance short-term warnings and forecasts, and implement seasonal to interannual climate forecasts-to (1) assess the collection and reporting of NOAA performance information in documents submitted to meet GPRA requirements, and (2) determine whether NOAA' s internal controls are sufficient to ensure that performance data is accurate, consistent, and reliable.

NTIS

Climate; Forecasting

20090001768 National Oceanic and Atmospheric Administration, Washington, DC, USA

San Angelo Weather Forecast Office Performs Its Core Responsibilites Well, but Office Management and Regional Oversight Need Improvement

Jun. 2001; 56 pp.; In English

Report No.(s): PB2009-102661; FINAL-IR-IPE-13531; No Copyright; Avail.: National Technical Information Service (NTIS)

National Weather Service (NWS), an agency within the National Oceanic and Atmospheric Administration, has 121

Weather Forecast Offices nationwide. Each Weather Forecast Office (WFO) issues local weather forecasts and warnings of severe weather such as tornadoes, severe thunderstorms, floods, hurricanes, and extreme winter weather for its assigned counties. The San Angelo office was opened in October 1947 under the Weather Bureau as a Weather Service Office. In July 1999, the office converted to a Weather Forecast Office, which currently has a staff of 22 and services a warning area covering 24 counties. At the time of our visit, there was one satellite office in Abilene, but it subsequently closed on December 19, 2000. The WFO uses various technology and programs to help protect the citizens in its county warning area. Radar, satellite, and automated surface observation systems are used to prepare forecasts and issue warnings for all types of severe weather. NWS commissioned the Advanced Weather Interactive Processing System in San Angelo on July 6, 2000. This system, which integrates NWS meteorological and hydrological data with NWS satellite and radar data, is designed to enable forecasters to prepare and issue more accurate and timely forecasts and warnings. In performing our review, we examined pertinent records and documents and interviewed all of the staff at the San Angelo WFO. We also spoke by telephone with the regional director in Fort Worth, and interviewed many representatives from the Department and other federal, state, and local government agencies. We also interviewed individuals outside of government involved in meteorological activities to obtain their assessment of the services provided by the San Angelo WFO, as well as to elicit any suggestions they had for improving the WFOs conveyance of critical weather information.
NTIS
Weather Forecasting; Meteorological Parameters; Hurricanes; Thunderstorms; Tornadoes

20090001770 National Oceanic and Atmospheric Administration, Washington, DC, USA
Missoula Weather Forecast Office Generally Provides Quality Service to Its County Warning Area
Sep. 2001; 50 pp.; In English
Report No.(s): PB2009-102662; FINAL-IR-IPE-14225; No Copyright; Avail.: National Technical Information Service (NTIS)

The Weather Forecast Office (WFO) uses various technologies and programs to help protect the citizens in its county warning area. Radar, satellite, and automated surface observing systems are used to prepare forecasts and issue warnings for all types of severe weather. NWS commissioned the Advanced Weather Interactive Processing System in Missoula on February 15, 2000. This system, which integrates NWS meteorological and hydrological data with NWS satellite and radar data, is designed to enable forecasters to prepare and issue more accurate and timely forecasts and warnings. The offices fire weather program, considered its most critical activity, provides meteorological support to wildland fire management agencies for the protection of life and property. This support includes providing warnings, forecasts, on-site services during wildfires, and meteorological training for fire management officials. In performing our review, we examined pertinent records and documents and interviewed all of the available staff at the Missoula WFO. We also interviewed the regional director in Salt Lake City, as well as many representatives from the Department and other federal, state, and local government agencies. In addition, we spoke with individuals outside of the federal government who are involved in meteorological activities to obtain their assessment of the services provided by the Missoula WFO, as well as to elicit any suggestions they had for improving the offices provision of critical weather information.
NTIS
Weather Forecasting; Meteorological Parameters; Meteorological Services

20090001771 National Oceanic and Atmospheric Administration, Washington, DC, USA
NWS Weather Forecast Offices Generally Perform Well, but Regional Oversight and Management at Some Offices Need to be Improved
Sep. 2002; 78 pp.; In English
Report No.(s): PB2009-102663; FINAL-IR-IPE-14577; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Weather Service, an agency of the National Oceanic and Atmospheric Administration, operates 121 weather forecast offices (WFOs) nationwide. Each WFO issues general weather forecasts and warnings of severe weathersuch as tornadoes, severe thunderstorms, floods, hurricanes, and extreme winter weatherfor its assigned county warning area. WFOs use both technologyradar, satellite, and automated surface observing systemsand professional staff to prepare forecasts and issue warnings and to help ensure the provision of timely and accurate weather information to the citizens in their county warning areas. During 2000 and 2001, the Office of Inspector General conducted comprehensive inspections of 4 WFOsRaleigh, North Carolina; San Angelo, Texas; Missoula, Montana; and Chanhassen, Minnesotato determine how effectively the WFOs (1) delivered warnings, forecasts, and other information to their service users; (2) coordinated their activities with state and local emergency managers; (3) managed their network of volunteer observers and spotters; and (4)

managed their resources and maintained adequate administrative controls to comply with Department of Commerce, NOAA, and NWS policies and procedures. We also evaluated NWSs regional oversight of its WFOs. Our overall assessment of the WFOs we evaluated was that they generally provide effective weather products and services but need to improve administrative operations and oversight. They also need regular and consistent attention from NWS regional and WFO managers to ensure adherence to Commerce and federal administrative guidelines. To determine whether the issues we identified for these 4 WFOs were applicable to other weather offices, we conducted limited reviews of 10 additional WFOs (shown in the box below) from all six NWS regions from September 2001 through March 2002. This report presents our crosscutting observations and recommendations based on our review of all 14 WFOs, including updated information on our comprehensive inspections of 4 WFOs.
NTIS
Forecasting; Weather Forecasting

20090001772 National Oceanic and Atmospheric Administration, Washington, DC, USA
Acquisition of NEXRAD Transition Power Source Marred by Management, Technical, and Contractual Problems
Sep. 2003; 87 pp.; In English
Report No.(s): PB2009-102666; FINAL-RPT-OSE-15676; No Copyright; Avail.: CASI: A05, Hardcopy

In 1992, NOAAs National Weather Service (NWS) began exploring technical solutions to power supply problems affecting the 158 Next Generation Weather Radar (NEXRAD) systems high resolution Doppler weather radar systems jointly designed, acquired, and operated by the Departments of Commerce (NWS), Defense (Air Force and Navy), and Transportation (Federal Aviation Administration). A tri-agency Radar Operations Center (ROC) located in Norman, Oklahoma, is responsible for meteorological, software, maintenance, and engineering support for all NEXRAD systems. The ROC is a component of NWS Office of Operational Systems (OOS). The search for supplementary power sources was prompted by two problems that degraded NEXRAD operability: power loss and resultant loss of critical data during transitions between commercial power and the standby engine generator; and poor power quality at remote NEXRAD sites, which shortens the life of the systems electronics and increases maintenance costs. To solve these problems, the ROC sought to acquire transition power sources (TPS) uninterruptible power systems that prevent power loss to the radar during power transfer and protect the electronics from commercial power anomalies. The ROC assessed two TPS technologies: static and rotary. A static TPS consists of a rectifier/battery charger, battery, and inverter; rotary units consist of an electric motor mechanically connected to a generator. In 1993, having concluded that static technology was less suitable due to technical, cost, and environmental issues, the ROC acquired a rotary TPS for testing. The testing showed commercial-off-the-shelf (COTS) rotary technology to be feasible, and NWS decided to acquire rotary TPS units for NEXRAD. The TPS is the major component acquired under the Transition Power Maintenance Shelter (TPMS) contract, which for most sites also includes a shelter to house the TPS, an electric toilet unit, a maintenance workbench, and storage areas.
NTIS
Meteorological Radar; Software Engineering; Radar Resolution; Doppler Radar

20090001827 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Global Precipitation Measurement (GPM) Mission: Overview and Status
Hou, Arthur Y.; Azarbarzin, Ardeshir A.; Kakar, Ramesh K.; Neeck, Steven; September 29, 2008; 1 pp.; In English; 2008 International Astronautical Congress, 29 Sep. - 3 Oct. 2008, Glasgow, Scotland, UK; No Copyright; Avail.: Other Sources; Abstract Only

The Global Precipitation Measurement (GPM) Mission is an international satellite mission to unify and advance global precipitation measurements from a constellation of dedicated and operational microwave sensors. The GPM concept centers on the deployment of a Core SpacecraR in a non-Sun-synchronous orbit at 65 deg. inclination carrying a dual-frequency precipitation radar (DPR) and a multi-frequency passive microwave radiometer (GMI) with high-frequency capabilities to serve as a precipitation physics observatory and calibration standard for the constellation radiometers. The baseline GPM constellation is envisioned to comprise conical-scanning microwave imagers (e.g., GMI, SSMIS, AMSR, MIS, MADRAS, GPM-Brazil) augmented with cross-track microwave temperaturethumidity sounders (e.g., MHS, ATMS) over land. In addition to the Core Satellite, the GPM Mission will contribute a second GMI to be flown in a low-inclination (approximately 40 deg.) non-Sun-synchronous orbit to improve near-realtime monitoring of hurricanes. GPM is a science mission with integrated applications goals aimed at (1) advancing the knowledge of the global watertenergy cycle variability and freshwater availability and (2) improving weather, climate, and hydrological prediction capabilities through more accurate and frequent measurements of global precipitation. The GPM Mission is currently a partnership between NASA and the Japan Aerospace Exploration Agency (JAXA), with opportunities for additional partners in satellite constellation and ground validation

activities. Within the framework of the inter-governmental Group ob Earth Observations (GEO) and Global Earth Observation System of Systems (GEOSS), GPM has been identified as a cornerstone for the Precipitation Constellation (PC) being developed under the auspices of Committee of Earth Observation Satellites (CEOS). The GPM Core Observatory is scheduled for launch in 2013, followed by the launch of the GPM Low-Inclination Observatory in 2014. An overview of the GPM mission status, instrument capabilities, ground validation plans, and anticipated scientific and societal benefits will be presented.
Author
Precipitation Measurement; Remote Sensing; Satellite Observation; General Overviews; Meteorological Radar

20090001834 NASA Ames Research Center, Moffett Field, CA, USA
CO Signatures in Subtropical Convective Clouds and Anvils During CRYSTAL-FACE: An Analysis of Convective Transport and Entertainment Using Observations and a Cloud-Resolving Model
Lopez, Jimena P.; Fridlind, Ann M.; Jost, Hans-Jurg; Loewenstein, Max; Ackerman, Andrew S.; Campos, Teresa L.; Weinstock, Elliot M.; Sayres, David S.; Smith, Jessica B.; Pittman, Jasna V.; Hallar, A. Gannet; Avallone, Linnea M.; Davis, Sean M.; Herman, Robert L.; Journal of Geophysical Research - Atmospheres; May 06, 2006; ISSN 0148-0227; Volume 111; 1 pp.; In English
Contract(s)/Grant(s): NNA05CS27A; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1029/2005JD006104

Convective systems are an important mechanism in the transport of boundary layer air into the upper troposphere. The Cirrus Regional Study of Tropical Anvils and Cirrus Layers-Florida Area Cirrus Experiment (CRYSTAL-FACE) campaign, in July 2002, was developed as a comprehensive atmospheric mission to improve knowledge of subtropical cirrus systems and their roles in regional and global climate. In situ measurements of carbon monoxide (CO), water vapor (H20v), and total water (H20t) aboard NASA's . WB-57F aircraft and CO aboard the U.S. Navy's Twin Otter aircraft were obtained to study the role of convective transport. Three flights sampled convective outflow on 11, 16 and 29 July found varying degrees of CO enhancement relative to the fiee troposphere. A cloud-resolving model used the in situ observations and meteorological fields to study these three systems. Several methods of filtering the observations were devised here using ice water content, relative humidity with respect to ice, and particle number concentration as a means to statistically sample the model results to represent the flight tracks. A weighted histogram based on ice water content observations was then used to sample the simulations for the three flights. In addition, because the observations occurred in the convective outflow cirrus and not in the storm cores, the model was used to estimate the maximum CO within the convective systems. In general, anvil-level air parcels contained an estimated 20-40% boundary layer air in the analyzed storms.
Author
Clouds (Meteorology); Water Vapor; In Situ Measurement; Climatology; Boundary Layers; Carbon Monoxide; Atmospheric Models

20090001840 Remote Sensing Systems, Inc., Santa Rosa, CA, USA
Wind Retrievals under Rain for Passive Satellite Microwave Radiometers and its Applications to Hurricane Tracking
Meissner, Thomas; Wentz, Frank J.; [2008]; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNH06CC29C; Copyright; Avail.: Other Sources
ONLINE: 10.1109/MICRAD.2008.4579492

We have developed an algorithm that retrieves wind speed under rain using C-hand and X-band channels of passive microwave satellite radiometers. The spectral difference of the brightness temperature signals due to wind or rain allows to find channel combinations that are sufficiently sensitive to wind speed but little or not sensitive to rain. We &ve trained a statistical algorithm that applies under hurricane conditions and is able to measure wind speeds in hurricanes to an estimated accuracy of about 2 m/s. We have also developed a global algorithm, that is less accurate but can be applied under all conditions. Its estimated accuracy is between 2 and 5 mls, depending on wind speed and rain rate. We also extend the wind speed region in our model for the wind induced sea surface emissivity from currently 20 m/s to 40 mls. The data indicate that the signal starts to saturate above 30 mls. Finally, we make an assessment of the performance of wind direction retrievals from polarimetric radiometers as function of wind speed and rain rate
Author
Wind Direction; Wind Velocity; Rain; Microwave Landing Systems; Brightness Temperature; Microwave Radiometers; Polarimetry

20090001842 Defence Science and Technology Organisation, Victoria, Australia

Modification of the Geographic Corrosivity Index and its Application to Overseas Bases

Bitcon, J C; Russo, S G; Mar 2008; 61 pp.; In English

Report No.(s): AD-A485776; DSTO-TR-2109; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485776

A Geographic Corrosivity Index (GCI) has been developed previously that models the atmospheric corrosivity at RAAF bases within Australia. Geographic, wind and other climate data are used to calculate the index for each base. The correlation of the GCI with atmospheric corrosion data from a large number of overseas bases, covering a broader range of geographic features and climatic conditions than experienced in Australia, was investigated to test its wider application. Modifications have been made to the GCI that enable it to be used with greater confidence for bases around the world that are within 200 km of the coast. Bases greater than 200 km from the coast have low corrosion rates, and a simpler algorithm based on time of wetness and distance from the coast has been used to predict atmospheric corrosivity at these inland sites.

DTIC

Atmospheric Effects; Corrosion

20090001868 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Current Scientific Progress and Future Scientific Prospects Enabled by Spaceborne Precipitation Radar Measurements

Smith, Eric A.; Im, Eastwood; Tripoli, Gregory J.; Yang, Song; October 11, 2008; 1 pp.; In English; 4th IPWG Workshop, 11 - 26 Oct. 2008, Beijing, China; Copyright; Avail.: Other Sources; Abstract Only

First, we examine current scientific progress and understanding that have been possible through use of spaceborne precipitation radar measurements being provided by the TRMM and CloudSat satellites. Second, we look across a future 20-year time frame to assess how and why anticipated improvements in space radar systems will further advance scientific progress into topic areas once considered beyond the realm of space-based remote sensing. JAXA's 13.8 GHz Ku-band cross-track scanning Precipitation Radar (PR) developed for flight on NASA's non-sun-synchronous, diurnally-precessing TRMM satellite, was the first Earth radar flown in space that was designed specifically for precipitation measurement. Its proven accuracy in measuring global rainfall in the tropics and sub-tropics and its unanticipated longevity in continuing these measurements beyond a full decade have established the standards against which all follow-up and future space radars will be evaluated. In regards to the current PR measurement time series, we will discuss a selection of major scientific discoveries and impacts which have set the stage for future radar measuring systems. In fact, the 2nd contemporary space radar applicable for terrestrial precipitation measurement, i.e., JPL-CSA's 94 GHz nadir-staring Cloud Profiling Radar (CPR) flown on NASA's sun-synchronous CloudSat satellite, although designed primarily for measurement of non-precipitating cloud hydrometeors and aerosols, has also unquestionably advanced precipitation measurement because CPR's higher frequency and greatly increased sensitivity (approximately 30 dBZ) has enabled global observations of light rain rate spectrum processes (i.e., rain rates below 0.05 mm per hourand of precipitation processes in the high troposphere (particularly ice phase processes). These processes are beyond reach of the TRMM radar because the PR sensitivity limit is approximately 17 dBZ which means its lower rain rate cutoff is around 0.3 mm per hour and its vertical profiling acuity is greatly limited above the melting layer. Thus, the newer CPR measurements have become important for a variety of scientific reasons that will be highlighted and assessed. In considering scientific progress likely to stem from future precipitation radar systems, we will specifically examine possible scientific impacts from three anticipated missions for which NASA and various of its space agency partners are expected to lead the way. These three missions are: (1) the nearterm Global Precipitation Measuring (GPM) Mission; (2) the decadal timeline Aerosol and Cloud Experiment (ACE) Mission; and the post-decadal timeline NEXRAD in Space (NIS) Mission. The observational capabilities of the planned radar systems for each of these three satellite missions are distinct from each other and each provides progressive improvements in precipitation measuring and scientific research capabilities relative to where we are now -- insofar as TRMM PR and the CloudSat CPR capabilities. The potential innovations in scientific research will be discussed in a framework of likely synergisms between next-generation radar capabilities and accessible dynamical and microphysical properties that have heretofore evaded detection.

Author

Precipitation (Meteorology); Radar Measurement; Remote Sensing; Clouds (Meteorology); Meteorological Radar

20090001869 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Laser Sounder Approach for Global Measurement of Tropospheric CO2 Mixing Ratio from Space

Abshire, James B.; Riris, Haris; Allan, Graham; Kawa, S. Randy; Mayo, Jian-Ping; Wilson, Emily; Stephen, Mark; Chen, Jeffrey; Sun, Xiaoli; Weaver, Clark; December 16, 2008; 3 pp.; In English; American Geophysical Union Meeting, 16-19 Dec. 2008, San Francisco, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

We report progress in assessing the feasibility of a new satellite-based laser-sounding instrument to measure CO2 and other trace gas abundances in the lower troposphere from space.

Author

Carbon Dioxide; Mixing Ratios; Troposphere; Optical Radar; Meteorology; Trace Contaminants

20090001885 NASA Marshall Space Flight Center, Huntsville, AL, USA

Compression Strength of Sulfur Concrete Subjected to Extreme Cold

Grugel, Richard N.; [2008]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Sulfur concrete cubes were cycled between liquid nitrogen and room temperature to simulate extreme exposure conditions. Subsequent compression testing showed the strength of cycled samples to be roughly five times less than those non-cycled. Fracture surface examination showed de-bonding of the sulfur from the aggregate material in the cycled samples but not in those non-cycled. The large discrepancy found, between the samples is attributed to the relative thermal properties of the materials constituting the concrete.

Author

Compressive Strength; Concretes; Sulfur; Thermodynamic Properties

20090001909 NASA Marshall Space Flight Center, Huntsville, AL, USA

Climate Variability during the TRMM Era: Relationships between TRMM Precipitation and Upper-Tropospheric Hydrometeors

Robertson, Franklin; August 04, 2008; 1 pp.; In English; 2008 Precipitation Mapping Mission Science Team Meeting, 4-7 Aug. 2008, Fort Collins, Co, USA; No Copyright; Avail.: Other Sources; Abstract Only

Tropical rainfall as seen by the TRMM radar has multiple scales of organization, one prominent example of which is mesoscale deep convection that supports the production of strong, widespread anvil systems important to the planet's water and energy balance. TRMM PR precipitation retrievals (i.e. the 2A25 algorithm) are reliable down to rates below 1.0 mm/h which captures the majority of near-surface rainfall. However, much of the precipitating hydrometeor mass above the freezing level in these anvil systems may be associated with particles where TRMM PR s/n is low. In out analysis we are examining the question of 'What portions of the total hydrometeor spectrum can we see individually with TRMM, CloudSat, high frequency passive microwave (e.g. AMSU-B, MHS) and MODIS'. This will allow us to pursue fundamental issues of precipitation, efficiency, maintenance of upper-troposheric humidity, and cloud forcing variability in the tropical climate system. We do this by generating frequency distributions of ice water content (IWC), integrated IWC (IWP), and precipitation as appropriate for these sensors and relate these to TRMM near-surface rainfall. Joint frequency distributions are developed from more limited coincidence between TRMM and these sensors. We interpret these results in terms of a climate regime descriptor and as an index of precipitation efficiency for tropical rain systems.

Author

TRMM Satellite; Climate Change; Tropical Meteorology; Rain; Troposphere; Hydrometeors; Ice; Hydrometeorology

20090001920 Lawrence Livermore National Lab., Livermore, CA, USA

Identification of Human-Induced Changes in Atmospheric Moisture Content

Santer, B.D.; Mears, C.; Wentz, F.J.; Taylor, K.E.; Gleckler, P.J.; Wigley, T.M.; Barnett, T.P.; Boyle, J.S.; Bruggemann, W.; Gillett, N.P.; Klein, S.A.; Meehl, G.A.; Nozawa, T.; Pierce, D.W.; Scott, P.A.; Washington, W.M.; Wehner, M.F.; Proceedings of the National Academy of Sciences (PNAS); September 25, 2007; Volume 104, No. 39, pp. 15248-15253; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNH06CC30C; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1073/pnas.0702872104

Data from the satellite-based Special Sensor Microwave Imager (SSM/I) show that the total atmospheric moisture content over oceans has increased by 0.41 kg/sq m per decade since 1988. Results from current climate models indicate that water vapor increases of this magnitude cannot be explained by climate noise alone. In a formal detection and attribution analysis using the pooled results from 22 different climate models, the simulated 'fingerprint' pattern of anthropogenically caused

changes in water vapor is identifiable with high statistical confidence in the SSM/I data. Experiments in which forcing factors are varied individually suggest that this fingerprint 'match' is primarily due to human-caused increases in greenhouse gases and not to solar forcing or recovery from the eruption of Mount Pinatubo. Our findings provide preliminary evidence of an emerging anthropogenic signal in the moisture content of earth's atmosphere.
Author
Atmospheric Moisture; Greenhouse Effect; Remote Sensing; Water Vapor; Climate Models; Earth Atmosphere; Climate; Moisture Content

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*.

20090001220 Naval Postgraduate School, Monterey, CA USA
Civil-Military Medicine: On Dangerous Ground
Clunan, Anne L; Mar 2006; 113 pp.; In English
Report No.(s): AD-A489558; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The interaction between armed forces and civilian organizations providing medical and health aid in insecure environments is increasing. Recent examples include a U.S.-led anti-insurgent Joint Task Force providing disaster relief after mud slides in the Philippines, the international response to the Asian tsunami, and operations in Iraq and Afghanistan. Practitioners and scholars alike have noted that the rising incidence of civil-military medical assistance increases the need for better operational coordination and cooperation among the actors in the medical and health sector of humanitarian assistance. From January 29 to February 2, 2006, representatives from the U.S. Government, United Nations, and international nongovernmental organizations (NGOs) participated in an educational game at the Center for Stabilization and Reconstruction Studies (CSRS) at the Naval Postgraduate School in Monterey, California. The game focused on the operational challenges associated with providing medical and health assistance as part of disaster relief and development assistance in regions of conflict or instability. Three scenarios were used, and participants took the role of representing their respective medical communities: military, civilian government, international organization, and international nongovernmental organization. The first scenario focused on disaster relief in a post-conflict setting, the second posed a situation of a natural disaster occurring during ongoing combat operations, and the third concerned an epidemic of avian influenza among a mixed population of civilians and insurgent forces.
DTIC
Disasters; Medical Services; Military Personnel; Organizations; Personnel

20090001321 NASA Johnson Space Center, Houston, TX, USA
Critical Features of Training that Facilitate Adaptive Generalization of over Ground Locomotion
Mulavara, Ajit; Cohen, H.S.; Bloomberg, J.J.; [2009]; 29 pp.; In English
Contract(s)/Grant(s): NCC9-58; DC04167; Copyright; Avail.: Other Sources

When subjects learn motor tasks under novel visuomotor conditions variations in sensory input during training facilitate adaptive generalization. We tested the hypotheses that training with multiple sensory input variations is more effective than a single or no variation and that training must include critical features of the criterion task. Normal adults were pre- and post-tested on an obstacle avoidance task while wearing visual distortion lenses after treadmill walking (Experiment 1), or balance training (Experiment 2). Subjects were randomized to training groups in which they wore either: 1) three different visual distortion lenses, 2) a single pair of visual distortion lenses, or 3) sham lenses. Post-tests were done while wearing novel lenses. In Experiment 1 subjects who trained with multiple lenses adapted better than single or sham lens groups. The single lens training group with magnifying lenses adapted better than the other single lens groups. In Experiment 2, training for dynamic balance, alone, did not increase training efficacy. Thus, training for an obstacle avoidance task in a novel visual environment required a critical feature of the criterion task: locomotion. Constant practice with a single lens was successful

only if the best lens was selected, but the best lens could not be known ahead of time. Therefore variable practice with multiple lenses on a task that included a critical feature of the criterion task was the best training strategy to enhance adaptive generalization.
Author
Psychomotor Performance; Locomotion; Treadmills; Walking; Obstacle Avoidance; Education

20090001352 General Accounting Office, Washington, DC USA
Military Personnel: DOD's and the Coast Guard's Sexual Assault Prevention and Response Programs Face Implementation and Oversight Challenges
Farrell, Brenda S; Wasleski, Marilyn K; Bolling, Krislin; Chan, Joanna; Davis, Pawnee A; Dubrovsky, Konstantin; Harms, K N; Johnson, Wesley A; La Due Lake, Ronald; Marchesani, Stephen V; Messam, Ayeke P; Miller, Amanda K; Weissman, Cheryl A; Aug 2008; 132 pp.; In English
Report No.(s): AD-A485714; GAO-08-924; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485714

In 2004, Congress directed the Department of Defense (DoD) to establish a comprehensive policy to prevent and respond to sexual assaults involving service members. Though not required to do so, the Coast Guard has established a similar policy. In response to congressional requests and Senate Report No. 110-77, GAO evaluated the extent to which DoD and the Coast Guard have done the following: (1) developed and implemented policies and programs to prevent, respond to, and resolve sexual assault incidents involving service members; (2) ensured visibility over reports of sexual assault involving service members; and (3) exercised oversight over reports of sexual assault involving service members. To conduct this review, GAO reviewed legislative requirements and DoD and Coast Guard guidance; analyzed sexual assault incident data; and obtained through surveys and interviews the perspective on sexual assault matters of more than 3,900 service members. GAO is suggesting that Congress consider requiring the Coast Guard to submit data to Congress on reported sexual assaults involving its members. GAO is also making a total of 11 recommendations to improve implementation of DoD's and the Coast Guard's programs, such as by reviewing and evaluating guidance and training, and to improve oversight of the programs. DoD and the Coast Guard concurred with GAO's recommendations.
DTIC
Attacking (Assaulting); Coasts; Defense Program; Females; Policies; Prevention; Responses

20090001353 Northwestern Univ., Evanston, IL USA
Molecular Mechanisms in Compromised Endothelial Barrier during Breast Cancer Metastasis
Chew, Teng-Leong; Mar 2008; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0345
Report No.(s): AD-A485716; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485716

In this funding period (second of three years), we have completed the first specific as scheduled. We have successfully devised a novel assay system comprise of an engineered 3D vasculature network stably expressing a FRET-based biosensor for myosin light chain kinase (MLCK) activity. This set-up thus offers a very powerful assay system to directly study tumor invasion of the vascular system from the perspective of the endothelial cells. Using this assay, we have observed that endothelial cell MLCK signal is closely mediated by the interaction of the endothelial cells with the invading tumor. Our results implicated a biphasic endothelial signaling response to the interaction with metastatic tumor cells: (1) an initial, general, elevation of MLCK activity above baseline when the cancer cells crawl along the endothelial cell surface, (2) a more acute and marked increase in MLCK activity at the site of tumor entry during active invasion. We also observed that the majority of cancer cells enter the engineered vasculature system via the transcellular route (i.e. through individual endothelial cells), rather than through the paracellular mechanism (through cell-cell junctions), as conventionally believed. We are now actively characterizing the signal of MLCK as well as the reorganization of the actin-myosin network during this event.
DTIC
Blood Vessels; Breast; Cancer; Endothelium; Mammary Glands; Metastasis

20090001354 Children's Hospital of Pittsburgh, Pittsburgh, PA USA

New Advances in Molecular Therapy for Muscle Repair after Diseases and Injuries

Huard, Johnny; Li, Yong; Peault, Bruno; Deasy, Bridget; Xiao, Xiao; Clemens, Paula; Wang, Bing; Apr 2008; 142 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0406

Report No.(s): AD-A485717; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485717

Muscle injuries, especially pulls and strains, are among the most common and most frequently disabling injuries sustained by athletes and soldiers. Although injured muscles heal naturally, the regeneration is very slow and often yields incomplete functional recovery. In injured muscle, regeneration begins shortly after injury, but the healing process is rather inefficient and is hindered by fibrosis that is, scar tissue formation. More importantly, the scar tissue that often replaces damaged myofibers may contribute to the tendency of strains to recur. We have observed that TGF-beta 1 plays a central role in skeletal muscle fibrosis and, more importantly, that the use of antifibrosis agents that inactivate this molecule, such as suramin (a Food and Drug Association [FDA]-approved drug that prevents fibrosis due to skin disorders), can reduce muscle fibrosis and consequently improve muscle healing, resulting in nearly complete recovery after laceration or strain injuries.

DTIC

Diseases; Fibrosis; Injuries; Muscles; Musculoskeletal System; Therapy

20090001356 State Univ. of New York, Stony Brook, NY USA

Keratinocyte Spray Technology for the Improved Healing of Cutaneous Sulfur Mustard Injuries

Simon, Marcia; McClain, Steve A; Zimmerman, Thomas; Jul 2008; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0490

Report No.(s): AD-A485720; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485720

The purpose of the current research is to determine whether the spray-on application of allogeneic keratinocytes in suspension will improve epidermal wound healing of vesicating burns induced by the chemical warfare agent sulfur mustard (HD). A beige SCID mouse model is used for these experiments which are being carried out in two phases. The first phase is dose ranging. The second phase tests the efficacy of spray keratinocytes (Universal Donor) at healing HD injuries. Dose ranging was carried out using HD (0, 80, 160, 320 mug) in methylene chloride delivered to the dorsum of depilated mice within an 8 mm diameter cloning ring. Under these conditions, the vehicle control caused patchy epidermal and follicular necrosis. As expected, the HD treatment generated confluent epidermal and follicular necrosis, endothelial cell necrosis, thrombi, and extravasation of fibrin and inflammatory infiltrate in the loose connective tissue. Induction of inflammation was independent of necrosis. Because of the confounding effects of methylene chloride, dose ranging and phase II experiments will be conducted with HD diluted in ethanol.

DTIC

Epidermis; Healing; Injuries; Sprayers; Sulfur

20090001357 University of Southern Illinois, Springfield, IL USA

Solidago Virgaurea for Prostate Cancer Therapy

Watabe, Kounosuke; Apr 2008; 9 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0202

Report No.(s): AD-A485724; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485724

The treatment options for prostate cancer are currently quite limited. Hormonal treatment is the most effective therapy in advanced cancer, however, virtually all the patients who undergo hormonal therapy inevitably develop hormone-resistant tumor. Traditional screening of anti-cancer drugs has been mostly dependent on growth inhibition assay for cancer cells. However, targeting a specific gene with well-defined clinical rationale will provide a better chance of developing a more effective therapeutic agent. We chose a target called Fatty acid synthase (FAS) which we found to be strongly expressed in prostate cancer cells but not in normal cells. Importantly, an inhibition of the FAS expression causes specific tumor cell death. In this project, we plan to test the hypothesis that an active component of Solidago virgaurea specifically inhibits the FAS activity and induces apoptosis in prostate tumor cells. Our specific aims are (i) to elucidate the molecular mechanism of growth

inhibitory effect of S. virgaurea by defining the signal pathway and factors responsible for apoptosis, and (ii) to examine the effect of the active component of Solidago virgaurea on tumorigenesis in an animal model.
DTIC
Apoptosis; Cancer; Fatty Acids; Hormones; Prostate Gland; Therapy

20090001358 Delaware Univ., Newark, DE USA
Predicting Bone Metastatic Potential of Prostate Cancer via Computational Modeling of TGF-Beta Signaling
Cooper, Carlton R; Ogunnaike, Baratunde; May 2008; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0071
Report No.(s): AD-A485725; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485725

This hypothesis generation project involved the development of a computational model of the TGF-beta signaling pathway and investigating whether such a model can be used to generate hypotheses regarding metastatic potential of prostate cancer (PCa). The primary deliverable of the investigation is a comprehensive quantitative model of TGF-beta signaling that is representative of a wide variety of experimental data collected in different labs worldwide; the primary outcome is the following set of related conclusions: (i) it is possible to use such a model to predict metastatic potential of PCa,; but (ii) to do so appropriately requires a deeper quantitative understanding of the role of TGF- as a regulator of prostate gland function; and in this regard, (iii) that the primary role of TGF- as a tumor suppressor may still be intact so that the observed over-expression in poor prognosis PCa patients is due to changes in the PCa cells and not in the ligand.
DTIC
Bones; Cancer; Metastasis; Predictions; Prostate Gland

20090001359 California Univ., Irvine, CA USA
A Functional Genomic Analysis of NF1-Associated Learning Disabilities
Tang, Shao-Jun; Feb 2008; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0261
Report No.(s): AD-A485726; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485726

Learning disabilities severely deteriorate the life of many NF1 patients. However, the pathogenic process for NF1-associated learning disabilities has not been fully understood and an effective therapy is not available. This study was proposed to identify genes that are deregulated in the hippocampus of the Nf1+/- mouse model by DNA microarray analysis. Characterization of these NF1-affected genes will dramatically improve our understanding of the molecular pathogenesis underlying NF1- associated learning deficits. During the 2007/2008 year of the project, we have focused on bioinformatics analyses on the NF1-affected genes and their associated molecular pathways. In addition, we also performed extensive bioinformatics analyses to identify NF1-genes that are affected by lovastatin treatment in the NF1 hippocampus.
DTIC
Disabilities; Functional Analysis; Genome

20090001360 Meharry Medical Coll., Nashville, TN USA
Development of Meharry Medical College Prostate Cancer Research Program
Ukoli, Flora A; Mar 2008; 29 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0229
Report No.(s): AD-A485727; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485727

There is substantial urology oncology epidemiology nutrition and other expertise at Meharry and Vanderbilt addressing issues related to prostate cancer (PCa) disparity among African-American (AA) men and the six program new/junior minority investigators have maintained partnerships with VU mentors and established viable community network ties. Dr. Ukoli has recruited 105 participants into the lycopene study sent 192 stored plasma samples for lycopene analysis and received a DHHS 2-year funding for prostate cancer education intervention among low-income AAs. Dr. Washington recruited 200 participants into the PCa health care seeking behavior study is now analyzing the data and preparing a full grant proposal. Dr. Stewart completed her pilot project received independent funding to continue her PCa cell line studies two of her students received pre-doctoral awards and will apply for a CTSA grant for DNA extraction/genotyping to investigate genetic polymorphisms in PCa risk using 300 AA and Nigerians samples stored by Dr. Ukoli. Dr. Ogunkua's work continues to grow; he has now

dosed/sacrificed 60 mice recording data at all time-points and submitted one R21. Dr. Taher is revising his DOD career development grant that scored 2.5 presented two posters and currently working on a manuscript with the PI.
DTIC
Cancer; Medical Science; Nutrition; Prostate Gland; Universities

20090001361 Northwestern Univ., Evanston, IL USA
The Role of ERBP in Breast Cancer Progression
Zhu, Yijun; Sep 2007; 11 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0583
Report No.(s): AD-A485728; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485728

Metastasis, a process during which primary tumor disseminates into distal sites, likely occurs when primary tumor cells obtain additional genetic or epigenetic alteration. ERBP (estrogen receptor binding protein) is an estrogen receptor binding protein which potentiates the transcriptional activity of estrogen receptor. Unlike most coactivators which interact with AF2 domain of estrogen receptor, ERBP interacts with the DNA binding domain of estrogen receptor. The altered expression of ERBP could promote the metastasis through enhancing the expression of genes which are regulated by estrogen and are involved in the breast cancer metastasis. By overexpressing ERBP in breast cancer cells, we found ERBP overexpression enhanced the migration and invasion capability of tumor cells. ERBP overexpression also promoted the tumor formation in nude mice. We identified 8 estrogen inducible genes which were up-regulated by ERBP overexpression. Finally, we found that expression of ERBP is increased in about 30% of breast cancers.
DTIC
Breast; Cancer; Mammary Glands

20090001362 Texas Univ., Houston, TX USA
BATTLE: Biomarker-Based Approaches of Targeted Therapy for Lung Cancer Elimination
Hong, Waun Ki; Herbst, Roy; Mao, Li; Kim, Edward; Apr 1, 2008; 58 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0303
Report No.(s): AD-A485729; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485729

Lung cancer is the leading cause of cancer-related death in both men and women in the USA. Chemotherapy has reached its limit in improving the survival of lung cancer patients. Therefore, a different strategy must be waged in the battle against lung cancer. Targeted therapy, a newly emerged therapeutic approach in lung cancer, has succeeded in some cancer types and demonstrated its initial success in the treatment of lung cancer when a class of targeted agents termed epidermal growth factor receptor (EGFR) tyrosine kinase inhibitors, such as gefitinib and erlotinib, improved tumor response rates in patients with advanced nonsmall cell lung cancer (NSCLC), which was strongly correlated to the presence of EGFR mutations in the tumors (Cappuzzo and Hirsch et al., 2004; Cappuzzo and Magrini et al., 2004; Gatzemeier et al., 2004; Herbst and Giaccone et al., 2004; Herbst and Prager et al., 2004; Herbst and Sandler et al., 2004; Lynch et al., 2004; Kobayashi et al., 2005; Miller et al., 2004; Pao et al., 2004; Paez et al., 2004; Shepherd et al., 2004; Shigematsu et al., 2005). This has for the first time demonstrated the importance of selecting patients for individualized targeted therapy in NSCLC.
DTIC
Biomarkers; Cancer; Lungs; Therapy

20090001364 Rice Univ., Houston, TX USA
Control of Growth Within Drosophila Peripheral Nerves by Ras and Protein Kinase A
Stern, Michael; Feb 2008; 40 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0272
Report No.(s): AD-A485733; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485733

The long term goals of this research are to understand the mechanisms by whichNF1 and its partners control growth using the Drosophila peripheral nerve as our assay system. This system is advantageous because we can apply a number of powerful molecular genetic methodologies that are not available in other systems. Our major findings were generated from aim #4. We reported after year2 that Ras nonautonomously activates perineurial glial growth via PI3 Kinase, Akt and FOXO (published in the Journal of Neuroscience in 2007). Second, were port preliminary evidence that pushover (push) acts in the glia to

regulate perineurial glial growth, but in the neuron to regulate excitability. Third, we report that activation of the Tor pathway is necessary but not sufficient to increase perineurial glial growth. Fourth, we report that the metabotropic glutamate receptor regulates neuronal growth and excitability via PI3K.
DTIC
Cells (Biology); Drosophila; Nerves; Nervous System; Proteins

20090001365 Wayne State Univ., Detroit, MI USA
Synthetic Beta-Lactam Antibiotics as a Selective Breast Cancer Cell Apoptosis Inducer: Significance in Breast Cancer Prevention and Treatment
Dou, Q P; Mar 2008; 83 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0175
Report No.(s): AD-A485735; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485735

Activation of the cellular apoptotic program is a current strategy for the prevention and treatment of human cancer including breast cancer. Because of the ease of synthesis and structural manipulation, small molecules with apoptosis-inducing ability have great potential to be developed into chemotherapeutic drugs. The b-lactam antibiotics have for the past 60 years played an essential role in treating bacterial infections without causing toxic side effects in the host. We hypothesized that active N-thiolated b-lactams can target a tumor-specific protein(s) and selectively induce apoptosis in human breast cancer but not normal cells. In this report, we have designed and synthesized a number of beta-lactams with selected C3 and N1 ring substituents, and evaluated their potencies to inhibit proliferation and induce apoptosis in human breast cancer cells. We have also studied the biochemical targets of these b-lactams by performing microarray assay. Our results supported by this IDEA award strongly support our hypothesis that beta-lactams cause tumor DNA damage, which is responsible for their anti-tumor activities. Our studies have provided strong support for proof-of-concept of the potential use of these b-lactams in breast cancer prevention and treatment.
DTIC
Antibiotics; Apoptosis; Bacterial Diseases; Breast; Cancer; Health; Infectious Diseases; Mammary Glands; Prevention

20090001367 Texas Univ., Austin, TX USA
Genome-Wide Chromosomal Targets of Oncogenic Transcription Factors
Iyer, Vishwanath R; Apr 2008; 40 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0472
Report No.(s): AD-A485738; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485738

We proposed to develop a new genomic method named STAGE (Sequence Tag Analysis of Genomic Enrichment) to identify the direct downstream targets of transcription factors important in breast cancer. STAGE was based on high-throughput sequencing of concatamerized tags derived from DNA associated with transcription factors isolated by chromatin immunoprecipitation. We have successfully accomplished the original goals of the project. The advent of next-generation sequencing technologies (Solexa, 454) after the inception of this project provided new opportunities to enhance our original idea of developing sequencing based methods of target identification. We have taken advantage of the power of next generation sequencing, and applied it to several transcription factors important in cancer and cell proliferation. Since the binding and function of transcription factors is strongly governed by chromatin and positions of nucleosomes, we have also adapted the sequencing approach to identify positioned nucleosomes genome-wide at high resolution.
DTIC
Carcinogens; Chromosomes; Genome; Targets; Tumors

20090001369 Massachusetts General Hospital, Boston, MA USA
The Role of c-FLIP(L) in Regulating Apoptotic Pathways in Prostate Cancer
Olumi, Aria F; Dec 2007; 19 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0080
Report No.(s): AD-A485742; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485742

Abnormalities in programmed cell death (apoptosis) machinery play a crucial role in initiation progression and metastasis of prostate cancer. Therefore molecules that initiate pro-apoptotic pathways are excellent therapeutic agents in prostate cancer.

However some prostate cancer cells develop resistance to pro-apoptotic agents. In this proposal we are examining the regulatory mechanisms of c-FLIP(L) which is an important modulator of apoptosis in prostate cancer.
DTIC
Abnormalities; Apoptosis; Cancer; Genes; Prostate Gland

20090001370 California Univ., Los Angeles, CA USA
Interactions between IGFBP-3 and Nuclear Receptors in Prostate Cancer Apoptosis
Lee, Kuk-Wha; Jan 2008; 36 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0053
Report No.(s): AD-A485743; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485743

IGFBP-3 is a potent inducer of apoptosis in both androgen-dependent and androgen-independent prostate cancer lines. When the nuclear receptor RXRaIpha was described as an unexpected intracellular binding partner for IGFBP-3 and effects on DNA transcription were demonstrnted rapid effects of IGFBP-3 on programmed cell death (apoptosis) still could not be explained. These rapid effects on apoptosis were clarified when I hypothesized that IGFBP-3 was a biological signal for Nur77 nuclear receptor translocation to the mitochondria where an apoptotic cascade is initiated. We proposed to determine scientifically the protein regions in each of these important cell death molecules that essential for apoptotic action and demonstrate this observation with mouse models. Our data so far reveal a nuclear export sequence in IGFBP-3. Mutation of this sequence impairs its apoptotic activity. Utilizing the IGFBP-3 KO mouse we show that IGFBP-3's critical role in castration-induced apoptosis. Mating studies are underway to determine the effects of genetically deleting Nur77 and IGFBP-3 in the ontogeny of prostate cancer.
DTIC
Apoptosis; Cancer; Prostate Gland

20090001372 Duke Univ., Durham, NC USA
Collaboration around Research and Education (Care) in Prostate Cancer
Price, Marva M; Feb 2008; 39 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0090
Report No.(s): AD-A485746; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485746

Collaboration Around Research and Education (CARE) in Prostate Cancer is a partnership between two universities Duke University School of Nursing and Bennett College for Women (Bennett) an historically black college or university (HBCU). Our goal is to build a collaborative relationship between Duke University and Bennett that brings together students and faculty mentors to facilitate opportunities for underrepresented minority students to learn about prostate cancer research. To accomplish this goal we are capitalizing on the strengths of both universities to conduct a 10-week in residence didactic and hands-on training program to expose undergraduate students to prostate cancer prevention detection and control and basic science and clinical research. The objectives of the CARE program are to provide undergraduate nursing students with mentored experiential learning to (1) understand the burden of prostate cancer; (2) develop a beginning level of competence in technology resources for information gathering and data management in prostate cancer research; (3) obtain introductory knowledge about the research process; (4) gain hands-on experience in clinical and basic science laboratory methods and research processes and begin to understand community-based prostate cancer control activities; and (5) experience role model development for research and health care practice careers and begin to build networks with researchers and health professionals in a Research I environment. Four undergraduate students participated in this 10-week prostate cancer research mentored experience.
DTIC
Cancer; Education; Prostate Gland

20090001374 Cincinnati Univ., OH USA
Investigation of a Putative Estrogen-Imprinting Gene, Phosphodiesterase Type IV Variant (Pde4d4), in Determining Prostate Cancer Risk
Tang, Wan-Yee; Apr 2008; 74 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0373
Report No.(s): AD-A485748; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485748

Estrogens are known to play a role in the initiation and progression of prostate cancer. Recently, environmental factors

such as xenoestrogens have been reported on their prevalence of prostate diseases or cancers. Estrogen imprinting of the prostate gland is believed to associate with an increased incidence of prostatic lesions including inflammation, epithelial hyperplasia, squamous metaplasia, dysplasia and adenocarcinoma. And DNA methylation may be one of the possible mechanisms of the prostate reprogramming. By using one of the global methylation profiling techniques, MSRF, a gene called phosphodiesterase type IV variant 4 (PDE4D4) was shown to be hypomethylated following neonatal exposure to estradiol (EB) or bisphenol A (BPA). We further confirmed the persistence of PDE4D4 promoter hypomethylation and gene up-regulation in the adult life by using bisulfite genomic sequencing and real-time PCR. PDE4D4 has function of cAMP-degradation to maintain the second messenger, cAMP, in a narrow range of concentrations that is critical for growth and differentiation of the hormone target cells by activating several downstream signaling molecules. Taken together, these findings supported that PDE4D4 dysregulation, via CpG island hypomethylation, at its promoter regions in early life, by EB or BPA, can alter its expression and activity of the gene. Present data also suggested that PDE4D4 can be used as a biomarker for prostate cancer assessment.
DTIC
Cancer; Enzyme Activity; Estrogens; Genes; Prostate Gland; Risk

20090001375 Colorado Univ., Aurora, CO USA
Ethnicity and Prostate Cancer: Vitamin D Genetic and Sociodemographic Factors
Torkko, Kathleen C; Mar 2008; 41 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0234
Report No.(s): AD-A485749; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485749

During the first year of the grant, one paper was accepted for publication based on the grantees PhD work. This paper would not have been completed without the additional resources provided by this grant and the grant is duly acknowledged in the paper. One other paper was published in the year as a result of collaborations with some of the grantees mentors. Both papers examined differences in genetic polymorphisms in prostate cancer by race/ethnicity in a cohort of men from south Texas. Further research is underway as a panel of new SNPs has been chosen and samples are currently being genotyped. Genotyping should be completed by mid 2008. The planned sociodemographic survey has been delayed but is currently being developed and should be completed within the next funding year. The grantees health disparities training program is going well. The grantee has taken two classes related to her work (Chronic Disease Epidemiology and Analytic Epidemiology) and is currently teaching a graduate level introductory epidemiology class with a focus on studying health disparities. She attended the 'Science of Health Disparities' conference in Atlanta, GA from November 27-30, 2007.
DTIC
Calciferol; Cancer; Ethnic Factors; Genetics; Polymorphism; Prostate Gland

20090001376 Texas Univ., Houston, TX USA
Second-Generation Therapeutic DNA Lymphoma Vaccines
Kwak, Larry W; May 2008; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0345
Report No.(s): AD-A485751; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485751

The overall goal of our proposal is to develop a lymphoma vaccine for clinical study. Our vaccine strategy aims to activate immune cells that can recognize and eventually eliminate tumor cells. Lymphoma uniquely expresses a tumor-specific antigen termed 'idiotype.' By genetic modification we linked this lymphoma antigen with a type of small proteins that are able to recruit immune cells. When given to animals these vaccines profoundly induced tumor protection in lymphoma mouse models. In the proposed project we will perform a series of animal experiments to choose the best vaccine formulation for a future clinical trial with lymphoma patients. We will also try to understand how the vaccine provokes the immune system to kill tumor cells. The selected vaccine should demonstrate the most potent antitumor effect that is mediated by immune cells. We will initiate the clinical trial which is outside the scope of this project after these proposed studies are completed. Collectively these studies will enable us to develop a more potent lymphoma vaccine and translate it into clinical application.
DTIC
Antigens; Deoxyribonucleic Acid; Therapy; Tumors; Vaccines

20090001381 California Univ., San Francisco, CA USA

Characterizing the Role of 1p36 Deletion in Breast Cancer and Identifying Candidate Tumor Suppressors

Hackett, Christopher S; Apr 2008; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0458

Report No.(s): AD-A485774; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485774

Over 60% of human breast tumors display a deletion of one copy of the 1p36 region of the short arm of chromosome 1. Tumors with this deletion show a three-fold increase in mortality, suggesting a biological role for this deletion in tumor development, and suggesting the presence of one or more tumor suppressors in this region. Purpose: Characterization of the unique biology of tumors with 1p36 deletion, and characterization of the tumor suppressor(s) in the region may inform therapeutic strategies, and present unique therapeutic targets for this subset of breast cancer cases with relatively poor survival. Scope: The goals of this research project are to 1) develop a mouse model for 1p36 deletion in breast cancer by generating mice harboring loxP sequences flanking the deletion region, and crossing to tissue-specific Cre expressing mice, 2) perform in-vivo insertional mutagenesis in breast tumors using the two-component Sleeping Beauty transposon system (mutagenic transposons mobilized by a trans-acting transposase) to tag tumor suppressors and oncogenes during tumor development and 3) to combine these two systems to identify tumor suppressors in the 1p36 region. To date, we have modified targeting constructs, generated cohorts of mice for insertional mutagenesis, identified transposon insertion sites, and developed in vitro, transplant-based alternative approaches.

DTIC

Breast; Cancer; Deletion; Identifying; Mammary Glands; Suppressors; Tumors

20090001385 Vical, Inc., San Diego, CA USA

Rapid Vaccine Manufacturing Facility: Emerging Pathogen Countermeasures Response. Initial Proof of Concept Stage

Vilalta, Adrian; Domanico, Edward; Chaplin, Jennifer; Mar 15, 2007; 69 pp.; In English

Contract(s)/Grant(s): W911NF-05-1-0545

Report No.(s): AD-A485782; 070315; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485782

Initial feasibility of using PCR-generated DNA vaccines (LEC) was completed as outlined in our proposal of July 21, OS. Specifically we demonstrated that (a) manufacture of milligram amounts of LEC DNA vaccine against H3N2 and H1N1 influenza strains was possible using microplate PCR technology; (b)resulting LEC DNA could be purified and formulated with the cationic lipid delivery system Vaxfectin and (c) vaccination of mice with Vaxfectin-formulated LEC vaccine resulted in protection against a lethal viral challenge. In addition, objectives outlined in our Expanded Aims proposal of Feb 21,06 were met. Specifically, we compared the performance of LEC vaccination to that of pDNA vaccination using the mouse influenza challenge model. These data indicate that Vaxfectin-formulated pDNA outperformed Vaxfectin-formulated LEC at doses between 0.4 and 0.08 ug. Protection data for pDNA vs. LEC at doses 2 ug or above were statistically indistinguishable. We also evaluated one potential scalable PCR device concept Heat transfer characteristics of materials and fluids were determined and PCR amplification was attempted at the 10 and 100 mL reaction volumes. Although DNA amplification was unsuccessful, causes for this outcome were identified and potential solutions have been proposed.

DTIC

Countermeasures; Deoxyribonucleic Acid; Influenza; Manufacturing; Pathogens; Vaccines; Viruses

20090001395 Health Research, Inc., Buffalo, NY USA

Determinants of Weight Gain in Women with Early-Stage Breast Cancer

Hong, Chi-Chen; Apr 30, 2008; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0401

Report No.(s): AD-A485806; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485806

Weight gain after breast cancer diagnosis is common, and it has been associated with poorer prognosis. The goals of the study are to examine weight gain in relation to treatment-related changes in sex hormone levels, and to genetic polymorphisms in sex hormone pathways, accounting for potential interactions with energy balance, psychosocial factors, tumor characteristics, cancer treatment, and medication use. Since sex hormones and glucocorticoids regulate body weight and adipose tissue distribution, the authors hypothesize that sex hormones and cortisol play a role in treatment-induced weight gain, and that complex interactions exist with genetic susceptibility, lifestyle, and psychosocial factors. A prospective longitudinal study of weight gain is being conducted in 215 stage I to stage IIIA breast cancer patients. During the second year

of this grant, a supplementary questionnaire was developed to examine temperature perception after breast cancer diagnosis and treatment. Study data bases were developed for data entry of this questionnaire. Recruitment and followup of participants have continued, with a total of 226 patients recruited into the study. Of these, 31 patients have withdrawn from the study and 5 were lost to followup leaving a total of 190 participants. The authors are in the process of double entering all data collected by survey and checking and clarifying any differences that exist. Participant recruitment using consent forms with DoD language began January 2007 after obtaining institutional IRB and USAMRMC Human Research Protections approval. Sixty-six participants have been re-enrolled using this consent form, with 9 refusing reconsent, and 16 still in the process of being reconsented. The study will help identify women who are most susceptible to weight gain after being diagnosed with breast cancer, based on biologic characteristics as well as modifiable factors.
DTIC
Alcohols; Body Weight; Breast; Cancer; Chemotherapy; Females; Genetics; Hormones; Mammary Glands; Polymorphism; Sex; Steroids

20090001403 Albany Coll. of Pharmacy, Albany, NY USA
Enhancing the Efficacy of Chemotherapeutic Breast Cancer Treatment with Nonanticoagulant Heparins
Mousa, Shaker A; May 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0344
Report No.(s): AD-A485829; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485829

A mouse model of breast cancer with human breast cancer cell lines MCF7 (wild type) or MCF7-doxorubicin resistant (MCF7-R) cells was used evaluate the efficacy of low molecular weight heparins (LMWH) either alone or in combination with doxorubicin to prevent tumor growth. Tumor volume measurements were performed at intervals throughout the course of treatment. LMWH compounds (Enoxaparin or non-anticoagulant heparin NACH) given together with chemotherapeutic agent doxorubicin decreased tumor growth rate and prolong survival in animals bearing MCF7 wild-type tumors. These agents appeared to be less effective in animals bearing doxorubicin-resistant tumors. Bleeding times determined on animals in all treatment groups showed that there were no statistically significant differences among the groups. However, animals in ENOX groups showed increased bruising at the sites of injection. These studies will be repeated, and studies with alpha v beta 3-targeted nanoparticle formulations will be performed to compare the efficacies of non-targeted and targeted therapies.
DTIC
Breast; Cancer; Chemotherapy; Drugs; Heparins; Mammary Glands

20090001413 Library of Congress, Washington, DC USA
International Population Assistance and Family Planning Programs: Issues for Congress
Blanchfield, Luisa; Jul 24, 2008; 23 pp.; In English
Report No.(s): AD-A485852; CRS-RL33250; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485852

Since 1965, the U.S. Government has supported international population planning based on principles of volunteerism and informed choice that gives participants access to information on all methods of birth control. This policy, however, has generated contentious debate for over two decades, resulting in frequent clarification and modification of U.S. international family planning programs. In 1984, controversy arose over U.S. population aid policy when the Reagan Administration introduced restrictions, which became known as the 'Mexico City policy.' The Mexico City policy denies U.S. funds to foreign nongovernmental organizations (NGOs) that perform or promote abortion as a method of family planning -- even if the activities are undertaken with non-U.S. funds. Presidents Reagan and George H. W. Bush also banned grants to the U.N. Population Fund (UNFPA) due to evidence of coercive family planning practices in China. President Clinton resumed UNFPA funding and repealed the Mexico City policy in 1993. President George W. Bush, however, re-applied the Mexico City restrictions. Following a State Department investigation of family planning programs in China, the Administration suspended U.S. contributions to UNFPA in 2002, citing violations of the Kemp-Kasten amendment. This provision bans U.S. assistance to organizations that support or participate in the management of coercive family planning programs. The suspension of U.S. contributions to UNFPA has continued through FY2008. On December 26, 2007, the President signed into law H.R. 2764, the Consolidated Appropriations Act, 2008 (P.L. 110-161), which directs that $395 million be made available for bilateral family planning activities. The Act also designates $40 million for UNFPA if it is determined eligible under the Kemp-Kasten

amendment. On June 26, 2008, the Administration announced that UNFPA was ineligible for FY2008 funding under Kemp-Kasten.
DTIC
Appropriations; Federal Budgets; Law (Jurisprudence); Organizations; Planning; Populations; United Nations; United States

20090001447 Miami Univ., FL USA
Breast Cancer Therapy Using Antibody-Endostatin Fusion Proteins
Shin, Seung-Uon; Apr 2008; 77 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0351
Report No.(s): AD-A485939; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485939

The anti-angiogenic protein endostatin demonstrated considerable anti-tumor activity in animal models. However, limited anti-tumor activity has been observed in human Phase I/II trials. Trastuzumab has activity in HER2+ breast cancer used alone or in combination with chemotherapy. Prior studies using an anti-HER2 antibodymurine endostatin fusion demonstrated enhanced anti-tumor activity compared to anti-HER2 antibody or endostatin given alone or in combination. We generated two anti-HER2 human endostatin fusion proteins by fusing human wild type or a mutant form of human endostatin (huEndo-P125A) to the 3' end of a humanized anti-HER2 lgG3 antibody. HuEndo-P125A antibody fusion protein (alphaHER2-huEndo-P125A) inhibited VEGF and bFGF induced endothelial cell proliferation, and capillary formation in vitro, to a greater degree than wild type endostatin fusion protein (alphaHER2-huEndo), endostatin alone, or anti-HER2 antibody (alphaHER2 lgG3). Treatment of SKBR-3 breast cancer xenografts with anti-HER2 lgG3-huEndo-P125A fusion resulted in complete regression, and improved survival, compared to either alphaHER2 lgG3, human endostatin, or anti-HER2 lgG3-huEndo treated mice. alphaHER2-huEndo fusion proteins specifically targeted tumors expressing HER2 in mice simultaneously implanted with murine mammary tumor cell line EMT6 and EMT6 engineered to express HER2 antigen (EMT6-HER2). alphaHER2 huEndo-P125A fusion antibody showed enhanced anti-angiogenic and anti-tumor activity and inhibited EMT6- HER2 growth more effectively than huEndo ($p = 0.003$), or alphaHER2-huEndo ($p = 0.004$). Targeting anti-angiogenic proteins using antibody fusion proteins could improve clinical activity of anti-HER2 antibody and endostatin alike, and provides a versatile approach that could be applied to other tumor targets with alternative antibody specificities or using other antiangiogenic domains.
DTIC
Antibodies; Breast; Cancer; Mammary Glands; Proteins; Therapy

20090001450 ITT Corp., Alexandria, VA USA
Cancer Mortality in Populations in Kazakhstan Subjected to Irradiation from Nuclear Weapons Testing in China
Gusev, B I; Kurakina, N N; Sekerbaev, A Kh; May 2008; 137 pp.; In English
Report No.(s): AD-A485952; DTRA-TR-07-44; DTRA-01-03-0022; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485952

From 1964 to 1981, 24 surface and atmospheric nuclear explosions were conducted in China at the Lop Nor Test Site. As a result of these tests, freshly produced fission products appeared in objects in the environment and in milk in the population points of the Makanchy, Urdzhar, and Taskesken Districts of the Semipalatinsk Province, Kazakhstan, located 900-1,100 km away from the Chinese Test Site. The contamination levels varied within very wide ranges. The radionuclides, in transferring from objects in the environment into food products, led to biological effects on the human body. In 1984 the medical statistics authorities began to record a significant rise in fatal cases of cancer among the populations of the above-noted districts; this rise significantly exceeded the dynamics of cancer distribution in preceding years. Especially significant increases in fatal cancer cases were registered in such primary sites as breast and lung cancer. The purpose of this work was to estimate the effective radiation doses to the population of the southern portions of the Semipalatinsk Province as a result of nuclear weapons tests in China, and to establish a link in the excess cases of malignant cancer with irradiation of the population. In 11 cases, taking the wind into consideration, the Makanchy, Urdzhar, and Taskesken districts were contaminated by fission products. The radiation situation was reconstructed based on archival materials and measurements of the radioactivity in objects found in the environment and in locally produced food products. The internal radiation doses were

calculated based on the explosion parameters with regard to the time they were conducted and according to the results of measuring of milk samples taken in specific population points.
DTIC
Cancer; China; Contamination; Irradiation; Kazakhstan; Mortality; Nuclear Explosions; Nuclear Weapons; Populations; Radiation Dosage; Radioactivity

20090001458 Wayne State Univ., Detroit, MI USA
The Functional Effect of an Amphiregulin Autocrine Loop on Inflammatory Breast Cancer Progression
Willmarth, Nicole E; Ethier, Stephen P; Mar 2008; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-1-0405
Report No.(s): AD-A485987; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485987

We have previously shown that an AR/EGFR autocrine loop is required for SUM149 human breast cancer cell proliferation, motility and invasion. In the present studies, we demonstrate that SUM149 cells and human mammary epithelial MCF10A cells that over express AR (MCF10A AR) or are cultured in the presence of exogenous AR, express higher levels of EGFR protein compared with MCF10A cells cultured in EGF. We show that EGFR protein remains stable in the presence of AR yet is degraded in the presence of EGF. Consistent with this observation, tyrosine 1045 on the EGFR, the c-cbl binding site, exhibited decreased phosphorylation in the presence of AR compared with EGF. Ubiquitination of EGFR was also dramatically decreased when AR was the ligand. Following AR binding, EGFR remained on the cell surface instead of being rapidly internalized as observed when EGF was present. Immunofluorescence demonstrated that MCF10A cells cultured in EGF exhibited a predominantly intracellular, punctate localization of EGFR. In stark contrast, SUM149 cells and MCF10A cells growing in the presence of AR expressed EGFR predominantly on the membrane and at cell-cell junctions. Therefore, AR alters EGFR internalization and degradation in a way that favors accumulation of EGFR at the cell surface and ultimately leads to changes in EGFR signaling. In addition, we found that AR, but not EGF upregulates NFkB activity and IL-1 production suggesting that AR may play a unique role in breast cancer progression.
DTIC
Breast; Cancer; Mammary Glands

20090001459 Thomas Jefferson Univ., Philadelphia, PA USA
Prolactin Receptor Coupling to Jak-Stat Pathways in Breast Cancer
Neilson, Lynn; Aug 2007; 21 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0553
Report No.(s): AD-A485989; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485989

Prolactin receptors (PRLR) have been considered selective activators of tyrosine kinase Jak2 but not Jak1, Jak3 or Tyk2. We now report marked PRL-induced tyrosine phosphorylation of Jak1, in addition to Jak2, in a series of human breast cancer cell lines, including T47D, MCF7, and SKBR3. In contrast, PRL did not activate Jak1 in immortalized, non-cancerous breast epithelial lines HC11, MCF10A, ME16C, and HBL-100, or in CWR22Rv1 prostate cancer cells or MDA-MB-231 breast cancer cells. However, introduction of exogenous PRLR into MCF10A, ME16C, or MDA-MB-231 cells reconstituted both PRL-Jak1 and PRL-Jak2 signals. PRL activated Jak1 through a Jak2-dependent mechanism in T47D cells, based on disruption of PRL activation of Jak1 following Jak2 suppression by 1) lentiviral delivery of Jak2 shRNA, 2) adenoviral delivery of dominant-negative Jak2, and 3) AG490 pharmacological inhibition. Finally, suppression of Jak1 by lentiviral delivery of Jak1 shRNA blocked PRL activation of ERK and Stat3, and suppressed PRL activation of Jak2, Stat5a, Stat5b, and Akt, as well as tyrosine phosphorylation of PRLR. The data suggest that PRL activation of Jak1 represents a novel, Jak2-dependent mechanism that may serve as a regulatory switch leading to PRL activation of ERK and Stat3 pathways, while also serving to enhance PRL-induced Stat5a/b and Akt signaling.
DTIC
Breast; Cancer; Mammary Glands; Pituitary Hormones

20090001460 Dana Farber Cancer Inst., Boston, MA USA

Targeting Breast Cancers Featuring Activating Mutations in PIK3CA by Generating a Lethal Dose of PIP3

Zhao, Jean J; Feb 2008; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0341

Report No.(s): AD-A485990; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485990

Our research described here is relevant to the pathogenesis and a potential novel therapy for breast cancers. The PIK3CA is the most commonly mutated oncogene in breast cancer and loss of the tumor suppressor, PTEN, occurs frequently in patients suffering from this disease. The most significant accomplishment during the second year of funding is the mammary gland tumor model induced by conditional expression of an oncogenic PIK3CA allele which will allow us to determine the oncogenic role of PIK3CA in tumor initiation, progression, maintenance and metastasis etc. It should also significantly facilitate preclinical testing for the development of PI3K inhibitors for targeted therapy. Our final goal of simultaneous inactivation of PTEN and activation of PIK3CA will not only provide a new perspective on the relationship of the two key oncogene and tumor suppressor, PIK3CA and PTEN, and the signaling pathway under their control in cell regulation and oncogenic transformation, but also a potential novel therapy to all patients plagued with the common tumorigenic mutations. DTIC

Activation; Breast; Cancer; Dosage; Mammary Glands; Mutations

20090001461 Colorado Univ., Aurora, CO USA

In Vivo Role of Six1 in Mammary Gland Tumorigenesis

McCoy, Erica; Apr 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0409

Report No.(s): AD-A485991; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485991

Homeobox transcription factor Six1 has been associated with tumorigenesis and metastasis in a number of organ systems and has been implicated in proliferation, survival, and migration during normal development. Our research is aimed at utilizing mouse models to understand in the role of Six1 in the onset and progression of breast cancer. Most significantly, we have determined that Six1 is sufficient to induce tumor formation in the mammary glands of mice genetically engineered toinducibly overexpress the gene. The latency for tumor formation is between 12-21 months and the tumors that arise in these animals are very aggressive and have morphological features of an epithelial to mesenchymal transition (EMT), a phenomenon that has recently been suggested to contribute to metastasis. Further molecular analysis of these tumors has revealed a possible role for Six1 in initiating Wnt signaling, a pathway implicated in maintaining EMT and a stem cell fate that may contribute to tumorigenesis. Additionally, we have discovered that our inducible mouse model allows for leaky transcription of Six1 in the uninduced state. Interestingly, animals from this group acquire tumors at an increased frequency compared to those animals that are induced to express Six1, suggesting that even low levels of Six1 are capable, and may even be more efficient at initiating tumorigenesis compared to higher Six1 levels.

DTIC

In Vivo Methods and Tests; Mammary Glands

20090001462 Vanderbilt Univ., Nashville, TN USA

Understanding the Mechanism through which Matrix Metalloproteinases (Mmps) Contribute to Breast Cancer-Associated Osteolytic Lesions

Thiolloy, Sophie; Mar 2008; 9 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0320

Report No.(s): AD-A485994; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485994

Bone metastasis is a common event during breast cancer (BC) progression. Matrix Metalloproteinases (MMPs) are often overexpressed in BC and play an important role in tumor progression. Metastatic BC is typically osteolytic and we hypothesize that specific stromal and tumor MMPs contribute to the growth and development of osteolytic lesions. To address the role of individual stromal MMPs in vivo we used an intratibial model that recapitulates breast induced osteolysis. We demonstrated that stromal MMP-2 and MMP-7 are required for mammary tumor growth in the bone and the development of osteolytic lesions. However MMP-9 does not affect tumor growth and bone resorption in our model of mammary tumor-associated bone

lesions. These findings emphasize the need to delineate the role of specific MMPs in breast induced-bone osteolysis to hopefully open the way for new therapeutics.
DTIC
Breast; Cancer; Lesions; Mammary Glands

20090001464 Wisconsin Univ., Madison, WI USA
Phosphoinositide-Driven Epithelial Proliferation in Prostatic Inflammation
Jerde, Travis J; Jan 2008; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0092
Report No.(s): AD-A486000; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486000

With this proposal, we seek to determine the mechanisms for epithelial proliferation in response to inflammation, a process termed reactive hyperplasia . The purpose of this report is to evaluate the first year of research on this project. We found that interleukin signaling is critical to the hyperplastic response of the prostate, and that proliferation is driven in the epithelium of the prostate by phosphoinositide-dependent action, while stromal proliferation appears dependent on Jak-STAT signaling. We expanded this project in response to a startling discovery: a myriad of inflammatory mediators are expressed at high levels during organogenesis of the prostate, a process that, like reactive hyperplasia, is characterized by rapid epithelial proliferation. We found the interleukin-1 signaling is critical to epithelial proliferation during organogenesis. Future research will determine the mechanisms of IL-1 action in development and reactive hyperplasia in the prostate.
DTIC
Cancer; Prostate Gland

20090001468 Dartmouth Coll., Hanover, NH USA
Combined Contrast-Enhanced MRI and Fluorescence Molecular Tomography for Breast Tumor Imaging
Davis, Scott C; Mar 2008; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0367
Report No.(s): AD-A486028; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486028

A unique fluorescence molecular tomography system which couples fluorescence data acquisition into the bore of a clinical MRI to image the spatial distribution of fluorescence activity in tissue volumes has been developed and characterized. Signal-to-noise and system sensitivity to fluorophore concentration have been studied extensively. In homogeneous 70mm diameter cylindrical phantoms, the system shows a linear response to fluorophore concentration down to 1nM and is sensitive down to 10pM. Images in realistic phantoms simulating breast tissue reveal the importance of the complimentary MRI information, especially in cases where the tumor to normal tissue fluorophore uptake is less than perfect. Reconstructing images using tissue morphology information from simultaneously acquired MRI images recover tumor regions down to contrasts of 1.5 to 1 while images reconstructed without the MR information show no tumor specificity even at contrasts above 6 to 1.
DTIC
Breast; Cancer; Fluorescence; Imaging Techniques; Magnetic Resonance; Mammary Glands; Tomography; Tumors

20090001469 Alabama Univ., Birmingham, AL USA
Innate Anti-Breast Cancer Activity of (Gamma)/(Delta) T-Cells: A Novel Biological and Clinical Approach to the Treatment of Relapsed or Refractory Breast Cancer
Lopez, Richard D; Mar 2008; 6 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0342
Report No.(s): AD-A486034; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486034

We initially identified and characterized a CD2-mediated interleukin (IL)-12-dependent signaling pathway which inhibits apoptosis in mitogen-stimulated human -T cells. We have since exploited this pathway to develop the methodologies allowing the large-scale ex vivo expansion of viable apoptosis-resistant -T cells - an undertaking until now not possible. Importantly we have shown that apoptosis- resistant human -T cells retain significant innate major histocompatibility complex (MHC)-unrestricted cytotoxicity against a wide variety of human-derived tumor cell lines including human breast cancer cell lines. Our efforts related to this proposal have remained focused upon testing the hypothesis that -T cells - by virtue of their

innate ability to recognize and kill epithelial-derived malignancies - play an important role in regulating the initial growth or spread of breast cancer in vivo. In this progress report we discuss the findings we have made in the first and second years of this award. The human pre-clinical work is reported here as we have made some important progress in optimizing our ability to expand -T cells from patients with breast cancer. Data derived from animal studies using the syngeneic model of breast cancer are very preliminary but will be discussed briefly in this year's report. Problems encountered in the first two year - and their solutions - are discussed in this annual report.
DTIC
Breast; Cancer; Lymphocytes; Mammary Glands; Refractories

20090001470 Library of Congress, Washington, DC USA
Military Medical Care: Questions and Answers
Best, Jr, Richard A; Aug 4, 2008; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486035; CRS-RL33537; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486035

The primary mission of the military health system, which encompasses the Defense Department's hospitals, clinics, and medical personnel, is to maintain the health of military personnel so they can carry out their military missions, and to be prepared to deliver health care during wartime. The military health system also provides, where space is available, health care services in Department of Defense (DOD) medical facilities to dependents of active duty service members and to retirees and their dependents. The Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) was established in 1966 legislation as the military equivalent of a health insurance plan, run by DOD, for active duty dependents, military retirees and the dependents of retirees, survivors of deceased members, and certain former spouses. CHAMPUS reimburses beneficiaries for portions of the costs of health care received from civilian providers. As a follow-on to CHAMPUS, DOD established Tricare to coordinate the efforts of the services medical facilities. Tricare also provides beneficiaries with the opportunity to receive their care through a DOD-managed health maintenance organization (Tricare Prime), a preferred provider organization (Tricare Extra), or to continue to use regular CHAMPUS (now known as Tricare Standard). The military health system currently includes some 75 hospitals and 461 clinics serving an eligible population of 8.9 million. It operates worldwide and employs some 39,000 civilians and 92,000 active duty military personnel. Calculating the total cost of military medical spending is complicated by the different categories of funds involved; DOD statistics on total medical spending indicate a growth from $17.5 billion in FY2000 to an estimated $37 billion in FY2008 (the latter figure includes an accrual fund for future retirees).
DTIC
Clinical Medicine; Hospitals; Medical Services; Military Operations; Military Personnel

20090001471 California Univ., Irvine, CA USA
Sxr, A Novel Target for Breast Cancer Therapeutics
Verma, Suman; Apr 30, 2008; 15 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0453
Report No.(s): AD-A486068; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486068

One of the major challenges in breast cancer research is to develop new chemotherapeutic and chemopreventive agents particularly for non-estrogen dependent and drug-resistant estrogen dependent breast cancers. SXR activators were able to cause cell cycle arrest and apoptosis in ER and ER breast cancer cell lines in culture. Different SXR activators caused accumulation of p53 in ER breast cancer cells leading to increase in its target genes involved in apoptosis and cell cycle. Confirmation of these results in at least two ER breast cancer cell lines suggests validity of this model in estrogen dependent breast cancer. Establishment of loss of function studies in these cell lines confirmed the significance and requirement of SXR in these compounds led apoptosis. Moreover loss of function studies and microarray studies on estroger receptor negative cells lines in next year of funding will be able to establish the role of SXR as apoptosis inducer in estrogen receptor independent cells and its mechanism of action in these cell lines. This will provide opportunities for rational drug design and improvement of the efficacy of existing drugs that act through SXR.
DTIC
Amides; Breast; Cancer; Fatty Acids; Mammary Glands; Targets

20090001526 Parkinson's Action Network, Washington, DC USA
The Parkinson's Action Network (PAN) 14th Annual Forum
Rick, Amy C; Mar 2008; 12 pp.; In English
Contract(s)/Grant(s): W81XWH-08-1-0119
Report No.(s): AD-A486074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This conference grant supported the Parkinson's Action Network (PAN) 14th Annual Research and Education Forum for Parkinson's patients, their families/caretakers and advocates, held February 2 to 4, 2008 at the Hyatt Regency on Capital Hill, Washington, DC. This forum brought together some of the foremost doctors and scientists working on Parkinson's research to share their work with patients and leaders in the Parkinson's community. PAN's Research and Education Forum serves as a premier educational program for Parkinson's physicians, patients, researchers as well as leaders in the Parkinson's community. The primary goal of the Forum is to bring together these various stakeholders so that they can share information and learn about the latest developments in Parkinson's research. Through plenary sessions, workshops and networking opportunities, participants will learn about the latest research and discuss creative ideas for new research endeavors. Fundamental to the success of the Forum is the premise that visiting scientists and researchers can learn from each other and from Parkinson's patients and caregivers.
DTIC
Diseases; Medical Science

20090001527 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Vector Competence of Selected African Mosquito (Diptera: Culicidae) Species for Rift Valley Fever Virus
Turell, Michael J; Linthicum, Kenneth J; Patrican, Lisa A; Davies, F G; Kairo, Alladin; Bailey, Charles L; Jan 2008; 9 pp.; In English
Report No.(s): AD-A486086; TR-07-052; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Outbreaks of Rift Valley fever (RVF) in Egypt, Yemen, and Saudi Arabia have indicated the potential for this disease to spread from its enzootic areas in sub-Saharan Africa. Because little is known about the potential for most African mosquito species to transmit RVF virus (RVFV), we conducted studies to determine the vector competence of selected African species of mosquitoes for this virus. All eight species tested (Aedes palpalis (Newstead), Aedes mcintoshi Huang, Aedes circumluteolus (Theobald), Aedes calceatus Edwards, Aedes aegypti (L.), Culex antennatus (Becker), Culex pipiens (L.), and Culex quinquefasciatus Say, were susceptible to infection and all except Ae. calceatus, Ae. aegypti and Cx. quinquefasciatus transmitted RVFV by bite after oral exposure. Estimated transmission rates for mosquitoes that successfully transmitted RVFV by bite ranged from 5% for Ae. mcintoshi to 39% for Ae. palpalis for mosquitoes that fed on a hamster with a viremia >108 plaque-forming units of virus/ml. We did not recover RVFV from any of 3,138 progeny of infected female mosquitoes. RVFV is unusual among arboviruses in that it has been isolated in nature from a large number of species and that numerous mosquitoes and other arthropods are able to transmit this virus in the laboratory. The recent introduction and spread of West Nile virus into the Americas and the spread of RVFV to the Arabian Peninsula illustrates the potential for viruses, once enzootic in Africa, to spread to other parts of the world.
DTIC
Africa; Diseases; Fever; Infectious Diseases; Insects; Parasitic Diseases; Viruses

20090001529 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Heterogeneity in the A33 Protein Impacts the Cross-Protective Efficacy of a Candidate Smallpox DNA Vaccine
Golden, Joseph W; Hooper, Jay W; Jan 2008; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486088; TR-07-052; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We previously developed a gene-based vaccine, termed 4 pox, which targets four orthopoxvirus proteins (A33, L1, B5, and A27). Because any subunit orthopoxvirus vaccine must protect against multiple species of orthopoxviruses, we are interested in understanding the cross-protective potential of our 4 pox vaccine target immunogens. In our current studies, we focused on the A33 immunogen. We found one monoclonal antibody against A33, MAb-1G10, which could not bind the monkeypox virus A33 ortholog, A35. MAb-1G10 binding could be rescued if A35 amino acids 118 and 120 were substituted with those from A33. MAb-1G10 has been shown to protect mice from VACV challenge, thus our findings indicated a protective epitope differs among orthopoxviruses. Accordingly, we tested the cross-protective efficacy of a DNA vaccine consisting of A35R against VACV challenge and compared it to vaccination with A33R DNA. Mice vaccinated with A35R had greater mortality and more weight loss compared to those vaccinated with A33R. These findings demonstrate that despite high homology between A33R orthologs, amino acid differences can impact cross-protection. Furthermore, our results caution

that adequate cross-protection by any pan-orthopoxvirus subunit vaccine will require not only careful evaluation of cross-protective immunity, but also of targeting of multiple orthopoxvirus immunogens.
DTIC
Deoxyribonucleic Acid; Heterogeneity; Proteins; Smallpox; Vaccines; Viruses

20090001531 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Bacterial-based Systems for Expression and Purification of Recombinant Lassa Virus Proteins of Immunological Relevance
Branco, Luis M; Matschiner, Alex; Fair, Joseph N; Goba, Augustine; Sampey, Darryl B; Ferro, Philip J; Cashman, Kathleen A; Schoepp, Randal J; Tesh, Robert B; Bausch, Daniel G; Jun 6, 2008; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486093; No Copyright; Avail.: Defense Technical Information Center (DTIC)

BACKGROUND: There is a significant requirement for the development and acquisition of reagents that will facilitate effective diagnosis, treatment, and prevention of Lassa fever. In this regard, recombinant Lassa virus (LASV) proteins may serve as valuable tools in diverse antiviral applications. Bacterial-based systems were engineered for expression and purification of recombinant LASV nucleoprotein (NP), glycoprotein 1 (GP1), and glycoprotein 2 (GP2). RESULTS: Full-length NP and the ectodomains of GP1 and GP2 were generated as maltose-binding protein (MBP) fusions in the Rosetta strains of Escherichia coli (E. coli) using pMAL-c2x vectors. Average fusion protein yields per liter of culture for MBP-NP, MBP-GP1, and MBP-GP2 were 10 mg, 9 mg, and 9 mg, respectively. Each protein was captured from cell lysates using amylose resin, cleaved with Factor Xa, and purified using size-exclusion chromatography (SEC). Fermentation cultures resulted in average yields per liter of 1.6 mg, 1.5 mg, and 0.7 mg of purified NP, GP1 and GP2, respectively. LASV-specific antibodies in human convalescent sera specifically detected each of the purified recombinant LASV proteins, highlighting their utility in diagnostic applications. In addition, mouse hyperimmune ascitic fluids (MHAF) against a panel of Old and New World arenaviruses demonstrated selective cross reactivity with LASV proteins in Western blot and enzyme-linked immunosorbent assay (ELISA). CONCLUSION: These results demonstrate the potential for developing broadly reactive immunological assays that employ all three arenaviral proteins individually and in combination.
DTIC
Bacteria; Fever; Immunology; Proteins; Purification; Viruses

20090001535 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Susceptibility of Peruvian Mosquitoes to Eastern Equine Encephalitis virus
Turell, M J; O'Guinn, M L; Dohm, D; Zyzak, M; Watts, D; Fernandez, R; Calampa, C; Klein, T A; Jones, J W; Jul 2008; 7 pp.; In English
Report No.(s): AD-A486098; USAMRIID-TR-07-081; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Mosquitoes were collected in the Amazon Basin, near Iquitos, Peru, and used in experimental studies to evaluate their susceptibility to strains of eastern equine encephalitis virus (EEEV) that were isolated from mosquitoes captured within 20 Km of Iquitos. When fed on hamsters or chickens with a viremia of ~10(5) plaque-forming units (PFU) of virus per ml, Culex pedroi Sirivanakarn and Belkin, Aedes fulvus (Wiedemann), Psorophora albigenu (Peryassu), and Psorophora ferox (Von Humboldt) were susceptible to infection, while none of the Aedes serratus (Theobald), Culex vomerifer Komp, Culex gnomatos Sallum, Huchings, & Ferreira, Culex portesi Senevet and Abonnenc, or Culex coronator Dyar & Knab became infected, even though they fed on the same viremic blood sources. When these mosquito species fed on animals with viremias ~10(8) PFU per ml, Cx. pedroi, Ae. fulvus, Ps. albigenu, as well as Psorophora cingulata (Fabricius), were the most susceptible. Mosquito species were susceptible to both a Lineage II (Brazil-Peru) as well as a Lineage III (Argentina-Panama) isolate of EEEV. This study, combined with the repeated isolation of strains of EEEV from Cx. pedroi captured in the Amazon Basin region of Peru, indicate that Cx. pedroi is the primary enzootic vector of EEEV in this region.
DTIC
Diseases; Encephalitis; Insects; Viruses

20090001537 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Treatment of Hantavirus Pulmonary Syndrome
Jonsson, Colleen B; Hooper, Jay; Mertz, Gregory; Oct 14, 2007; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Viruses in the genus Hantavirus can cause one of two illnesses when transmitted from rodents to humans: hemorrhagic fever with renal syndrome (HFRS) or hantavirus pulmonary syndrome (HPS). Of the two diseases, HPS is more severe with

an approximate 40% mortality across the Americas. The high rate of mortality could be reduced if effective therapeutics could be discovered for treatment of this illness. Herein we review approaches being explored for the discovery of therapeutics for HPS and how they could be employed in treatment and prevention of disease.
DTIC
Signs and Symptoms; Therapy; Viral Diseases

20090001542 Duke Univ., Durham, NC USA
Design, Implementation, and Characterization of a Dedicated Breast Computed MammoTomography System for Enhanced Lesion Imaging
McKinley, Randolph L; Mar 2008; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0280
Report No.(s): AD-A486120; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall goal of this work was to design, implement, and characterize a novel dedicated mammotomography system for enhanced lesion detection. This novel system allows fully 3-D imaging of a pendant, uncompressed breast using novel 3-D complex orbit capabilities. A prototype system has been designed, developed, and extensively characterized with a number of figures of merit including SNR, dose efficiency, and contrast sensitivity. Results indicate the potential for sub dual-view dose uncompressed breast imaging. Observer studies have been performed to determine the lower limits of detectibility. Patient bed optimization has also been performed as well as system/bed positioning and tilt angles for optimal chest wall imaging and patient comfort. The outcome of this project is a fully functioning 3D dedicated breast imaging system ready for initial patient studies. In addition, the training provided by this grant has allowed the PI to continue on with further research and development of this system through SBIR and North Carolina state funding with the goal of commercialization.
DTIC
Breast; Computer Aided Tomography; Imaging Techniques; Lesions; Mammary Glands

20090001543 Tufts Univ., Boston, MA USA
Promotion of Epithelial to Mesenchymal Transformation by Hyaluronan
Krause, Silva; Jul 2007; 43 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0467
Report No.(s): AD-A486130; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The homeostasis observed in an organ is a consequence of a coordinated multidirectional communication between the epithelium and its microenvironment through physical and biochemical signals. An interruption of this communication can lead to the formation of cancer. One of the major components of mammary gland microenvironment, also called stroma, is hyaluronan (HA). It has been proposed that HA may induce malignant transformation in normal cells through interaction with its receptors. However, HA's function during normal mammary gland development is still unknown and we therefore wanted to elucidate its function during normal development before taking a closer look at its possible functions during breast cancer.
DTIC
Breast; Cancer; Mammary Glands

20090001544 Tennessee State Univ., Nashville, TN USA
Psychosocial and Cultural Barriers to Prostate Cancer Screening: Racial Comparisons
Hull, Pamela C; Mar 2008; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0425
Report No.(s): AD-A486131; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this project is to better understand the psychosocial and cultural factors affecting prostate cancer screening among African American and White men. It is a community-based participatory research project, which involves participation of local community members through a community steering committee. The first phase of the project was a focus group study (Year 1). The second phase used the focus group results to develop a questionnaire instrument (Year 2), and the third phase is to collect survey data on African American and White men (Years 2-3). The fourth phase is to analyze the survey data, and the final phase is to use the results to develop recommendations for interventions to increase informed decision-making about prostate cancer screening among African American and White men (Year 3). The qualitative data provided by the focus groups was used to develop a structured questionnaire with the input of our Community Steering Committee and research consultants.

The questionnaire went through several revisions, was pre-tested and the final draft is under review by the local and DOD human subjects review boards. Upon approval, a multi-stage random sample of 400 males will be surveyed.
DTIC
Cancer; Prostate Gland

20090001545 Cold Spring Harbor Lab., New York, NY USA
Detection of Genes Modifying Sensitivity to Proteasome Inhibitors Using a shRNA Library in Breast Cancer
Hannon, Gregory J; Mar 2008; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0249
Report No.(s): AD-A486132; No Copyright; Avail.: Defense Technical Information Center (DTIC)

By virtue of their accumulated genetic alterations, tumor cells may acquire vulnerabilities that create opportunities for therapeutic intervention. We have devised a massively parallel strategy for screening short hairpin RNA (shRNA) collections for stable loss-of-function phenotypes. We assayed from 6000 to 20,000 shRNAs simultaneously to identify genes important for the proliferation and survival of five cell lines derived from human mammary tissue. Lethal shRNAs common to these cell lines targeted many known cell-cycle regulatory networks. Cell line-specific sensitivities to suppression of protein complexes and biological pathways also emerged, and these could be validated by RNA interference (RNAi) and pharmacologically. These studies establish a practical platform for genome-scale screening of complex phenotypes in mammalian cells and demonstrate that RNAi can be used to expose genotype-specific sensitivities. We are applying these methods to study the drug Bortezomib (Velcade). Velcade is the first targeted therapeutic to the proteasome approved by the FDA for treatment against multiple myeloma and is currently in phase II clinical trials for breast and lung cancers. We are identifying genes that mediate resistance against Velcade that could serve as potential drug targets.
DTIC
Breast; Cancer; Genes; Inhibitors; Libraries; Mammary Glands; Ribonucleic Acids; Sensitivity

20090001546 Jackson (Henry M.) Foundation, Rockville, MD USA
Carcinogenicity of Embedded Tungsten Alloys in Mice
Kalinich, John F; Mar 2008; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-2-0025
Report No.(s): AD-A486133; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A variety of unique metal mixtures have entered the military arsenals of many countries in recent years. One such material is the tungsten alloys, which have been proposed as replacements for depleted uranium (DU) in armor-penetrating munitions. As a result, opportunities for exposure are increasingly likely. This leads to questions, similar to those originally surrounding DU, as to the health effects of exposure to the tungsten alloys, especially for embedded fragment exposures. The Armed Forces Radiobiology Research Institute (AFRRI) recently performed research that showed one of the militarily promising tungsten alloys to be a potent carcinogen when implanted in rats. The need to confirm the carcinogenicity of such alloys in another rodent species is an important second step required in biological as well as regulatory terms to better assess the cancer risk in humans. Results of this work will help in formulating policies for military surgeons who must treat personnel wounded by fragments of the alloys. Indications of unacceptable risks of exposure will also help determine the advisability of deploying (or developing) similar munitions. In year 2 of this project, despite a change in Principal Investigator, substantial progress has been made. Pellets for implantation were received and all mice in the 24-month experimental groups successfully implanted. At present, there have been no adverse health effects as a result of pellet implantation.
DTIC
Carcinogens; Embedding; Mice; Tungsten Alloys

20090001547 Maryland Univ. Baltimore County, Catonsville, MD USA
Novel MHC Class II Breast Cancer Vaccine Using RNA Interference (RNAi) to Down Regulate Invariant Chain (Ii)
Thompson, James A; May 1, 2007; 218 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0337
Report No.(s): AD-A486134; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our goal is to induce a strong CD4+ T cell response against tumor antigens by preferentially presenting endogenous tumor antigens via class II major histocompatibility complex molecules (MHC II). MHC II can present endogenous tumor antigens if expressed in the absence of Invariant chain (II). We have up-regulated MHCII and down regulated II without affecting MHC II expression in tumor cells. Using the key transcription factor class II trans-activator (CIITA) we have coordinately

up-regulated all class II MHC molecules (DR, DP, DQ) and associated molecules such as the Invariant chain in a Human mammary carcinoma (MCF10). We have successfully down regulated the invariant chain in MCF10 cells, up regulated for MHC II, using retroviral vectors that express siRNAs as hairpin loops. Immuno-fluorescence shows no down regulation of MHC II molecules on the cell surface after II was down regulated. We will test the ability of our vaccine to present tumor antigen by observing whether these cells can stimulate HER2/neu restricted CD4+ or CD8+ T cells. These tumor cells could be used as a vaccine stimulating both CD4+ and CD8+ T cells in close proximity inducing a powerful long-term immune response against tumor sharing common tumor antigen with the vaccine.
DTIC
Breast; Cancer; Mammary Glands; Ribonucleic Acids; Vaccines

20090001549 Meharry Medical Coll., Nashville, TN USA
Modulation of the Proliferation and Metastasis of Human Breast Tumor Cells by SLUG (IDEA)
Chaudhuri, Gautam; Apr 2007; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0466
Report No.(s): AD-A486136; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The objective of the project for the reporting period was to identify high affinity SLUG-regulated gene promoters from human breast cells. We over expressed 3xFLAG-tagged (C-terminal) human SLUG in the SLUG-negative MDA-MB-468 and MCF-7 cells through a lentiviral construct. Employing the ChIP-DSL techniques, we have identified 154 genes in the human breast cells that are tightly binding to the transcriptional silencer protein SLUG at the E2-boxes of their promoters. The gene promoters we are following up include those of claudin 7, VDR, UBE2D3 and dynactin 5. By mutational analysis, we identified two distinct motifs in the repressor domain of the SLUG protein as essential for the repressor function of SLUG. We further characterized the structure and function of the Pmotif of SLUG repressor domain as a unique CtBP1-recruiting site. We are planning to design peptide aptamer from the P-motif region of human SLUG protein and evaluate whether that aptamer can inhibit the repressor activity in vitro and in vivo.
DTIC
Breast; Cancer; Cells (Biology); Mammary Glands; Metastasis; Modulation; Peptides; Tumors

20090001550 Mayo Clinic, Rochester, MN USA
Assessment of Lymphedema Risk Following Lymph Node Dissection and Radiation Therapy for Primary Breast Cancer
Cheville, Andrea L; Sep 2007; 53 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0622
Report No.(s): AD-A486137; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Lymphedema is a common complication of primary breast cancer therapy. It is a chronic insidiously progressive and potentially devastating condition. Radiation increases patients lymphedema risk as conventional fields encompass functioning lymphatics. Fusion imaging technologies that combine anatomical and physiological data may identify these lymphatics and allow tailoring of radiation fields to minimize radiation exposure while preserving regional tumor control. This study uses SPECT scanning to localize lymphatics critical for arm drainage after surgical removal of axillary lymph nodes. The study has established the feasibility of using SPECT images to identify critical lymph nodes on high resolution CT scans used in radiation simulation. Furthermore the study has demonstrated that this technique allows precise quantification of radiation dosimetry delivered to lymph nodes critical for arm drainage. The study will test the hypothesis that increased arm volume correlates with high levels of radiation dosimetry delivered to critical lymph nodes. The fact that higher doses of radiation and larger radiation ports are associated with an increased incidence of lymphedema (volume up arrow > = 150ml.) particularly severe lymphedema (volume arrow up > = 400ml.) supports this hypothesis. The proposed study realizes the BCRP goals by elucidating a novel means of refining breast cancer treatment to minimize patients risk of developing the most prevalent and dreaded complication of conventional therapy lymphedema.
DTIC
Breast; Cancer; Dissection; Lymphatic System; Mammary Glands; Radiation Therapy; Risk

20090001551 McMaster Univ., Hamilton, Ontario Canada
The Role of the POZ-ZF Transcription Factor Kaiso in Breast Cell Proliferation and Tumorigenesis
Anstey, Michelle I; Apr 2008; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0263
Report No.(s): AD-A486139; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Kaiso is a member of the POZ-ZF family of transcription factors, first identified as a binding partner for the p120ctn cell

adhesion co-factor. Previous work in our laboratory showed that Kaiso was misexpressed in ~40% of human breast tumors and we also identified cyclin D1 as a putative Kaiso target gene. This project elucidated the mechanism by which Kaiso regulates cyclin D1 expression and the effects of this on breast cell tumorigenesis. Using minimal promoter assays, electrophoretic mobility shift assays and immunoblotting we showed how Kaiso regulates cyclin D1 expression. Our work to date demonstrates that Kaiso regulates cyclin D1 transcription through its binding properties (by binding to both sequence specific TCCTGCNA and methylated CpG sites within the promoter). We also demonstrated that Kaiso and p120ctn can modulate canonical Wnt signaling and activation of cyclin D1.
DTIC
Breast; Cancer; Cells (Biology); Mammary Glands; Regeneration (Physiology)

20090001552 Adelaide Univ., Australia
Disruption of the Circadian Rhythms of Gene Expression and the Development of Breast Cancer
Kennaway, David J; Feb 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0265
Report No.(s): AD-A486140; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project uses a mouse model to examine the effects of rhythm disruption on the expression of genes, the growth of breast cancer xenografts and spontaneous mammary tumours. Task 2: Task has been completed except for some additional gene expression assays. Task 3: Collection of tissues from the PyMT transgenic mice has been partially completed. Second cohort of animals are currently growing under the control and shiftwork simulation conditions. Task 4: A viable SCID+Clock 19 mouse colony has been established and expanded. These mice will be used in a xenograft experiment (Task 5). Task 6: We have commenced this Task and have demonstrated partial knock-down of Bmal1 expression. Experiments are continuing to clonally expand the cell lines and conduct functional assays on them.
DTIC
Breast; Cancer; Circadian Rhythms; Gene Expression; Genes; Mammary Glands

20090001553 California Univ., San Francisco, CA USA
Inclusion of Minority Patients in Breast Cancer Clinical Trials: The Role of the Clinical Trial Environment
Kaplan, Celia P; May 2008; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0254
Report No.(s): AD-A486142; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Clinical trials are the primary vehicle for transforming laboratory discoveries in breast cancer care into clinical practice. Enhanced participation by minorities in these trials is necessary to assess the effectiveness of advances in breast cancer care among major subpopulations and to ensure equity in the distribution of research benefits. However minority participation in clinical trials will likely remain low without research designed to understand the reasons for limited participation. To address persistent ethnic and socioeconomic disparities in cancer care including participation in research interventions need to assess the broader context of clinical trials and include the larger community where these trials take place. Our study examines the combined effect of these factors on minority referral. Due to challenges in contacting research team members (RTMs) we have developed a protocol to randomly sample clinical trial site locations to identify 100 RTMS to survey. Final versions of the survey instruments have been developed. Lastly a no cost extension has been obtained to complete the project due to changes in staffing and the principal investigator's leave of absence for health reasons. We have also added a new research team member to assist with the study.
DTIC
Breast; Cancer; Mammary Glands; Minorities; Patients

20090001555 Cincinnati Univ., OH USA
Antagonism of Taxol Cytotoxicity by Prolactin: Implication for Patient Resistance to Chemotherapy
Ben-Jonathan, Nira; Mar 2008; 60 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0359
Report No.(s): AD-A486144; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall objective of these studies is to examine the protective effects of prolactin (PRL) against anti-cancer drugs using MDA-MB-468 breast cancer cells and cisplatin as the experimental models. The major goal was to characterize the mechanism by which PRL provides chemoprotection. Progress has been made toward this goal as follows. First using flow cytometry we have established that cisplatin causes cell cycle arrest at the G2 phase. This was partially reversed by PRL.

Second we found that cisplatin induces cell death by increasing early and late apoptotic events. This was prevented by pretreatment with PRL which likely acts by affecting cisplatin-induced DNA double strand breaks. Future studies will continue to explore the mechanism of chemoprotection by PRL.
DTIC
Breast; Cancer; Chemotherapy; Mammary Glands; Patients; Pituitary Hormones

20090001557 John Wayne Inst. for Cancer Treatment and Research, Santa Monica, CA USA
Serum Genetic Markers as Surrogates of Prostate Cancer Progression
Hoon, Dave S; Apr 2008; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0261
Report No.(s): AD-A486146; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As proposed, we have successfully established assays to detect free tumor-related DNA marker(s) in serum of prostate cancer (PCa) patients and studied the potential use of the biomarker detection as surrogate genetic markers in monitoring PCa patients. Despite slight delay in the beginning, the program has moved expediently over the years from assay development and optimization to subject sample accrual and assessment. DNA markers involving allelic instability (Al; 6 markers) and methylation of genes (3 markers) with high specificity and sensitivity were screened and established. Of the 83 AJCC stage I-IV PCa patients studied, the proportion of patients demonstrating Al for greater or equal to 1 marker was 47% (38/81 patients). Methylation biomarkers were detected in 24/83 (28%) patients. By combining two DNA assays, the number of PCa patients positive for greater or equal to 1 methylated or Al marker increased to 52/83 (63%). The combined assays detected PCa in 15 of 24 (63%) patients with normal PSA levels. The combination of the DNA biomarker assays detected the presence of PCa regardless of AJCC stage of PSA level. The results obtained through this award demonstrate that tumor-related DNA marker serum assay may be used, independent of AJCC stage or PSA level, in identifying and monitoring patients with PCa.
DTIC
Cancer; Genetics; Markers; Patients; Prostate Gland; Serums

20090001559 Virginia Commonwealth Univ., Richmond, VA USA
Sildenafil and Phosphofiesterase-5 Inhibitors to Reduce Cardiotoxicity and Enhance the Response of Breast Tumors to Doxrubicin
Gewirtz, David A; Mar 2008; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0360
Report No.(s): AD-A486150; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In our studies of the interaction between sildenafil and adriamycin in breast tumor cells and cardiomyocytes, we have made the following observations. In breast tumor cells: 1. Sildenafil fails to protect various breast tumor cell lines against the toxicity of adriamycin. 2. Sildenafil moderately enhances the response to adriamycin in breast tumor cells .3. Sildenafil does not alter the extent of DNA damage induced by adriamycin in breast tumor cells. 4. Adriamycin promotes autophagy in breast tumor cells. 5. Sildenafil appears to increase sensitivity to irradiation in breast tumor cells. In cardiomyocytes: 1. Questions are raised relating to the role of reactive oxygen in the cardiotoxicity of adriamycin. 2. The combination of Herceptin with taxol or adriamycin is relatively toxic in cardiomyocytes. Based on these observations, we propose to further explore the basis for adriamycin cardiotoxicity as well as examining the capacity of sildenafil to protect the heart cells from the combination of Herceptin with Adriamycin and with taxol. We will evaluate the influence of sildenafil on autophagy and senescence in both breast tumor cells and cardiomyocytes. We will pursue the unexpected finding that sildenafil appears to increase sensitivity to radiation in the breast tumor cells by attempting to understand the mechanistic basis for this observation. We will also assess the impact of sildenafil on radiation sensitivity in the cardiomyocyte. These proposed studies are of significance because the heart is known to incur damage during irradiation of the breast during therapy for breast cancer.
DTIC
Breast; Cancer; Inhibitors; Mammary Glands; Tumors

20090001560 Alabama Univ., Huntsville, AL USA
Novel Magnetic Fluids for Breast Cancer Therapy
Mazuruk, Konstanty; Jan 2008; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0176
Report No.(s): AD-A486151; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The research goal of this project was to develop a novel class of magnetic fluids that exhibit thermo-regulating properties

attractive for a number of medical applications. These fluids could potentially surpass the functionality of currently available magnetic fluids used in hyperthermia A A novel class of nano-particles has been discovered that possesses an inherent self-limiting mechanism against overheating and it utilizes a different physical principle than the Curie point based principle. These systems have almost ideal for magnetic fluid hyperthermia self-limiting heating properties.
DTIC
Breast; Cancer; Ferrofluids; Mammary Glands; Therapy

20090001563 Stanford Univ., Stanford, CA USA
Selenium is a Chemotherapeutic Agent for the Treatment of Prostate Cancer
Knox, Susan J; Dec 1, 2007; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0160
Report No.(s): AD-A486154; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A large body of data suggests that selenium supplementation may be used as a chemopreventive strategy to reduce the risk of prostate cancer. In spite of this little is known regarding the use of selenium as a cancer therapy. High doses of selenite can deplete cells of the primary intracellular antioxidant glutathione and generate superoxide. The net effect of the metabolism of selenite is a profound alteration in the cellular redox status and generation of potentially lethal reactive oxygen species. We have characterized the tumor-selective killing properties of selenite in patient-matched pairs of normal and malignant prostate cells and demonstrated the ability of selenite to sensitize prostate cancer cells to ?-irradiation both in vitro and in vivo. Importantly we found that selenite does not sensitize intestinal and rectal mucosa to radiation in vivo using an intestional crypt stem cell survival assay. Recently we have also demonstrated that selenite inhibits androgen receptor expression and activity via a redox mechanism involving GSH superoxide and a redox sensitive transcription factor Sp1. The primary goal of this proposal was to generate pre-clinical data supporting the concept that selenite might be a novel chemotherapeutic agent for prostate cancer. Currently we are planning a phase I/II trial of selenite in patients with hormone refractory prostate cancer.
DTIC
Antioxidants; Cancer; Chemotherapy; Drugs; Glutathione; Hormones; Males; Prostate Gland; Selenium

20090001564 North Carolina Univ., Chapel Hill, NC USA
Cortical-Cortical Interactions And Sensory Information Processing in Autism
Tommerdahl, Mark; Apr 30, 2008; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0287
Report No.(s): AD-A486156; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There are two specific aims or categories of deliverables to be accomplished as tasks in this DoD sponsored research: The first specific aim is the hardware design and fabrication of a portable tactile diagnostic stimulator that can be used for the assessment of the cerebral cortical health of neurologically compromised subjects in particular, those subjects with autism. The second specific aim is the development of tactile discriminative protocols that will be used for the evaluation of the differences in cerebral cortical function between subjects with and without autism. In this first year of research, all the milestones listed for Y01 in the Statement of Work were met.
DTIC
Central Nervous System; Cognition; Data Processing; Imaging Techniques; Magnetic Resonance

20090001565 Minnesota Univ., Minneapolis, MN USA
Development of a Tumor Histologic-Specific, Nano-Encapsulated Contrast for Enhancing Magnetic Resonance Imaging of Prostate Cancer
Slaton, Joel W; Apr 2008; 15 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0216
Report No.(s): AD-A486158; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Imaging of both metastatic and localized prostate cancer (CaP) remains a challenge. Our collaborators at GeneSegues, Inc. have developed the nanocapsule, a novel technology that, when coated with antibodies against specific cell types, is capable of delivering large cargos intracellularly into these specific cells. This project proposes to use nanocapsules to carry a contrast agent to human CaP cells growing in mice to enhance MR detection of cancer. Our work in the first year has focused on in vitro construction of a standard nancapsule around a variety of ferrous oxide particle which we have successfully completed. We have demonstrated reproducible in vitro uptake monitored by i) morphology (atomic force microscopy, AFM), ii) surface charge (zeta potential by dynamic light scattering) iii) incorporation (colorometric assay, ICP-AES), iv) cellular proliferation

by thymidine incorporation and v) cellular uptake by iron histology. Cue to collapse of 35 W bridge, our MR collaborator's lab was shut down and has now just about to open delaying our in vivo MR work. We have recruited a second MR collaborator, Gregory Metzger, who is assisting with in vitro phantom work.
DTIC
Cancer; Imaging Techniques; Magnetic Resonance; Prostate Gland; Tumors

20090001568 Pennsylvania State Univ., University Park, PA USA
The Role of Osteoblast-Derived Inflammatory Cytokines in Bone Metastatic Breast Cancer
Bussard, Karen M; Mar 2008; 111 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0363
Report No.(s): AD-A486164; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Breast cancer (BC) has a predilection for bone metastases. While the mechanism for directional metastasis is unknown, the bone microenvironment likely provides a fertile soil for metastatic BC cells. Besides affecting osteoblast (OB) and osteoclast (OC) properties, we have evidence that metastatic BC cells further create a unique bone niche by co-opting osteoblasts to increase production of inflammatory cytokines that may be chemoattractants, growth, or maintenance factors for cancer cells or OCs. Our purpose is to determine how OB-derived cytokines influence BC metastases to bone. Goals include investigating the production of OB-derived cytokines in response to BC cells or their conditioned medium (CM), the production of bone-derived cytokines in response to BC cells in vivo, the presence of functional cytokine receptors on OBs and BC cells, and the chemoattractant effect of OB-derived cytokines on BC metastasis. Using murine osteoblasts and human non-osteoblast variants, we found that BC CM treatment increased osteoblast-derived cytokine secretion of IL-6, KC, VEGF, MIP-2, and MCP-1. Maximum induction of osteoblast-derived cytokine secretion occurred with 20 day old cells. Human metastatic BC cells produce very small quantities of MCP-1. When osteoblasts and non-osteoblasts were placed in a co-culture system, nonosteoblast- derived cytokine production decreased significantly from baseline amounts. Murine bone cell-derived cytokine production increased when human metastatic cancer cells were present in the bone microenvironment.
DTIC
Bones; Breast; Cancer; Mammary Glands; Metastasis; Osteoblasts

20090001570 Colorado State Univ., Fort Collins, CO USA
Characterization of Mediators of Cardiac And Renal Development in Response to Increased Prenatal Testosterone
Maresh, Ryan W; Aug 1, 2008; 117 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486166; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During fetal development, a complex interaction between numerous growth factors, receptors, and signaling pathways takes place to establish the regulation of the various hormonal and metabolic functions necessary for normal development, both during the fetal period as well as later in life. Alterations in the fetal environment during this time can modify normal gene expression, protein concentrations, metabolic cascades, and other physiologic functions. Exposure to excess prenatal androgens has been previously shown to cause growth restriction, alter sexual development and function, and cause the onset of symptoms that closely resemble those seen in women with polycystic ovary syndrome, including the metabolic syndrome. Previously reported differences in cardiac and kidney weights at 21 months of age of female offspring from ewes treated with testosterone during early- to mid-gestation suggested the development of systemic hypertension. This observation led to the current study to evaluate if prenatal androgen excess influences cardiovascular development and can lead to adulthood disease by altering the expression of key mediators in the heart and kidneys, as well as if it can alter metabolic mediators important in glucose regulation. Pregnant Suffolk ewes were assigned to either a control or a prenatal testosterone treatment group. The treated ewes received twice weekly im injections of 100 mg testosterone (T)-propionate in 2.4 ml cottonseed oil from days 30 - 90 of gestation (term = 147). The control ewes received im injections of vehicle only.
DTIC
Adrenal Gland; Cardiovascular System; Heart; Hormones; Physiological Responses; Renal Function

20090001571 Georgetown Univ., Washington, DC USA
The Role of ABC Proteins in Drug Resistant Breast Cancer Cells
Lekostaj, Jacqueline K; Apr 2008; 34 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0454
Report No.(s): AD-A486167; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This predoctoral training grant, supported by the Department of Defense Breast Cancer Research Program (BCRP) of the

Office of the Congressionally Directed Medical Research Programs (CDMRP), aims to study the possible role of ABC transporters in pleitropic drug resistance, using a combination of molecular biological, biochemical, and biophysical methods. The second year of funding was spent working with a member of a drug/metabolite transporter superfamily called the Plasmodium falciparum Chloroquine Transporter (PfCRT). While PfCRT is known to be the main molecular determinant of chloroquine resistance, there is only indirect proof of its interaction with the drug. Therefore, I have employed a methodology commonly applied to drug resistance proteins (such as human P-glycoprotein) and labeled PfCRT with a photoaffinity drug analogue. A manuscript is currently in preparation detailing my results.
DTIC
Breast; Cancer; Drugs; Mammary Glands; Proteins

20090001572 Chicago Univ., Chicago, IL USA
Optimization of Tomosynthesis Imaging for Improved Mass and Microcalcification Detection in the Breast
Xia, Dan; Apr 2008; 19 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0431
Report No.(s): AD-A486168; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this research is to obtain systematic understandings of the effects of various physical factors that are important in breast tomosynthesis imaging and to develop techniques for effectively dealing with their effects and for reducing radiation dose. During the second year of the project we have achieved fruitful results based upon the progress made in our first year of the project. Specifically we have further investigated the performance of the total-variation (TV) based algorithm under different data conditions and different constraint parameters. Furthermore we have also proposed and investigated a new tomosynthesis imaging method with non-planar trajectories for yielding more data information with the same amount of imaging dose. We have also simulated the scatter in tomosynthesis breast imaging by convolving the ideal projection data with angular dependent scatter kernel.
DTIC
Breast; Cancer; Computer Aided Tomography; Detection; Imaging Techniques; Mammary Glands

20090001573 Stanford Univ., Stanford, CA USA
Immunology, Systems Biology, and Immunotherapy of Breast Cancer
Lee, Peter P; Mar 2008; 37 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0417
Report No.(s): AD-A486170; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In year 2, we made substantial progress in multiple areas. We have an efficient system in place to recruit patients into this study and procure their samples. However, limited numbers of subjects available and limited amounts of clinical materials available from each subject remain major challenges to the success of this project-we continually attempt to address and solve this issue. We have developed a powerful set of immunological assays and molecular tools to study these samples in greater detail than previously possible. We are constantly striving to minimize the numbers of cells we need to generate useful data, and have to make decisions to pursue only the most promising assays with many samples. We are beginning to uncover dramatic changes in the immune cell populations within tumors, TDLNs, and peripheral blood from breast cancer patients. These will provide important insights into how breast cancer alters the host immune system. We look forward in the coming year to build upon the early data we are generating to come up with meaningful observations and insights into the immunobiology of breast cancer. In the coming year and beyond, we will also begin to make progress on the systems biology that will ultimately position us for the immunotherapy of breast cancer.
DTIC
Breast; Cancer; Immunology; Mammary Glands

20090001575 Colorado Univ., Aurora, CO USA
Modification of BRCA1 Breast Cancer Risk by Coffee Consumption: Potential Mechanisms for Biologic Effect
Holt, Jeffrey; Aug 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0617
Report No.(s): AD-A486173; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study was to investigate the role of coffee and caffeine in the function of the DNA repair protein BRCA1 and to determine whether or not coffee and/or caffeine prevent BRCA1 hereditary breast cancer. We have bred the necessary genetically engineered mice for the animal study to determine whether coffee decaffeinated coffee or caffeine

prevents BRCA1 hereditary breast cancer. We applied for a no cost extension to complete these studies during the next year so we will know whether or not caffeine prevents breast cancer in the animal model. We have also analyzed the 1853 mutation in the BRCA1 mutant cell line HCC1937 and shown that is unaffected by DNA damaging agents including caffeine although the full length wildtype BRCA1 protein is affected. We also show that the BRCA1 mutant proteins 1853 and Cys61Gly show a loss of nuclear localization and are defective in DNA repair and radiation response. We are preparing a manuscript to report this finding.
DTIC
Breast; Caffeine; Cancer; Coffee; Genes; Mammary Glands; Mutations; Risk

20090001585 Pennsylvania State Univ., University Park, PA USA
A New In Vitro Model of Breast Cancer Metastasis to Bone
Mastro, Andrea M; Apr 2008; 78 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0432
Report No.(s): AD-A486212; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The use of a bioreactor system has permitted the growth of osteoblasts lines and primary osteoblasts into osteoid, bone-like tissue. Over the course of months in culture, pre-osteoblasts matured to osteoblasts and eventually to osteocyte-like cells. This is the first system, that we are aware of, that permits this full range of osteogenesis. The system supports the growth of primary osteoblasts as well as osteoblast lines. The addition of breast cancer cells to the cultures, brought about profound effects on the osteoid tissue. The osteoblasts changed from cuboidal to spindle shaped and were less adherent to the substrate. The cancer cells aligned themselves with the osteoblasts into an Indian filing pattern. The breast cancer also penetrated the osteoid tissue. Extracellular matrix was degraded. These interactions of breast cancer cells with osteoblasts in vitro have not been previously detected. With both the primary osteoblasts and the MC3T3-E1 cell line, the cancer cells inhibited osteoblast gene expression of osteoblast differentiation proteins, but stimulated production of inflammatory cytokines. Microarray data of osteoblasts treated with growth medium versus conditioned medium from MDA-MB231 breast cancer cells supported the switch in pattern from differentiation to inflammation. In addition the microarray data indicated that several adhesion molecules were down regulated. Taken together, these data suggest that the osteoblasts in the bioreactor mimic those in metaphyseal areas of bone. The system should be useful as an in vivo surrogate.
DTIC
Bones; Breast; Cancer; In Vitro Methods and Tests; Mammary Glands; Metastasis

20090001586 Beth Israel Deaconess Medical Center, Boston, MA USA
The Role of ADAM9 in Tumor-Stromal Interactions in Breast Cancer
Fry, Jessica L; Apr 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0460
Report No.(s): AD-A486213; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The tasks outlined in the Statement of Work for the second year of research on the action of ADAM9 isoforms in tumor-stromal interactions focused on the role of endogenous ADAM9 in breast cancer cell migration, and the elucidation of which major function of the protein is mechanistically relevant to cell migration. The major developments during this research period were the creation of an shRNA model system to evaluate the silencing of endogenous ADAM9 isoforms in breast cancer cell lines, and the reconstitution of gene expression with wild-type or functional mutants of both ADAM9 isforms to evaluate the distinct roles the functions of ADAM9 play in mediating cell migration.
DTIC
Breast; Cancer; Mammary Glands; Tumors

20090001587 Florida International Univ., Miami, FL USA
Inhibition of Estrogen-induced Growth of Breast Cancer by Targeting Mitochondrial Oxidants
Roy, Deodutta; Felty, Quentin; Kunkle, Brian; Apr 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0468
Report No.(s): AD-A486214; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have completed proposed research of the Second Year Task (iii) and the part of Task (iv) by studying: (a) Foci Formation, (b) Anchorage-independent cell growth, and (c) tumor spheroid formation using new 3D HuBiogel bioassay whether estrogen induced conversion of normal cells to transformed cells is inhibited by treatment with antioxidants, over expression of MnSOD, catalase, PrxIII, Trx2; or mtTFA silencing. Normal breast epithelial cells respond to E2 in terms of

producing ROS very similar to breast cancer cells. E2 treatment to MCF-10A cells increased the formation of ROS. Over expression of catalase or silencing of mtTFA prevented E2-induced anchorage-independent growth of MCF-10A cells. We observed similar results using 3-D culture of transformed cells. These results support ROS functioning as signal molecules in E2-induced cell transformation. These findings suggest that, in addition to the receptor activity of E2, E2-generated ROS may promote susceptibility to malignant transformation. Thus our results suggest: (1) a new paradigm that estrogen-induced oxidants control cell transformation and invasiveness of transformed cells, and (2) provide the basis for the discovery of novel antioxidant-based drugs or antioxidant gene therapies for the prevention and treatment of estrogen-dependent breast cancer.
DTIC
Breast; Cancer; Estrogens; Mammary Glands; Mitochondria; Oxidizers

20090001588 Texas Univ. Health Science Center, Houston, TX USA
The Integrative Studies of Genetic and Environmental Factors in Systemic Sclerosis
Zhou, Xiaodong; May 2008; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0277
Report No.(s): AD-A486215; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During this first year of the project, we established 60 primary fibroblast strains from normal controls and SSc patients who have been genotyped with HLA markers. We performed stimulation assays with silica and/or carbon, titanium particles in 60 primary fibroblast strains. Our results showed that both silica and carbon particle can activate fibroblasts toward fibrotic changes. To develop a comprehensive statistical analysis in study of dynamic properties of fibroblasts, we employed widely used state-space equations in systems science to model biological systems, and used expectation-maximization (EM) algorithms and Kalman filter to estimate the parameters in the models. We applied the developed state-space models and performed dynamic analysis of gene expression of partial TGF beta pathway in both normal and SSc fibroblasts stimulated by silica. In comparing fibroblasts from SSc patients and normal controls, we demonstrated that SSc fibroblasts are unstable and less controllable in response to silica stimulation, which may contribute to susceptibility of SSc fibroblasts to fibrotic changes. Next step, we will identify which genetic components inside SSc patients contribute to these changes and to susceptibility to environmental stimuli. Therefore, our studies are fulfilled with original proposal in the grant.
DTIC
Fibroblasts; Fibrosis; Genetics

20090001590 California Univ., Riverside, CA USA
The Role of Constitutively Active Prolactin Receptors in the Natural History of Breast Cancer
Huang, Kuang-tzu; Apr 2008; 7 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0448
Report No.(s): AD-A486217; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prolactin receptor (PRLR) is a single transmembrane receptor that normally requires ligand-binding to trigger intracellular signaling. Several isoforms of the human PRLR have been identified, including a long form (LF) and two short forms (SF1a and SF1b). These isoforms share identical amino acid sequence in the extracellular domain, but different cytoplasmic domain as a consequence of alternative splicing. The extracellular domain consists of two fibronectin-like subdomains, S1 and S2. Recently we have identified the existence of naturally-occurring S2 deleted (delta S2) variants in several human cancer cell lines. We also showed that these human delta S2 isoforms were constitutively dimerized in the absence of added PRL. When overexpressed in human breast cancer cells (T-47D) driven by a Tet-responsive promoter, the short isoform delta S2 SF1b produced prolonged activation of ERK and up-regulated both the cell cycle inhibitor, p21, and the milk protein, beta-casein. In this report, a soluble receptor lacking the S2 subdomain is also described. This isoform, termed SS1, is downregulated in human breast cancer and is capable of modulating PRL-stimulated signaling in T-47D cells.
DTIC
Breast; Cancer; Mammary Glands; Pituitary Hormones

20090001591 Pittsburgh Univ., Pittsburgh, PA USA
Inhibition of Prostate Cancer Skeletal Metastases by Targeting Cathepsin K
Zhang, Jian; May 2008; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0028
Report No.(s): AD-A486219; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The prostate cancer (PCa) metastasis processes are facilitated by proteolytic cascade involving cathepsin K (CatK). CatK

expression level is higher in PCa bone metastatic sites than primary tumor or normal prostate tissues. The role of CatK in PCa skeletal metastasis, however, is not known. We first confirmed the expression of CatK in LNCaP, C4-2B, and PC3 PCa cell lines. Then, we observed the inhibitory effect of CatK inhibitor on the PCa cell invasion suggesting the role of CaK in PCa tumor invasion. Finally, we injected C4-2B cells into the tibiae of SCID mice and then the animals received either vehicle or Cat K inhibitor for 8 weeks either at the time of tumor cells injection (tumor establishment model) or 4 weeks after tumor cells were injected (tumor progression model). In the tumor establishment model, CatK inhibitor significantly prevented the establishment of mixed osteolytic/osteoblastic tibial tumors as were observed in vehicle-treated animals. In the progression model, CatK inhibitor diminished tumor-induced bone lesions. We conclude that CatK inhibitor is an effective drug to prevent the establishment and diminish progression of PCa growth in bone. The overall goal of this project is to identify a clinically relevant strategy to inhibit PCa skeletal metastasis.
DTIC
Bones; Cancer; Metastasis; Musculoskeletal System; Prostate Gland

20090001592 Oklahoma Univ., Oklahoma City, OK USA
Improved Therapeutic Regimens for Treatment of Post-Traumatic Ocular Infections
Callegan, Michelle C; May 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0280
Report No.(s): AD-A486220; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Greater than 10% of battlefield injuries occur to the eyes, resulting in significant morbidity. The potential for ocular infection by trauma is high, due to the types of organisms encountered in arid environments and the delay between time of injury and adequate treatment. This proposal was designed to analyze the effectiveness of antibiotics, anti-inflammatory drugs, and non-conventional agents targeting bacterial and host virulence factors, with the goal of improving the outcome of infections that would otherwise result in significant vision loss. The first year results highlight the need for prompt and aggressive therapy (intravitreal administration) in preventing inflammation and vision loss. Delays in treatment result in vision loss, but may not result in loss of globe architecture. The use of anti-inflammatory agents with antibiotics for intraocular infections has been controversial, and our results add little to clarify whether these drugs are of any benefit during therapy. These studies have provided new information on improvements in treatment regimens that preserve vision and ocular architecture. Further analysis of conventional and non-conventional therapies will identify those that may be implemented for future treatment of blinding bacterial infections of the eye.
DTIC
Bacterial Diseases; Drugs; Eye (Anatomy); Infectious Diseases; Injuries; Therapy; Vision

20090001594 Army Research Inst. of Environmental Medicine, Natick, MA USA
The Military Health Issues in Occupational and Environmental Health
Proctor, Susan P; Jan 2008; 10 pp.; In English
Report No.(s): AD-A486224; MISC07-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Military occupational and environmental health encompasses the life-cycle of military personnel, from the time of entry (accession) into the service, throughout training and readiness phases, over specific and potential multiple missions and deployment cycles, as well as when attending to long-range health and disease prevention needs. This chapter provides an overview of occupational and environmental health issues of significance for military service personnel. The chapter is organized into three sections: i) health hazard issues surrounding military service during peacetime or garrison (at home) duty, ii)health hazard issue pertaining to mobilization and deployment, and iii) longer-term health issues. Content areas are drawn primarily from US military experiences, but it is recognized that a number of the issues and experiences are common within the international military communities.
DTIC
Health; Medical Services; Military Operations; Occupational Diseases

20090001595 University of Southern California, Los Angeles, CA USA
Development of a Multifaceted Ovarian Cancer Therapeutic and Imaging Agent
Markland, Francis S; Apr 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0298
Report No.(s): AD-A486225; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Ovarian cancer (OC) is the deadliest of all gynecological cancers, with five year survival rates of <45%. One critical

feature of the disease is that two thirds of the women diagnosed have advanced disease, and the five year survival rate of this group is <30%. This project outlines the development of a recombinant version of a member of a class of proteins known as disintegrins as an innovative imaging and diagnostic agent for ovarian cancer (OC). Vicrostatin (VN) is a recombinant protein based on the venom disintegrin contortrostatin (CN), which has shown impressive antitumor and antiangiogenic activities in models of human ovarian cancer. OC cells have been shown to display integrins alphavbeta5 and alpha5beta1, and the antitumor activity of CN, and demonstrated for VN, is based on the high affinity interaction between the disintegrin and these integrins. Thus far we have developed and shown that we have a robust and viable system for the production of VN and that the protein produced displays a high affinity for integrins displayed on ovarian cancer cells. In ongoing experiments we are evaluating the imaging potential for VN to be used for both evaluation of treatment and diagnosis of OC. The high affinity of VN for the integrins found on OC cells make for an excellent candidate for improvement of OC diagnosis and therapy.
DTIC
Cancer; Imaging Techniques; Ovaries; Therapy

20090001596 Southwest Research Inst., San Antonio, TX USA
Targeted Therapies for Myeloma and Metastatic Bone Cancers
Vail, Neal; Feb 2008; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-C-0004
Report No.(s): AD-A486227; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Developed methods to radiolabel polymer nanoparticles, the first time to our knowledge this has been done. Quantified functional groups available for ligand conjugation using S35-labeled ligands. Developed alternative assay to confirm affinity of bone-targeting nanoparticles to hydroxyapatite substrates. Demonstrated in vitro stability of radiolabeled nanoparticles. Successfully transferred our nanoparticle preparation protocols to another facility to support in vivo biodistribution studies. Started in vivo biodistributions validating ability of our radiolabeled nanoparticles to be imaged for up to 48 hours and further confirming our protocol methods to study bone-targeting nanoparticle biodistribution via radio-imaging.
DTIC
Bones; Cancer; Metastasis; Nanoparticles; Therapy

20090001597 Michigan Univ., Ann Arbor, MI USA
Development of a Smart Diagnostics Platform for Early-Stage Screening of Breast Cancer
Lahann, Joerg; Apr 2007; 58 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0271
Report No.(s): AD-A486230; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The proposed research aims to develop innovative technology that could ultimately lead to new breast cancer screening tests ? ones, which will not require expensive equipment for read-out, but rather will be compatible with miniaturized systems integrated in cheap handheld devices. Towards this goal, we have designed and realized in practice a surface that can act as detection unit. This opens the door for further work that will be geared towards testing of biomarkers.
DTIC
Breast; Cancer; Diagnosis; Mammary Glands

20090001598 Christopher Reeve Foundation, Short Hills, NJ USA
Potential North American Clinical Trials Network (NACTN) for Treatment of Spinal Cord Injury: A Consortium of Military, Veterans Administration, and Civilian Hospitals
Grossman, Robert G; May 2008; 303 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0361
Report No.(s): AD-A486232; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The first military (WRAMC) and four new civilian hospitals have joined NACTN. 198 patients were enrolled in national data registry; NACTN PIs are analyzing the data and preparing a manuscript on the occurrence of acute injury complications. NACTN has received ORP approval for the data registry protocol and the NACTN Data Management Center has expanded to accommodate increasing patient numbers. Modifications submitted to TATRC include: Stemnion (approved and project underway); FY 2007 and riluzole mods (the latter to replace the originally proposed anti-Nogo study) are in the review/contracting continuum. In anticipation of approval, all NACTN personnel met in February 2008 to discuss the riluzole protocol/safety study, and the centers are working with local IRBs and ORP to fulfill all regulatory requirements for the data registry. The final riluzole protocol will be submitted to the ORP HRPO for HSRRB review after securing IRB approval from

one NACTN site. National ASIA training for all clinical NACTN personnel will be held in Louisville June 2-3, 2008. NACTN is collaborating with three other clinical networks: the European Union Clinical Trial Network, the Canadian SCI Translational Research Network and NIH-funded NETT. GRASSP validation is nearing successful completion and preliminary STASCIS data suggest that early decompression of the spinal cord (< 24h) is associated with improved neurological recovery.
DTIC
Clinical Medicine; Hospitals; Neurology; Organizations; Spinal Cord; Spinal Cord Injuries

20090001599 Nihon Gene Research Labs., Inc., Sendai, Japan
Investigation of Hyperfine Structure of Various Materials Using All-Electron Full-Potential Program
Nakagawara, Kanichi; Bahramy, M S; Adachi, H; Kawazoe, Y; Sep 1, 2008; 6 pp.; In English
Contract(s)/Grant(s): FA4869-07-1-4044
Report No.(s): AD-A486236; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A specific example of first-principles hyperfine parameters is presented. Within density functional theory, the magnetic hyperfine properties are studied for a model molecule representing the heme moiety of nitrosylmyoglobin using so called all-electron mixed basis method. The isotropic hyperfine parameters are calculated for the N atoms of nitric oxide agent and proximal histidine group by considering various values for Fe-N(NO) bond distance and Fe-N-O angle. The values are compared with the available experimental data from EPR and ENDOR techniques in order to predict the most stable structure of nitrosylmyoglobin at low temperatures.
DTIC
Hemoglobin; Hyperfine Structure; Low Temperature; Myoglobin; Stability

20090001600 Kentucky Univ., Lexington, KY USA
Treatment of Prostate Cancer with a DBP-MAF-Vitamin D Complex to Target Angiogenesis and Tumorigenesis
Fannon, Michael W; Feb 2008; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0010
Report No.(s): AD-A486241; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study has been to determine the efficacy of combined therapy using vitamin D binding protein-macrophage activating factor (DBP-maf) and vitamin D as therapy for human prostate cancer. We had found that in endothelial tube formation vitamin D and DBP-maf inhibited the tube formation. Both molecules were effective on their own however the vitamin D showed evidence of toxicity at higher concentration. We here show that the combination of vitamin D, at a level ineffective by itself(10 pM), and DBP-maf at concentrations as low as 100 ng/ml show potent synergistic behavior. We observed that DBP-maf inhibits the expression of urokinase-type plasminogen activator receptor (UPAR), a molecule whose expression has been linked with increased metastasis. We also observed reduced expression of p21 and p27 by DBP-maf but not by the control DBP. The expression of UPAR by DBP-maf may explain its potent activity on tumors.
DTIC
Angiogenesis; Calciferol; Cancer; Prostate Gland; Proteins; Targets

20090001613 Alabama Univ., Birmingham, AL USA
A Double Selection Approach to Achieve Specific Expression of Toxin Genes for Ovarian Cancer Gene Therapy
Curiel, David T; Siegal, Gene; Wang, Minghui; Nov 2007; 351 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0035
Report No.(s): AD-A486296; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Gene therapy is a novel treatment modality which offers great potential for the control of carcinoma of the ovary. The efficacy of such approaches, however, is currently limited due to the inability of available gene delivery vehicles (vectors) to achieve efficient and selective gene transfer to target tumor cells. Proposed herein is a strategy to modify one candidate vector, recombinant adenovirus, such that it embodies the requisite properties of efficacy and specificity. This approach is based on targeting the delivered anti-cancer gene to tumor via two complimentary approaches. This strategy is based upon restricting the expression of the anti-cancer gene exclusively to ovarian cancer tumor cells ('transcriptional targeting') plus directing the binding of the viral vector particle exclusively to tumor cells (?transductional targeting?).This ?double targeting? approach is highly novel. We have advanced this double targeting approach and shown its overall utility for improving ovarian cancer gene therapy. In the first regard, we have improved the infectivity of adenovirus (Ad) for ovarian cancer targets via a knob ?switch? method exploiting fiber knobs of canine and ovine Ad fiber knobs. In the second instance, we have defined optimized tumor selective promoters for ovarian cancer (TSPs). Finally, we have shown that the combination of these targeting strategies can

improve the overall therapeutic index of ovarian cancer gene therapy in a stringent murine model of human ovarian cancer. These studies have thus provided the framework for translation of targeting approaches to the context of human clinical trials.
DTIC
Cancer; Gene Therapy; Genes; Ovaries; Toxins and Antitoxins

20090001614 Florida Univ., Gainesville, FL USA
Contrast Enhancement for Thermal Acoustic Breast Cancer Imaging via Resonant Stimulation
Li, Jian; Sheplak, Mark; Cattafesta, Lou; Zmuda, Henry; Jiang, Huabei; Arreola, Manuel; Mar 2008; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0389
Report No.(s): AD-A486302; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research plans to develop enhanced contrast thermal acoustic imaging (TAI) technology for the detection of breast cancer by combining amplitude-modulated (AM) electromagnetic (EM) field excitation resonant acoustic scattering and advanced signal processing techniques. While EM-induced TAI possesses great promise, the thermal acoustic signals tend to be weak However when the tumor is excited into resonance via EM stimulation the effective acoustic scattering cross-section may increase by a factor in excess of 100 based on predictions for microsphere-based ultrasound contrast agents. Such an increase would truly be revolutionary making the EM-induced TAI technology a very promising candidate for routine breast screening. The image formation methods in the existing TAI systems are data-independent and have poor resolution and high sidelobe problems. We will devise adaptive image formation algorithms to achieve high resolution and excellent interference and noise suppression capability.
DTIC
Acoustic Imaging; Acoustic Scattering; Augmentation; Breast; Cancer; Mammary Glands; Signal Transmission; Simulation; Sound Waves; Stimulation; Thermal Mapping

20090001622 General Accounting Office, Washington, DC USA
Military Personnel: Actions Needed to Strengthen Implementation and Oversight of DOD's and the Coast Guard's Sexual Assault Prevention and Response Programs
Farrell, Brenda S; Wasleski, Marilyn K; Chan, Joanna; Davis, Pawnee A; Harms, K N; Johnson, Wesley A; La Due Lake, Ronald; Miller, Amanda K; Weissman, Cheryl A; Sep 10, 2008; 18 pp.; In English
Report No.(s): AD-A486324; GAO-08-1146T; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In 2004, Congress directed the Department of Defense (DoD) to establish a comprehensive policy to prevent and respond to sexual assaults involving service members. Though not required to do so, the Coast Guard has established a similar policy. This statement addresses implementation and oversight of DoD's and the Coast Guard's programs to prevent and respond to sexual assault incidents. Specifically, it addresses the extent to which DoD and the Coast Guard have done the following: (1) developed and implemented policies and procedures to prevent, respond to, and resolve reported sexual assault incidents; (2) ensured visibility over reports of sexual assault in the military; and (3) exercised oversight over reports of sexual assault involving service members. This statement draws on GAO's report on DoD's and the Coast Guard's Sexual Assault Prevention and Response programs issued on August 29, 2008 (GAO-08-924). For this work, GAO reviewed legislative requirements and DoD and Coast Guard guidance, analyzed sexual assault incident data, and obtained through surveys and interviews the perspective of more than 3,900 service members on sexual assault matters. GAO made 11 recommendations to improve implementation of DoD's and the Coast Guard's programs. These include, for example, reviewing and evaluating guidance and training, and improving oversight of the programs. DoD and the Coast Guard concurred with the recommendations.
DTIC
Attacking (Assaulting); Coasts; Defense Program; Policies; Prevention; Responses; Sex

20090001630 General Accounting Office, Washington, DC USA
Defense Health Care: Oversight of Military Services' Post-Deployment Health Reassessment Completion Rates Is Limited
Williamson, Randall B; Sep 4, 2008; 21 pp.; In English
Report No.(s): AD-A486360; GAO-08-1025R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

PDHRA (post-deployment health reassessment) is a screening tool for military servicemembers; it is designed to identify and address their health concerns including mental health concerns 90 to 180 days after return from deployment. Although DOD established PDHRA requirements and policies, it gave the military services discretion to implement them to meet their

unique needs as long as the services adhere to the requirements and policies. DOD oversees the military services compliance with PDHRA requirements through its deployment health assessment quality assurance program and is required to report on the quality assurance program annually to the Armed Services Committees of the House of Representatives and Senate. The Senate Committee on Armed Services directed us to review DOD's oversight of PDHRA, and the House Committee on Armed Services and 11 senators also expressed. In this report, we focus on how DOD ensures that servicemembers complete the PDHRA. Specifically, we discuss how well DOD's quality assurance program oversees the military services' compliance with the requirement that they ensure that servicemembers complete the PDHRA.
DTIC
Deployment; Health; Military Personnel; Quality Control; Surveys

20090001831 NASA Marshall Space Flight Center, Huntsville, AL, USA
Spirochaeta dissipitropha sp. nov., a New Alkaliphilic, Obligately Anaerobic Bacterium Isolated from Owens Lake in California and Emended Description of the Genus Spirochaeta
Pikuta, Elena; Bej, Asim K.; Hoover, Richard B.; Bej, Asim K.; Whitman, William B.; Krader, Paul; [2008]; 22 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

A novel obligately anaerobic, mesophilic, alkaliphilic spirochete, strain ASpC2, was isolated from an anaerobic sediment of the alkaline, hypersaline Owens Lake, USA. The Gram-negative cells are motile with helical shape and sizes of 0.23 x 8.0-18.0 micrometers. Growth was observed over the following ranges: temperature 10 C to 43 C; optimum 37 C; NaCl concentration 1-3 % (w/v); optimum NaCl 2 % (w/v) and pH 8- 10.5; optimum pH 10.0. The novel isolate is strictly alkaliphilic and requires high concentrations of carbonate-ions in the medium. New isolate utilizes some sugars, organic acids, amino acids, yeast extract, and peptone. The main end products of glucose fermentation are: CO2, acetate, ethanol, and formate. Strain ASpC2 is resistant to kanamycin, and rifampin, but sensitive to ampicillin, chloramphenicol, gentamycin and tetracycline. The G+C content in DNA of the new isolate is 43.8 mol%, genome size is 6xl0(exp 8) Daltons, Tm of genomic DNA is 71 plus or minus 0.03 C. DNA-DNA hybridization exhibited 46% homology with the phylogeneticaily closest species, Spirochaeta asiatica strain Z-7491. On the basis of physiological and molecular properties, the taxonomic position for new isolate occurs on the level of a separate new species within the Spirochaeta genus. The name Spirochaeta dissipitropha sp. nov., is suggested for the new isolate (type strain ASpC2= ATCC BAA-1083= JCM 12856). Since this new species is able to utilize some amino acids and proteolysis products an emended diagnosis for the genus Spirochaeta is proposed.
Author
Bacteria; Mesophiles; Anaerobes; Genome; Morphology; Microbiology; Alkalies

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*.

20090001148 NASA Johnson Space Center, Houston, TX, USA
Risk of Sensory-Motor Performance Failures Affecting Vehicle Control during Space Missions: A Review of the Evidence
Paloski, William H.; Oman, Charles M.; Bloomberg, Jacob J.; Reschke, Millard F.; Wood, Scott J.; Harm, Deborah L.; Peters, Brian T.; Mulavara, Ajitkumar P.; Locke, James P.; Stone, Leland S.; [2009]; 84 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

NASA's Human Research Program (HRP) has identified a number of potentially significant biomedical risks that might limit the agency s plans for future space exploration, including missions back to the Moon and on to Mars. Among these risks is the: Risk of Impaired Ability to Maintain Control of Vehicles and Other Complex Systems. We examine the various dimensions of this risk by reviewing the research and operational evidence demonstrating sensory-motor performance decrements circa space flight that might affect vehicle and complex system control, including decreased visual acuity, eye-hand coordination, spatial and geographic orientation perception, and cognitive function. Furthermore, we evaluate this evidence to identify the current knowledge gaps that must be filled through further research and/or data mining efforts before the risk can be fully mitigated. We conclude that the true operational risks associated with the impacts of adaptive sensory-motor changes on crew abilities to control vehicles and other complex systems will only be estimable after the gaps

have been filled and we have been able to accurately assess integrated performance in off-nominal operational settings. Author

Sensorimotor Performance; Coordination; Risk; Visual Acuity; Attitude (Inclination); Complex Systems

20090001235 NASA Johnson Space Center, Houston, TX, USA

Validation of Procedures for Monitoring Crewmember Immune Function

Crucian, Brian; Stowe, Raymond; Mehta, Satish; Uchakin, Peter; Quiriarte, Heather; Pierson, Duane; Sams, Clarence; [2009]; 1 pp.; In English; HRP Investigators Workshop, 2 - 4 Feb. 2009, Texas, USA; Copyright; Avail.: Other Sources; Abstract Only

There is ample evidence to suggest that space flight leads to immune system dysregulation, however the nature of the phenomenon as it equilibrates over longer flights has not been determined. This dysregulation may be a result of microgravity, confinement, physiological stress, radiation, environment or other mission-associated factors. The clinical risk (if any) for exploration-class space flight is unknown, but may include increased incidence of infection, allergy, hypersensitivity, hematological malignancy or altered wound healing. The objective of this Supplemental Medical Objective (SMO) is to determine the status of the immune system, physiological stress and latent viral reactivation (a clinical outcome that can be measured) during both short and long-duration spaceflight. In addition, this study will develop and validate an immune monitoring strategy consistent with operational flight requirements and constraints. Pre-mission, in-flight and post-flight blood and saliva samples will be obtained from participating crewmembers. Assays included peripheral immunophenotype, T cell function, cytokine profiles (RNA, intracellular, secreted), viral-specific immunity, latent viral reactivation (EBV, CMV, VZV), and stress hormone measurements. This study is currently ongoing. To date, 10 short duration and 5 long-duration crewmembers have completed the study. Technically, the study is progressing well. In-flight blood samples are being collected, and returned for analysis, including functional assays that require live cells. For all in-flight samples to date, sample viability has been acceptable. Preliminary data (n = 4/7; long/short duration, respectively) indicate that distribution of most peripheral leukocyte subsets is largely unaltered during flight. Exceptions include elevated T cells, reduced B/NK cells, increased memory T cells and increased central memory CD8+ T cells. General T cell function, early blastogenesis response to mitogenic stimulation, is markedly reduced in-flight. In-vivo cytokine production profiles are altered, with in-flight dysregulation observed in the Th1/Th2/Treg equilibrium. EBV specific T cell levels are increased during flight, whereas their function is reduced. VZV reactivation was observed inflight and several days post flight with highest levels measured later during long-duration flight. The shedding of CMV in the urine was detected of 4/5 long duration and 4/7 short duration crewmembers. Plasma cortisol was not elevated during flight. Further data will be required to validate the initial observations. Author

Stress Measurement; Viruses; Microgravity; Crews; Allergic Diseases; Infectious Diseases; Leukocytes

20090001237 NASA Johnson Space Center, Houston, TX, USA

Homocysteine and Cognitive Performance in Elders with Self-Neglect

Burnett, J.; Smith, S.M.; Aung, K.; Dyer, C.; [2009]; 1 pp.; In English; American Geriatrics Society Annual Meeting, 29 Apr. - 03 May 2009, Illinois, USA; No Copyright; Avail.: Other Sources; Abstract Only

Elevated plasma homocysteine has been associated with altered cognitive performance in older adults. Elders referred to Adult Protective Services (APS) for self-neglect have been reported to have elevated plasma homocysteine levels and to suffer from cognitive impairment. This study assesses the association, if any, between plasma homocysteine and cognitive performance among elders with self-neglect. Methods: Sixty-five community-living adults, 65 years of age and older, reported to Adult Protective Services for self-neglect and 55 matched controls (matched for age, ethnicity, gender and socio-economic status) consented and participated in this study. The research team conducted in-home comprehensive geriatric assessments which included the mini-mental state exam (MMSE), the 15-item geriatric depression scale (GDS), the Wolf-Klein Clock Drawing Tests (CDT) and a comprehensive nutritional biochemistry panel, which included plasma homocysteine. Student s t tests and Pearson correlations were conducted to assess for bivariate associations. Results: Elders with self-neglect had significantly higher plasma homocysteine levels (M=12.68umol/L, sd=4.4) compared to the controls (M=10.40umol/L, sd=3.61;t=3.21, df=127, p=.002). There were no statistically significant associations between cognitive performance and plasma homocysteine in the self-neglect group, however there was a significant correlation between plasma homocysteine and the CDT among the controls (r=-.296, p=.022). Conclusion: Mean plasma homocysteine levels were significantly higher in elders with self-neglect, however, they do not appear to be related to cognitive performance, indicating that cognitive impairment in elder self-neglect involve mechanisms other than hyperhomocysteinemia. These findings warrant further investigation

Author

Mental Health; Mental Performance; Biochemistry; Correlation; Geriatrics; Cognition

20090001238 NASA Johnson Space Center, Houston, TX, USA

Parathyroid Hormone Levels and Cognition

Burnett, J.; Smith, S.M.; Aung, K.; Dyer, C.; [2009]; 1 pp.; In English; American Geriatrics Society Annual Meeting, 29 Apr. - 03 May 2009, Illinois, USA; No Copyright; Avail.: Other Sources; Abstract Only

Hyperparathyroidism is a well-recognized cause of impaired cognition due to hypercalcemia. However, recent studies have suggested that perhaps parathyroid hormone itself plays a role in cognition, especially executive dysfunction. The purpose of this study was to explore the relationship of parathyroid hormone levels in a study cohort of elders with impaied cognition. Methods: Sixty community-living adults, 65 years of age and older, reported to Adult Protective Services for self-neglect and 55 controls matched (on age, ethnicity, gender and socio-economic status) consented and participated in this study. The research team conducted in-home comprehensive geriatric assessments which included the Mini-mental state exam (MMSE), the 15-item geriatric depression scale (GDS) , the Wolf-Klein clock test and a comprehensive nutritional panel, which included parathyroid hormone and ionized calcium. Students t tests and linear regression analyses were performed to assess for bivariate associations. Results: Self-neglecters (M = 73.73, sd=48.4) had significantly higher PTH levels compared to controls (M =47.59, sd=28.7; t=3.59, df=98.94, p<.01). There was no significant group difference in ionized calcium levels. Overall, PTH was correlated with the MMSE (r=-.323, p=.001). Individual regression analyses revealed a statistically significant correlation between PTH and MMSE in the self-neglect group (r=-.298, p=.024) and this remained significant after controlling for ionized calcium levels in the regression. No significant associations were revealed in the control group or among any of the other cognitive measures. Conclusion: Parathyroid hormone may be associated with cognitive performance. Author

Mental Health; Mental Performance; Parathyroid Gland; Regression Analysis; Cognition

20090001239 NASA Johnson Space Center, Houston, TX, USA; Wyle Integrated Science and Engineering Group, Houston, TX, USA

Cardiovascular Exercise Responses during and Following U.S. Space Flight

Platts, Steven H.; Moore, Alan D.; Lee, Stuart M.C.; Stender, Michael B.; December 19, 2008; 46 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Cardiovascular responses to exercise during and following space flight have been studied in U.S. astronauts since Project Mercury. With a few exceptions, data collected have been limited to the measurement of heart rate (HR) during submaximal exercise and conclusions about maximal aerobic capacity (VO2max) have been extrapolated. True measurements of VO2max have been performed before and immediately after selected Space Shuttle flights, and only one report exists of these measurements being obtained during space flight. This paper examines the data collected during the U.S. space program regarding the cardiovascular responses to exercise and the data s limitations. In general, both VO2max and the maximum work rates attained during cycle ergometer exercise appear to be maintained during short duration (<14 day) space flight. Following short duration flight, both VO2max and the HR response to submaximal exercise are elevated for least the first 3 days of recovery. During longer duration flight, the HR response to exercise was not elevated in the U.S. Skylab crew members, but appears elevated in the first phase of flight in the members of International Space Station (ISS). The elevated HR response to exercise, and presumably lowered VO2max, observed in the ISS crew members becomes less extreme with flight duration, presumably due to participation in exercise countermeasures. Following long-duration flights, the HR response to exercise is elevated at 5 days following flight and recovery appears complete 30 days after the missions. Future research should focus on obtaining actual measurements of aerobic capacity during and following long duration space flight.
Author

Cardiovascular System; Flight Crews; Physical Exercise; Heart Rate; Heart Function; Spacecrews; Astronauts

20090001276 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

The Second Seven Years of the FAA's Postmortem Forensic Toxicology Proficiency-Testing Program

Chaturvedi, Arvind K.; Craft, Kristi J.; Cardona, Patrick S.; Rogers, Paul B.; Canfield, Dennis v.; October 2008; 16 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): AM-B-08-TOX-202; AM-B-99-TOX-202; AM-B-00-TOX-202; AM-B-01-TOX-202; AM-B-02-TOX-202; AM-B-03-TOX-202

Report No.(s): DOT/FAA/AM-08/24; No Copyright; Avail.: CASI: A03, Hardcopy

For aircraft accident investigations, samples from pilot fatalities are analyzed at the Federal Aviation Administration's (FAA's) civil Aerospace Medical Institute (CAMI) for the presence of combustion gases, alcohols/volatiles, and drugs. Throughout this forensic toxicological process, a high degree of quality control/quality assurance (QC/QA) is maintained, and quality improvement is continuously pursued. Under this philosophy, CAMI started a quarterly forensic toxicology

proficiency-testing (PT) program in July 1991 for the analysis of postmortem specimens. In continuation of the first 7 years of the CAMI PT findings reported earlier, PT findings of the next 7 years (July 1998-April 2005) are summarized herein. During this period, 28 PT challenge survey samples (12 urine, 9 blood, and 7 tissue homogenate) with/without alcoholslvolatiles, drugs, drug metabolites, and/or putrefactive amine(s) were submitted to an average of 31 participating laboratories, of which an average of 25 participants returned their result sheets-that is, 53-96% (mean = 82%). The number of respondents was dependent upon the complexity of the sample matrix, the number and types of analytes in the sample, and the associated analytical chemistry/toxicology. For example, ethanol/methanol/volatiles in urine were correctly quantitated by a higher number of participants than those for amphetamine/methamphetamine and cannabinoid levels in blood and tissues. Methods employed ranged from immunoassays to gas chromatography-mass spectrometrylhighperformance liquid chromatography. Analytes in survey samples were correctly identified and quantitated by a large number of participants, but some false positives of concern were reported, as some of them were abused drugs. Some of the false positives would have been avoided by not reporting those drugs solely based upon presumptive analyses. Their presence should have been confirmed, authenticated, and, if possible, quantitated by other analytical methods, which should have been based upon different analytical principles than those used during presumptive analyses. It is anticipated that the FAA's PT program would continue to serve as a tool to effectively allow its own toxicology laboratory and other participating laboratories for professional and technical maintenance and advancement on a voluntary, interlaboratory, and self-evaluative basis. Furthermore, this PT program will continue to provide service to the forensic toxicology scientific community through this important part of the QC/QA for the laboratory accreditation to withstand professional and judicial scrutiny of analytical results.

Author

Aerospace Medicine; Drugs; Toxicology; Quality Control; Aircraft Accident Investigation; Aircraft Pilots; Accident Investigation; Reliability

20090001278 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Alcohol-related Aviation Accidents Involving Pilots with Previous Alcohol Offenses

Botch, Sara R.; Johnson, Robert D.; October 2008; 13 pp.; In English

Contract(s)/Grant(s): AM-B-05-TOX-204

Report No.(s): DOT/FAA/AM-08/22; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration (FAA) requires airmen to report legal actions involving ethanol and/or other drugs, including driving while impaired by or while under the influence of alcohol. Pilots are also required to report any administrative action resulting in denial, suspension, cancellation, or revocation of driving privileges or mandatory attendance at an educational or rehabilitation program. The purpose of this study was to evaluate fatal civil aviation accidents between the years 2000 and 2007 in which ethanol was present in the pilot, and the pilot had previously documented drug and/or alcohol offenses and/or dependence. Toxicological and aeromedical findings from pilots were collected for an 8- year period, 2000 - 2007. Case histories, accident information, and the probable cause of the accidents were obtained from the National Transportation Safety Board. Toxicological information was obtained from the Civil Aerospace Medical Institute's Forensic Toxicology Research Laboratory. During the examined time period, 215 pilots (9%) of the 2,39 1 received for analysis had documented alcohol- or drug-related offenses. Of the 215 pilots, 23 (1 1%) had consumed ethanol prior to the fatal incident. Of these 23 pilots, 16 (+70%) had ethanol concentrations above the FAA's legal limit of 40 mg/dL and 7 (approximately 30%) between 20 and 40 mg/dL. Providing more detailed documentation to aviation medical examiners would aid in the determination of eligibility for medical certification and could potentially save pilots as well as their passengers' lives. Identifying pilots with substance abuse problems is paramount for providing a safe environment to fly but also benefits the pilots who may not have addressed these issues.

Author

Aerospace Medicine; Civil Aviation; Drugs; Identifying; Pilots; Alcohols

20090001303 NASA Johnson Space Center, Houston, TX, USA

Medical Operational Challenges in the Expedition 16 Landing and Recovery

Moynihan, S.; Johnston, S. L.; Ilcus, L. S.; Shevchenko, V.; [2009]; 1 pp.; In English; 80th Annual Scientific Meeting of the Aerospace Medical Association, 3-7 May 2009, Los Angeles, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

On April 19, 2008 the crew of Expedition 16 left the International Space Station and returned to earth via their Soyuz TMA-11 capsule after 192 days on orbit. Their capsule experienced the second consecutive and third ballistic reentry in the last 10 TMA recoveries and landed approximately 260 miles (420 km) from the prime landing site. Issues: The purpose of this presentation will be to describe, not only the typical medical operational challenges faced by Flight Surgeons recovering a long

duration crew from space, but also address the unique challenges that existed with the Expedition 16 landing and crew recovery. Nominal Soyuz recovery challenges include remote recovery sites with crew exposures to sleep shifting and fatigue, dehydration, hypothermia and hyperthermia, and rotational, sustained, and impact g-forces. These environmental factors coupled with the patho-physiologic neuro-vestibular and orthostatic intolerance changes that occur secondary to the crews reintroduction into the earth s gravity field will be detailed. Additional challenges that were unique to this expedition included a ballistic reentry with higher g-loads, the presence of fire outside of the capsule on landing, a contingency medical event of a ground support personnel, and loss of communications with the crew just prior to landing and during recovery operations. Conclusions: In spite of these unique challenges the Russian Search and Rescue Forces and Medical Support personnel along with U.S. Medical Support performed well together. Possible improvements in training and coordination will be discussed. Author

Spacecrews; Flight Surgeons; Medical Personnel; Physiology; Dehydration; Rescue Operations; Hypothermia

20090001305 NASA Johnson Space Center, Houston, TX, USA

Assessment of Evidence Base from Medical Debriefs Data on Space Motion Sickness Incidence and Treatment

Younker, D.R.; Daniels, V.R.; Boyd, J.L.; Putcha, L.; [2008]; 1 pp.; In English; Human Research Program, Investigators Workshop, 2- 4 Feb. 2009, Texas, USA; Copyright; Avail.: Other Sources; Abstract Only

An objective of this data compilation and analysis project is to examine incidence and treatment efficacy of common patho-physiological disturbances during spaceflight. Analysis of medical debriefs data indicated that astronauts used medications to alleviate symptoms of four major ailments for which astronauts received treatment for sleep disturbances, space motion sickness (SMS), pain (headache, back pain) and sinus congestion. In the present data compilation and analysis project on SMS treatment during space missions, subject demographics (gender, age, first-time or repeat flyer), incidence and severity of SMS symptoms and subjective treatment efficacy from 317 crewmember debrief records were examined from STS-1 through STS-89. Preliminary analysis of data revealed that 50% of crew members reported SMS symptoms on at least one flight and 22% never experienced it. In addition, there were 387 medication dosing episodes reported, and promethazine was the most commonly used medication. Results of analysis of symptom check lists, medication use/efficacy and gender and flight record differences in incidence and treatment efficacy will be presented. Evidence gaps for treatment efficacy along with medication use trend analysis will be identified.

Author

Aerospace Medicine; Motion Sickness; Physiology; Headache; Promethazine; Flight Crews

20090001314 NASA Johnson Space Center, Houston, TX, USA

Rashes and Exanthems on Long Duration Space Flights

Ilscus, L.S.; Johnston, S.L.; Moynihan, S.; Kerstman, E.L.; Marshall, G.D.; January 2009; 1 pp.; In English; 80th Annual Scientific Meeting of the Aerospace Medical Association, 3 - 7 May 2009, California, USA; Copyright; Avail.: Other Sources; Abstract Only

INTRODUCTION: As NASA expands its human space exploration to the Moon, Mars and beyond, it will be presented with many challenges, not the least of which will be dealing with medical conditions, which on earth are simple, but take on new levels of complexity in space habitats. Skin conditions exemplify this complexity. METHODS and RESULTS: While skin conditions account for 7 % of outpatient presentations to a primary care provider in the USA, NASA Longitudinal Study of Astronaut Health (LSAH) database indicates that cutaneous manifestations are significantly prevalent on-orbit. Reviewing this data for US astronauts, there have been 90 total cases of skin rashes during 27.34 person-years of spaceflight, or 3.29 cases/person. Specifically, STS-1 though 114 had 56 cases, ISS Expeditions 1 though 13 had 7 cases, Mir had 4 cases, Skylab had 5 cases and the Apollo program had 18 cases. If there was a period of 24 hours or more between rashes in the same crewmember, this was counted as an additional case. DISCUSSION: This prevalence is likely due, in some part, to constraints of hygiene and to immunologic changes that occur. The stresses of microgravity and austere Earth environments such as the Antarctic, submarine and military deployments, no doubt, similarly contribute to cutaneous reactions; but the difference of the environments are significant enough to warrant further study and discussion. This paper will discuss rashes, exanthems, and cutaneous reactions in space habitats; it will address diagnosis, causation, mitigation and treatment of skin conditions seen on orbit, to date, with a look to anticipating what may be seen with larger crews on future extended duration expeditions.

Author

Long Duration Space Flight; Hygiene; Health; Space Habitats; Astronauts; Microgravity

20090001319 NASA Johnson Space Center, Houston, TX, USA

Stability of Dosage Forms in the Pharmaceutical Payload Aboard Space Missions

Du, Brian J.; Daniels, Vernie; Boyd, Jason L.; Crady, Camille; Satterfield, Rick; Younker, Diane R.; Putcha, Lakshmi; [2009];

1 pp.; In English; Human Research Program Investigators Workshop, 2 - 4 Feb. 2009, Texas, USA; Copyright; Avail.: Other Sources; Abstract Only

Efficacious pharmaceuticals with adequate shelf lives are essential for successful space medical operations. Stability of pharmaceuticals, therefore, is of paramount importance for assuring the health and wellness of astronauts on future space exploration missions. Unique physical and environmental factors of space missions may contribute to the instability of pharmaceuticals, e.g., radiation, humidity and temperature variations. Degradation of pharmaceutical formulations can result in inadequate efficacy and/or untoward toxic effects, which could compromise astronaut safety and health. Methods: Four identical pharmaceutical payload kits containing 31 medications in different dosage forms (liquid, tablet, capsule, ointment and suppository) were transported to the International Space Station aboard the Space Shuttle (STS-121). One of the 4 kits was stored on the Shuttle and the other 3 were stored on the International Space Station (ISS) for return to Earth at 6-month interval aboard a pre-designated Shuttle flight for each kit. The kit stored on the Shuttle was returned to Earth aboard STS-121 and 2 kits from ISS were returned on STS 117 and STS-122. Results: Analysis of standard physical and chemical parameters of degradation was completed for pharmaceuticals returned by STS-121 after14 days, STS - 117 after11 months and STS 122 after 19 months storage aboard ISS. Analysis of all flight samples along with ground-based matching controls was completed and results were compiled. Conclusion: Evaluation of results from the shuttle (1) and ISS increments (2) indicate that the number of formulations degraded in space increased with duration of storage in space and was higher in space compared to their ground-based counterparts. Rate of degradation for some of the formulations tested was faster in space than on Earth. Additionally, some of the formulations included in the medical kits were unstable, more so in space than on the ground. These results indicate that the space flight environment may adversely affect the shelf life of pharmaceuticals aboard space missions. Author

Aerospace Environments; Pharmacology; Dosage; Toxicity; Storage Stability; Payloads; Medical Equipment; Health; Drugs; Service Life

20090001320 NASA Johnson Space Center, Houston, TX, USA

Aerobic Exercise Deconditioning and Countermeasures during Bed Rest

Lee, Stuart M.C.; Moore, Alan D.; Everett, Meghan; Stenger, Michael B.; Platts, Steven H.; [2009]; 33 pp.; In English; Copyright; Avail.: Other Sources

Bed rest is a well-accepted model for space flight in which the physiologic adaptations, - particularly in the cardiovascular system, are studied and potential countermeasures can be tested. Bed rest without countermeasures results in reduced exercise performance, particularly maximal aerobic capacity. Aerobic endurance and factors which may impact prolonged exercise performance, however, have not been well studied. The initial loss of maximal aerobic capacity is rapid, occurring in parallel with the loss of plasma volume. Thereafter, the reduction in maximal aerobic capacity proceeds more slowly and is influenced by central and peripheral adaptation. Exercise performance can be maintained during bed rest and may be improved during recovery with appropriate countermeasures. Restoration of plasma volume, resistive exercise, orthostatic stress, aerobic exercise, and aerobic exercise plus orthostatic stress all have been tested with varying levels of success. However, the optimal combination of elements modality, intensity, duration, and frequency of aerobic exercise, orthostatic stress, and supplementary resistive or anaerobic exercise training has not been systematically evaluated. Currently, frequent (at least three days per week) bouts of intense exercise (interval-style and near maximal) with orthostatic stress appears to be the most efficacious method to protect aerobic exercise performance during bed rest. Further refinement of protocols and countermeasure hardware may be necessary, however, to insure the success of countermeasures in the unique environment of space.
Author

Bed Rest; Physiology; Orthostatic Tolerance; Physical Exercise; Cardiovascular System

20090001322 NASA Johnson Space Center, Houston, TX, USA; Universities Space Research Association, Houston, TX, USA

Bioavailability of Promethazine during Spaceflight

Boyd, Jason L.; Wang, Zuwei; Putcha, Lakshmi; [2009]; 1 pp.; In English; Human Research Program Investigators Workshop, 2 - 4 Frb. 2009, Texas, USA; Copyright; Avail.: Other Sources; Abstract Only

Promethazine (PMZ) is the choice anti-motion sickness medication for treating space motion sickness (SMS) during flight. The side effects associated with PMZ include dizziness, drowsiness, sedation, and impaired psychomotor performance which could impact crew performance and mission operations. Early anecdotal reports from crewmembers indicate that these central nervous system side effects of PMZ are absent or greatly attenuated in microgravity, potentially due to changes in pharmacokinetics (PK) and pharmacodynamics in microgravity. These changes could also affect the therapeutic effectiveness of drugs in general and PMZ, in particular. In this investigation, we examined bioavailability and associated pharmacokinetics

of PMZ in astronauts during and after space flight. Methods. Nine astronauts received, per their preference, PMZ (25 or 50 mg as intramuscular injection, oral tablet, or rectal suppository) on flight day one for the treatment of SMS and subsequently collected saliva samples and completed sleepiness scores for 72 h post dose. Thirty days after the astronauts returned to Earth, they repeated the protocol. Bioavailability and PK parameters were calculated and compared between flight and ground. Results. Maximum concentration (Cmax) was lower and time to reach Cmax (tmax) was longer in flight than on the ground. Area under the curve (AUC), a measure of bioavailability, was lower and biological half-life (t1/2) was longer in flight than on the ground. Conclusion. Results indicate that bioavailability of PMZ is reduced during spaceflight. Number of samples, sampling method, and sampling schedule significantly affected PK parameter estimates.
Author
Aerospace Medicine; Promethazine; Psychomotor Performance; Human Performance; Central Nervous System; Alertness; Dizziness; Dosage; Sleep Deprivation

20090001377 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
TNO Contribution to the Quest 303 Trial - Human Performance Assessed by a Vigilance and Tracking Test, a Multi-Attribute Task, and by Dynamic Visual Acuity (TNO Bijdrage aan het Quest 303 Onderzoek)
Bos, J E; Valk, P J; Hogervorst, M A; Munnoch, K; Perrault, D; Colwell, J L; Jul 2008; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485753; TNO-DV-2008-A267; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485753

A multi-national sea trial on the effects of ship motions on human performance was performed off the coast of Canada, in early 2007. Primary goal: To obtain subjective and objective measures for human task performance, possibly affected by real ship motion. TNO participated with a Vigilance and Tracking Test, a Multi-Attribute Task, and a Dynamic Visual Acuity test. The experiment was conducted in three phases: a pre-exposure phase in harbour, an exposure phase at sea, (sea conditions varying from calm to low sea state six) and a post-exposure phase in sheltered waters to re-examine baseline performance. Experiment schedule and protocol are described, motions and wave conditions encountered during the trial, and the results of the Dutch tests are presented. Results: Cognitive performance and visual acuity are impaired by ship motion. This seems to be caused by seasickness in particular, possibly even more so than by ship motion per se. Tracking was affected only by sickness, and not by motion itself. Apart from showing that DVA is of value to further quantify human performance, these data also support the development of an onsite fit-to-perform screening tool based on DVA.
DTIC
Human Performance; Motion Sickness; Ships; Visual Acuity

20090001380 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Review of Published Safety Thresholds for Human Divers Exposed to Underwater Sound (Veilige maximale geluidsniveaus voor duikers - beoordeling van publicaties)
Ainslie, M A; Apr 2008; 18 pp.; In English
Report No.(s): AD-A485758; TNO-DV-2007-A598; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485758

High levels of underwater sound can be harmful to human divers, as they can result in hearing damage or damage to other organs, either directly, or indirectly by causing a panic reaction. Published recommendations for the maximum safe underwater sound level are reviewed. The results of the review are presented in the form of safety thresholds of underwater sound for divers, in the frequency range 125 hertz to 250 kilohertz.
DTIC
Diving (Underwater); Safety; Underwater Acoustics

20090001589 Army Research Inst. of Environmental Medicine, Natick, MA USA
General Procedure for Protective Cooling and Equipment Evaluations Relative to Heat and Cold Stress
O'Brien, Catherine; Cadarette, Bruce S; Endrusick, Thomas L; Blanchard, Laurie A; Xu, Xiaoxiang; Berglund, Larry G; Sawka, Michael N; Hoyt, Reed W; Sep 2008; 27 pp.; In English
Report No.(s): AD-A486216; TN08-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As part of the U.S. Army materiel development and acquisition process, clothing and individual equipment (CIE) must undergo a Health Hazard Assessment (HHA) conducted by the U. S. Army Center for Health Promotion and Preventive Medicine. Scientists at the U.S. Army Research Institute of Environmental Medicine (USARIEM) are world experts in thermal

physiology, biophysics, and biomedical modeling and are uniquely capable of providing technical measurements and subject matter expertise for thermal stress associated with CIE. A comprehensive evaluation of thermal stress involves: (1) biophysical measurements of the thermal insulation and moisture permeability of textiles using a guarded hot plate, and of garments using thermal manikins; (2) biomedical modeling to predict physiological (body temperatures, sweating rate and heart rate) strain expected of Soldiers wear the CIE under conditions of environmental (temperature, humidity, air motion, radiant lead) and metabolic (work, rest) stressors; and (3) human volunteer testing of CIE worn by persons exposed to a variety of controlled (laboratory or field) environmental and metabolic stressors.
DTIC
Biomedical Data; Body Temperature; Coolers; Cooling; Heart Rate; Heat Tolerance; Medical Science; Protective Clothing; Protectors; Thermal Stresses; Thermodynamic Properties

20090001874 Air Force Research Lab., Brooks AFB, TX USA
The Identification of Fatigue Resistant and Fatigue Susceptible Individuals
Harrison, Richard; Chaiken, Scott; Harville, Donald; Fischer, Joseph; Fisher, Dion; Whitmore, Jeff; May 2008; 56 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A486022; AFRL-RH-BR-TR-2008-0050; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486022

The present study was designed to target two specific areas regarding fatigue. The primary purpose was to begin investigations into possible genetic markers linked to fatigue resistance and fatigue susceptibility. This study provided a resistant or susceptible listing of individuals to a genetics research group that is correlating the rankings to the participant's genetic material. The secondary focus was to follow up past research in order to quantify fatigue's effects on a team performing a complex Command, Control, and Communications (C3) type task. Participants completed two, four-hour training sessions prior to experiencing a 48-hr period of sustained wakefulness. During the testing session participants iteratively took part in various cognitive performance tasks as well as a complex air battle management task (either as an individual or team depending on their assignment). At the end of the 48 hours, performance on all measures showed significant effects of fatigue. In order to determine which participants were fatigue resistant/susceptible, a percent change score was used for the various cognitive tasks in order to rank the participants. The lower the percent change, the more resistant a participant was to fatigue on that task. Participants rankings were then averaged across all of the cognitive tasks in order to produce an overall ranking. When this list is correlated to demographics, the amount of weekday sleep a participant receives significantly impacts the results (r (90) =.36). To remove this potential confounding factor, a second ranking of resistance/susceptibility was created that took into account the amount of sleep the participants reported during the week. In addition to the two fatigue resistant/susceptibility lists, the study found that team productivity was about the same as individual productivity on the complex air battle management task. Also, performance on the complex air battle management tasks (regardless of being a team or individual)
DTIC
Genetics; Human Performance; Performance Tests; Teams

20090001876 Air Force Research Lab., Mesa, AZ USA
Decreased Arousal as a Result of Sleep Deprivation: The Unraveling of Cognitive Control
Gunzelmann, Glenn; Gluck, Kevin A; Price, Scott; Van Dongen, Hans P; Dinges, David F; Jan 2007; 13 pp.; In English
Contract(s)/Grant(s): F41624-97-D-5000; Proj-1123; Proj-313
Report No.(s): AD-A486024; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486024

This chapter discusses recent efforts at developing mechanisms for capturing the effects of fatigue on human performance. We describe a computational cognitive model developed in ACT-R, that performs a sustained attentional task called the psychomotor vigilance (PVT). We use neurobehavioral evidence from research on sleep deprivation, in addition to previous research from within the ACT-R community, to select and to evaluate a mechanism for producing fatigue effects in the model. Fatigue is represented by decrementing a parameter associated with arousal in ACT-R, while also reducing a threshold value in the architecture to capture attempts at compensating for the negative effects of decreased arousal. These parameters are associated with the production utility computation in ACT-R, which controls the selection/execution cycle to determine which production (if any) to execute on each cognitive cycle. In ACT-R, this mechanism is linked to the basal ganglia and the thalamus. In turn, portions of the thalamus show heightened activation in attentional tasks under conditions of sleep

deprivation. The model we describe closely captures the performance of human participants on the PVT, as observed in a laboratory experiment involving 88 hours of total sleep deprivation.
DTIC
Adaptive Control; Arousal; Cognition; Computerized Simulation; Sleep; Sleep Deprivation

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20090001141 Michigan Univ., Ann Arbor, MI, USA
Diver Education Series: Thermal Stress and the Diver
Somers, L. H.; January 1986; 9 pp.; In English
Contract(s)/Grant(s): NOAA-NA85AA-D-SG045
Report No.(s): PB2009-101931; MICHU-SG-86-502; No Copyright; Avail.: CASI: A02, Hardcopy

The human body is homeothermic, or warmblooded, and must constantly interact with its external environment in an effort to maintain thermal equilibrium. It basically operates in a very narrow temperature range. Slight cooling of the body can produce discomfort, and continued cooling can cause serious, if not life-threatening, physiological changes. The same is true if the body is heated. Cold induced deterioration in both motor and mental processes is considered to be the major limiting factor relative to diver performance, comfort, and safety. All divers have experienced hypothermia or a subnormal body temperature, in varying degrees at one time or another. Most divers associate cold stress and hypothermia with polar or temperate region waters and fail to recognize the 'thermal drain' that can be associated with diving the tropics. On the other hand, hyperthermia, or abnormally high body temperature, may unknowingly place some divers at high risk.
NTIS
Diving (Underwater); Education; Thermal Stresses

20090001142 Michigan Univ., Ann Arbor, MI, USA
Diver Education Series: A Portable Diving System for Search and Rescue, Scientific, and Commercial Divers
Somers, L. H.; January 1987; 24 pp.; In English
Contract(s)/Grant(s): NOAA-NA85AA-D-SG045
Report No.(s): PB2009-101937; MICHU-SG-87-504; No Copyright; Avail.: CASI: A03, Hardcopy

Safe, efficient, and cost-effective diving operations require creative flexibility in the use of personnel and equipment. Reductions in funding, increased costs, limited availability of large vessels, and operations in remote areas with minimal logistical support have challenged some scientific, search and rescue, and commercial divers to re-evaluate the selection/training of personnel and their mode of diving. A versatile, compact, and portable diving system that enables a dive team to transport and select from components to support scuba, tethered scuba, and surface-supplied diving is described in this publication.
NTIS
Diving (Underwater); Education; Personnel; Rescue Operations; Underwater Breathing Apparatus

20090001143 NASA Johnson Space Center, Houston, TX, USA
Development of an Inline Urine Monitoring System for the International Space Station
Broyan, James Lee, Jr.; Cibuzar, Banelle R.; [2008]; 1 pp.; In English; 39th International Conference on Environmental Systems, 12-16 Jul. 2009, Savannah, GA, USA
Contract(s)/Grant(s): 868800.01.04.02; Copyright; Avail.: Other Sources; Abstract Only

Human exposure to microgravity during spaceflight causes bone loss. Calcium and other metabolic byproducts are excreted in urine voids. Frequent and accurate measurement of urine void volume and constituents is essential to determining crew bone loss and the effectiveness of countermeasures. Previous US Space Shuttle (SS) Urine Monitoring System (UMS) technology was unable to accurately measure urine void volumes due to cross contamination between users and fluid system instabilities. Currently, urine voids must be collected manually in a flexible plastic bag containing a known tracer quantity. The crew member must completely mix the bag then withdraw a representative syringe sample for later ground analysis. The current bag system accuracy is highly dependent on mixing technique. The International Space Station (ISS) UMS has been developed as an automated device that collects urine from the Waste and Hygiene Compartment (WHC) urinal funnel

interface, separates the urine, measures the void volume, and allows for syringe sampling. After operations, the ISS UMS delivers the urine to the WHC for normal processing then flushes its plumbing with a small water volume. The current ISS UMS design incorporates an innovative rotary separator that minimizes foaming, greatly reduces cross contamination between urine voids (< 0.5 ml urine), and provides accurate volume measurements (< +/- 2% error for 100 to 1000 ml void volumes). The system performance has been validated with extensive ground tests and reduced gravity aircraft flights. The lockersized ISS UMS is currently being modified to interface with the ISS Node 3 WHC Russian ACY hardware. The operation principles, characteristics, and results are outlined in the paper.
Author
Bone Demineralization; Microgravity; Metabolism; Contamination; By-Products; Flight Crews; Fluid Flow; Accuracy

20090001153 NASA Johnson Space Center, Houston, TX, USA
Water Pump Development for the EVA PLSS
Schuller, Michael; Kurwitz, Cable; Goldman, Jeff; Morris, Kim; Trevino, Luis; July 12, 2009; 1 pp.; In English; 39th International Conference on Environmental Systems, 12-16 Jul. 2009, Savannah, GA, USA
Contract(s)/Grant(s): 903184.04.02.02.02; Copyright; Avail.: Other Sources; Abstract Only

This paper describes the effort by the Texas Engineering Experiment Station (TEES) and Honeywell for NASA to design, fabricate, and test a preflight prototype pump for use in the Extravehicular activity (EVA) portable life support subsystem (PLSS). Major design decisions were driven by the need to reduce the pump s mass, power, and volume compared to the existing PLSS pump. In addition, the pump will accommodate a much wider range of abnormal conditions than the existing pump, including vapor/gas bubbles and increased pressure drop when employed to cool two suits simultaneously. A positive displacement, external gear type pump was selected because it offers the most compact and highest efficiency solution over the required range of flow rates and pressure drops. An additional benefit of selecting a gear pump design is that it is self priming and capable of ingesting noncondensable gas without becoming 'air locked.' The chosen pump design consists of a 28 V DC, brushless, sealless, permanent magnet motor driven, external gear pump that utilizes a Honeywell development that eliminates the need for magnetic coupling. Although the planned flight unit will use a sensorless motor with custom designed controller, the preflight prototype to be provided for this project incorporates Hall effect sensors, allowing an interface with a readily available commercial motor controller. This design approach reduced the cost of this project and gives NASA more flexibility in future PLSS laboratory testing. The pump design was based on existing Honeywell designs, but incorporated features specifically for the PLSS application, including all of the key features of the flight pump. Testing at TEES will simulate the vacuum environment in which the flight pump will operate. Testing will verify that the pump meets design requirements for range of flow rates, pressure rise, power consumption, working fluid temperature, operating time, and restart capability. Pump testing is currently scheduled for March, 2009, after which the pump will be delivered to NASA for further testing.
Author
Portable Life Support Systems; Pumps; Temperature Control; Cooling Systems

20090001159 NASA Johnson Space Center, Houston, TX, USA
International Space Station Environmental Control and Life Support System Acceptance Testing for Node 1 Atmosphere Control and Supply Subsystem
Williams, David E.; [2009]; 1 pp.; In English; International Conference of Environmental Systems, 12-16 Jul. 2009, Savannah, GA, USA
Contract(s)/Grant(s): WBS 401769.06.01.01.01
Report No.(s): DAA-17434; No Copyright; Avail.: Other Sources; Abstract Only

The International Space Station (ISS) Node 1 Environmental Control and Life Support (ECLS) System is comprised of five subsystems: Atmosphere Control and Supply (ACS), Atmosphere Revitalization (AR), Fire Detection and Suppression (FDS), Temperature and Humidity Control (THC), and Water Recovery and Management (WRM). This paper provides a summary of the Node 1 ECLS ACS subsystem design and a detailed discussion of the ISS ECLS Acceptance Testing methodology utilized for that subsystem.
Author
Life Support Systems; International Space Station; Environmental Control; Control Systems Design; Fire Fighting

20090001208 DCS Corp., Alexanderia, VA USA

A Modeling and Simulation Approach to Analysis of Stressors on Non-Line of Sight Launch System (NLOS-LS) Control Cell Crew

Kellihan, Bret; Jun 2008; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A489861; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA489861

HUMAN CENTRIC NETWORK ENABLED BATTLE COMMAND. Part of the RDECOM MATREX Program * Focused on HPM/HBM of warfighters * Command Control and Communications Human Performance Model (C3HPM) * Historical Models * FCS SO1 NLOS-LS Modeling and Analysis.

DTIC

Human Factors Engineering; Launchers; Launching; Line of Sight; Models; Simulation; Stress Analysis

20090001281 NASA Marshall Space Flight Center, Huntsville, AL, USA

Performance Assessment of the Exploration Water Recovery System

Carter. D. Layne; Tabb, David; Perry, Jay; June 30, 2008; 9 pp.; In English; 38th International Conference on Environmental Systems, 30 Jun. - 2 Jul. 2008, San Francisco, CA, USA; Original contains color and black and white illustrations

Report No.(s): 2008-01-0042; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001281

A new water recovery system architecture designed to fulfill the National Aeronautics and Space Administration s (NASA) Space Exploration Policy has been tested at the Marshall Space Flight Center (MSFC). This water recovery system architecture evolved from the current state-of-the-art system developed for the International Space Station (ISS). Through novel integration of proven technologies for air and water purification, this system promises to elevate existing system optimization. The novel aspect of the system is twofold. First, volatile organic compounds (VOC) are removed from the cabin air via catalytic oxidation in the vapor phase, prior to their absorption into the aqueous phase. Second, vapor compression distillation (VCD) technology processes the condensate and hygiene waste streams in addition to the urine waste stream. Oxidation kinetics dictate that removing VOCs from the vapor phase is more efficient. Treating the various waste streams by VCD reduces the load on the expendable ion exchange and adsorption media which follows, as well as the aqueous-phase catalytic oxidation process further downstream. This paper documents the results of testing this new architecture.

Author

Water Reclamation; Technology Assessment; Performance; NASA Programs; International Space Station; Design Optimization; Aerospace Engineering

20090001285 Wyle Integrated Science and Engineering Group, Houston, TX, USA

ISS Expeditions 16 & 17: Chemical Analysis Results for Potable Water

Straub, John E., II; Plumlee, Debrah K.; Schultz, John R.; [2009]; 1 pp.; In English; 39th International Conference on Environmental Systems, 12-16 Jul. 2009, Savannah, GA, USA; Copyright; Avail.: Other Sources; Abstract Only

During the twelve month span of Expeditions 16 and 17 beginning October of 2007, the chemical quality of the potable water onboard the International Space Station (ISS) was verified safe for crew consumption through the return and chemical analysis of water samples by the Water and Food Analytical Laboratory (WAFAL) at Johnson Space Center (JSC). Reclaimed cabin humidity condensate and Russian ground-supplied water were the principle sources of potable water and for the first time, European groundsupplied water was also available. Although water was transferred from Shuttle to ISS during Expeditions 16 and 17, no Shuttle potable water was consumed during this timeframe. A total of 12 potable water samples were collected using U.S. hardware during Expeditions 16 and 17 and returned on Shuttle flights 1E (STS122), 1JA (STS123), and 1J (STS124). The average sample volume was sufficient for complete chemical characterization to be performed. The results of JSC chemical analyses of these potable water samples are presented in this paper. The WAFAL also received potable water samples for analysis from the Russian side collected inflight with Russian hardware, as well as preflight samples of Rodnik potable water delivered to ISS on Russian Progress vehicles 28 to 30. Analytical results for these additional potable water samples are also reported and discussed herein. Although the potable water supplies available during Expeditions 16 and 17 were judged safe for crew consumption, a recent trending of elevated silver levels in the SVOZV water is a concern for longterm consumption and efforts are being made to lower these levels.

Author

Potable Water; International Space Station; Chemical Analysis; Expeditions; Water Vehicles

20090001286 NASA Marshall Space Flight Center, Huntsville, AL, USA

The First Development of Human Factors Engineering Requirements for Application to Ground Task Design for a NASA Flight Program

Dischinger, H. Charles, Jr.; Stambolian, Damon B.; Miller, Darcy H.; June 29, 2008; 5 pp.; In English; 38th International Conference on Environmental Systems, 29 Jun. - 2 Jul. 2008, San Francisco, CA, USA

Report No.(s): 08ICES-0279; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001286

The National Aeronautics and Space Administration has long applied standards-derived human engineering requirements to the development of hardware and software for use by astronauts while in flight. The most important source of these requirements has been NASA-STD-3000. While there have been several ground systems human engineering requirements documents, none has been applicable to the flight system as handled at NASA's launch facility at Kennedy Space Center. At the time of the development of previous human launch systems, there were other considerations that were deemed more important than developing worksites for ground crews; e.g., hardware development schedule and vehicle performance. However, experience with these systems has shown that failure to design for ground tasks has resulted in launch schedule delays, ground operations that are more costly than they might be, and threats to flight safety. As the Agency begins the development of new systems to return humans to the moon, the new Constellation Program is addressing this issue with a new set of human engineering requirements. Among these requirements is a subset that will apply to the design of the flight components and that is intended to assure ground crew success in vehicle assembly and maintenance tasks. These requirements address worksite design for usability and for ground crew safety.

Author

Human Factors Engineering; Ground Operational Support System; NASA Programs

20090001293 NASA Dryden Flight Research Center, Edwards, CA, USA

Instrument Display Visual Angles for Conventional Aircraft and the MQ-9 Ground Control Station

Kamine, Tovy Haber; Bendrick, Gregg A.; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Aircraft instrument panels should be designed such that primary displays are in optimal viewing location to minimize pilot perception and response time. Human Factors engineers define three zones (i.e. cones) of visual location: 1) 'Easy Eye Movement' (foveal vision); 2) 'Maximum Eye Movement' (peripheral vision with saccades), and 3) 'Head Movement (head movement required). Instrument display visual angles were measured to determine how well conventional aircraft (T-34, T-38, F- 15B, F-16XL, F/A-18A, U-2D, ER-2, King Air, G-III, B-52H, DC-10, B747-SCA) and the MQ-9 ground control station (GCS) complied with these standards, and how they compared with each other. Selected instrument parameters included: attitude, pitch, bank, power, airspeed, altitude, vertical speed, heading, turn rate, slip/skid, AOA, flight path, latitude, longitude, course, bearing, range and time. Vertical and horizontal visual angles for each component were measured from the pilot s eye position in each system. The vertical visual angles of displays in conventional aircraft lay within the cone of 'Easy Eye Movement' for all but three of the parameters measured, and almost all of the horizontal visual angles fell within this range. All conventional vertical and horizontal visual angles lay within the cone of Maximum Eye Movement. However, most instrument vertical visual angles of the MQ-9 GCS lay outside the cone of Easy Eye Movement, though all were within the cone of Maximum Eye Movement. All the horizontal visual angles for the MQ-9 GCS were within the cone of 'Easy Eye Movement'. Most instrument displays in conventional aircraft lay within the cone of Easy Eye Movement, though mission-critical instruments sometimes displaced less important instruments outside this area. Many of the MQ-9 GCS systems lay outside this area. Specific training for MQ-9 pilots may be needed to avoid increased response time and potential error during flight. The learning objectives include: 1) Know three physiologic cones of eye/head movement; 2) Understand how instrument displays comply with these design principles in conventional aircraft and an uninhabited aerial vehicle system. Which of the following is NOT a recognized physiologic principle of instrument display design? Cone of Easy Eye Movement 2) Cone of Binocular Eye Movement 3) Cone of Maximum Eye Movement 4) Cone of Head Movement 5) None of the above. Answer: # 2) Cone of Binocular Eye Movement

Author (revised)

Ground Based Control; Display Devices; Visual Perception; Human Factors Engineering; Pilot Performance; Peripheral Vision; Commercial Aircraft

20090001318 NASA Johnson Space Center, Houston, TX, USA

Human Systems Integration (HSI) Case Studies from the NASA Constellation Program

Baggerman, Susan; Berdich, Debbie; Whitmore, Mihriban; January 2009; 10 pp.; In English; Human Systems Integration Symposium \@ISIS) 2009, 17 - 19 Mar. 2009, Maryland, USA; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001318

The National Aeronautics and Space Administration (NASA) Constellation Program is responsible for planning and implementing those programs necessary to send human explorers back to the moon, onward to Mars and other destinations in the solar system, and to support missions to the International Space Station. The Constellation Program has the technical management responsibility for all Constellation Projects, including both human rated and non-human rated vehicles such as the Crew Exploration Vehicle, EVA Systems, the Lunar Lander, Lunar Surface Systems, and the Ares I and Ares V rockets. With NASA s new Vision for Space Exploration to send humans beyond Earth orbit, it is critical to consider the human as a system that demands early and continuous user involvement, inclusion in trade offs and analyses, and an iterative 'prototype/test/ redesign' process. Personnel at the NASA Johnson Space Center are involved in the Constellation Program at both the Program and Project levels as human system integrators. They ensure that the human is considered as a system, equal to hardware and software vehicle systems. Systems to deliver and support extended human habitation on the moon are extremely complex and unique, presenting new opportunities to employ Human Systems Integration, or HSI practices in the Constellation Program. The purpose of the paper is to show examples of where human systems integration work is successfully employed in the Constellation Program and related Projects, such as in the areas of habitation and early requirements and design concepts.

Author

Constellation Program; NASA Programs; Systems Integration; Extravehicular Activity; Space Programs; Lunar Surface; Ares 5 Cargo Launch Vehicle

20090001382 Shearwater Human Engineering, North Vancouver, British Columbia Canada

Determining the Appropriate Font Size, and Use of Colour and Contrast for Underwater Displays

Morrison, J B; Zander, J K; Apr 2008; 51 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7711-997606

Report No.(s): AD-A485777; DRDC-TORONTO-CR-2008-034; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485777

Canadian mine countermeasures (MCM) divers currently use a combination of different displays to provide them with information about their safety, equipment, and status. MCM divers require a single, integrated display to simplify information gathering, and to provide information from the dive supervisor. Ergonomic design guidelines were reviewed and modified for information display in the underwater environment. A two-phase experiment was conducted to determine the optimal font size and the optimal colour, contrast, and background combination(s) for underwater displays. Eighteen subjects viewed a series of displays in four environments that simulated a combination of light and dark, clear and turbid conditions. Each subject viewed over 210 display screens to compare different font sizes and colour and contrast combinations. Each screen was scored for accuracy and readability. Results showed that when designing an underwater display, character height should be approximately 6 mm (26 point font size) when using Arial font. The display should have a black (or dark) background with light foreground letters. Light orange or light green were found to be the optimum colours for use in the display. A set of ergonomic guidelines for the design of underwater displays were developed based on the results of this study.

DTIC

Character Recognition; Color; Display Devices; Diving (Underwater)

20090001383 Shearwater Human Engineering, North Vancouver, British Columbia Canada

Factors Influencing Manual Performance in Cold Water Diving

Morrison, J B; Zander, J K; Apr 2008; 39 pp.; In English

Contract(s)/Grant(s): W7711-997606

Report No.(s): AD-A485778; DRDC-TORONTO-CR-2007-165; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485778

With the introduction of new communications and display technologies, the ability of divers to operate complex controls becomes an important factor in systems design. This study evaluates the effects of pressure, gloves, and cold on three components of manual performance: grip strength, tactile sensitivity and manual dexterity. Performance was evaluated at 0.4

and 40 msw: with and without gloves in 25 deg C water, and with gloves in 4 deg C water. Results show that narcosis did not affect manual performance at 40 msw (p>0.05). In 25 deg C water, three fingered neoprene gloves caused a significant impairment of grip strength (23%), tactile sensitivity (35%) and manual dexterity (45%). There was an interaction effect between gloves and pressure, with the compression of neoprene providing an improvement in grip strength and manual dexterity at 40 msw. Tactile sensitivity and manual dexterity were both affected by cold at 40 msw when wearing gloves (p < 0.05). The combined effects of gloves, pressure and cold water resulted in a 30% decrement in grip strength and a 60% decrement in tactile sensitivity and manual dexterity. Based on these findings, ergonomic recommendations are made for design and usability testing of underwater equipment and controls.
DTIC
Cold Water; Diving (Underwater)

20090001638 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Bepaling Referentiewaarden voor Ergonomie en Warmtebelasting van Lichtgewicht Bommenpakken (Determination of Ergonomic and Thermal Load Tests and Assessment of Reference Values With Light Weight Bomb Disposal Suits)
Kistemaker, J A; May 2008; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486385; TNO-DV-2008-A188; No Copyright; Avail.: Defense Technical Information Center (DTIC)
A third series of tests were performed with light weight explosive ordnance disposal suits to get reference data about ergonomics and heat load. The results can be used for future tenders of light weight explosive ordnance disposal suits.
DTIC
Human Factors Engineering; Load Tests; Loads (Forces); Ordnance; Protective Clothing; Thermal Analysis

20090001639 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Optimalisatie Draagsysteem (Optimization of the Load Carriage System)
Koerhuis, C L; Rensink, P; Schijndel, J van; Jun 2008; 30 pp.; In Dutch; Original contains color illustrations
Report No.(s): AD-A486386; TNO-DV-2008-A230; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Besides positive effects of an earlier developed load carriage system in which the load was carried predominantly on the hips, mobility was increased and protection and load carriage was integrated into one system (ILCS), tilting of the hip belt caused an unacceptable amount of discomfort. After optimization of the construction of the ILCS (ILCS-II), the performance while wearing the ILCS-II was compared with the performance while wearing the current load carriage system. Wearing the ILCS-II, with all the load carried on the hips, resulted in an unacceptable amount of discomfort. Wearing the ILCS-II, with the load partly carried on the hips and shoulders, resulted in less discomfort and a lower RPE score compared to wearing the current load carriage system. The increase in HR during walking was higher wearing the ILCS-II compared to the current load carriage system. Wearing the ILCS-II (with the load distributed on the hips and shoulders) has both advantages (less discomfort, lower RPE) and disadvantages (small increase in HR) compared to wearing the current load carriage system. Besides these results, in an earlier study an improved mobility was found wearing the ILCS(-II) compared to the current load carriage system. Based on these results, the ILCS-II seems to be an improvement for the operational performance compared to the current load carriage system.
DTIC
Carriages; Human Factors Engineering; Loads (Forces); Portable Equipment

20090001892 NASA Marshall Space Flight Center, Huntsville, AL, USA
Engineered Structured Sorbents for the Adsorption of Carbon Dioxide and Water Vapor from Manned Spacecraft Atmospheres: Applications and Modeling 2007/2008
Knox, James C.; Howard, David F.; Perry, Jay L.; June 29, 2007; 9 pp.; In English; 38th International Conference on Environmental Systems, 29 Jun. - 2 Jul. 2007, San Francisco, CA, USA; Original contains color and black and white illustrations
Report No.(s): 2008-01-2094; Copyright; Avail.: CASI: A02, Hardcopy
In NASA s Vision for Space Exploration, humans will once again travel beyond the confines of earth s gravity, this time to remain there for extended periods. These forays will place unprecedented demands on launch systems. They must not only blast out of earth s gravity well as during the Apollo moon missions, but also launch the supplies needed to sustain a larger crew over much longer periods. Thus all spacecraft systems, including those for the separation of metabolic carbon dioxide and water from a crewed vehicle, must be minimized with respect to mass, power, and volume. Emphasis is also placed on system robustness both to minimize replacement parts and ensure crew safety when a quick return to earth is not possible. This

paper describes efforts to improve on typical packed beds of sorbent pellets by making use of structured sorbents and alternate bed configurations to improve system efficiency and reliability. The development efforts described offer a complimentary approach combining testing of subscale systems and multiphysics computer simulations to characterize the regenerative heating substrates and evaluation of engineered structured sorbent geometries. Mass transfer, heat transfer, and fluid dynamics are included in the transient simulations.
Author
Adsorption; Mass Transfer; Carbon Dioxide; Working Fluids; System Effectiveness; Sorbents; Fluid Dynamics

20090001911 Wyle Integrated Science and Engineering Group, Houston, TX, USA
Evaluation of the Biocidal Efficacy of Different Forms of Silver Against Cupriavidus (formerly Wautersia) Species Bacteria
Gazda, Daniel B.; Schultz, John R.; Wong, Wing; Algate, Michelle T.; Bryant, Becky; Castro, Victoria A.; [2009]; 1 pp.; In English; 39th International Conference on Environmental Systems, 12-16 Jul. 2009, Savannah, GA, USA; Copyright;
Avail.: Other Sources; Abstract Only

Contingency Water Containers (CWCs) are used to store potable and technical water that is transferred to the International Space Station (ISS) from the Shuttle orbiter vehicles. When CWCs are filled, water from the orbiter galley is passed through an ion exchange/activated carbon cartridge that removes the residual iodine biocide used on Shuttle before silver biocide is added. Removal of iodine and addition of silver is necessary to inhibit microbial growth inside CWCs and maintain compatibility with the water systems in the Russian segment of ISS. As part of nominal water transfer activities, crewmembers collect samples from several CWCs for postflight analysis. Results from the analysis of water transfer samples collected during the docked phases of STS-118/13A.1 and STS-120/10A showed that several of the CWCs contained up to 10(exp 4) CFU/mL of bacteria despite the fact that the silver concentrations in the CWCs were within acceptable limits. The samples contained pure cultures of a single bacteria, a Cupriavidus (formerly Wautersia) species that has been shown to be resistant to metallic biocides. As part of the investigation into the cause and remediation of the bacterial contamination in these CWCs, ground studies were initiated to evaluate the resistance of the Cupriavidus species to the silver biocides used on ISS and to determine the minimum effective concentration for the different forms of silver present in the biocides. The initial findings from those experiments are discussed herein.
Author
Potable Water; Contamination; Bacteria; Water Treatment; Antiinfectives and Antibacterials; Silver

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*.

20090000979 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Term Rewriting with Traversal Functions
Van den Brand, M. G. J.; Klint, P.; Vinju, J. J.; Jul. 2001; 40 pp.; In English
Report No.(s): PB2009-102735; SEN-R0121; Copyright; Avail.: National Technical Information Service (NTIS)

Term rewriting is an appealing technique for performing program analysis and program transformation. Tree (term) traversal is frequently used but is not supported by standard term rewriting. We extend many-sorted, first-order term rewriting with ‘traversal functions’ that automate tree traversal in a simple and type safe way. Traversal functions can be bottom-up or top-down traversals. They can be either sort preserving transformations, or mappings to a fixed sort. We give examples and describe the semantics and implementation of traversal functions.
NTIS
Computer Programs; Semantics

20090000980 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Partial tau-Confluence for Efficient State Space Generation
Blom, S. C. C.; Aug. 2001; 22 pp.; In English
Report No.(s): PB2009-102737; SEN-R0123; Copyright; Avail.: National Technical Information Service (NTIS)

We extend the theory of partial order methods with a new notion of tau-confluence. Based on this new notion we define a reduced transition system, which is branching bisimilar to the original state space. We show that the new notion is preserved

under various transformations. We present an algorithm which efficiently computes the reduced transition system from a symbolic representation.
NTIS
Convergence; State Estimation; Branching (Mathematics)

20090000982 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Coinductive Counting: Bisimulation in Enumerative Combinatorics (Extended Abstract)
Rutten, J. J. M. M.; Dec. 31, 2001; 20 pp.; In English
Report No.(s): PB2009-102743; SEN-R0129; Copyright; Avail.: National Technical Information Service (NTIS)
The recently developed coinductive calculus of streams finds here a further application in enumerative combinatorics. A general methodology is developed to solve a wide variety of basic counting problems in a uniform way: (1) the objects to be counted are enumerated by means of an infinite (weighted) automaton; (2) the automaton is minimized by means of the quantitative notion of stream bisimulation; and (3) the minimized automaton is used to compute an expression (in terms of stream constants and operators) that represents the stream of all counts.
NTIS
Differential Equations; Algebra

20090000983 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Manual for the muCRL Tool Set (Version 2.8.2)
Wouters, A. G.; Dec. 31, 2001; 56 pp.; In English
Report No.(s): PB2009-102744; SEN-R0130; Copyright; Avail.: National Technical Information Service (NTIS)
The specification language muCRL and a tool set for manipulation, optimisation and state space generation are described.
NTIS
Algebra; Manuals

20090000984 Commerce Dept., Washington, DC, USA
Office of the Secretary: FY 2004 Independent Evaluation of the Department of Commerce's Information Security Program Under the Federal Information Security Management Act for FY 2004. Final Inspection Report No. OSE-16954
Oct. 2004; 13 pp.; In English
Report No.(s): PB2009-102861; No Copyright; Avail.: CASI: A03, Hardcopy
FISMA mandates two annual reviews of an agency's information security program: one conducted by the agency iteself and a second independent evaluation performewd by the agency's Office of Inspector General (OIG). The objective of the FISMA evaluation was to determine whether the Department's information security program and practices comply with the act's requirements, and thereby protect the information and information systems on which the federal government depends.
NTIS
Commerce; Data Processing; Information Management; Inspection; Management Planning; Security; United States

20090000989 Center for Mathematics and Computer Science, Amsterdam, Netherlands
XT: A Bundle of Program Transformation Tools; System Description
De Jonge, M.; Visser, E.; Visser, J. M. W.; May 31, 2001; 10 pp.; In English
Report No.(s): PB2009-102728; SEN-R0114; Copyright; Avail.: National Technical Information Service (NTIS)
XT bundles existing and newly developed program transformation libraries and tools into an open framework that supports component-based development of program transformations. We discuss the roles of XT's constituents in the development process of program transformation tools, as well as some experiences with building program transformation systems with XT.
NTIS
Bundles; Computer Programs

20090000996 Commerce Dept., Washington, DC, USA
Bureau of Economic Analysis: FY 2008 FISMA Assessment of BEA Estimation Information Technology System (BEA-015). Final Inspection Report No. OSE-19001
Sep. 2008; 34 pp.; In English
Report No.(s): PB2009-102706; No Copyright; Avail.: CASI: A03, Hardcopy
This report presents the results of our Federal Information Security Management Act (FISMA) review of the BEA

Estimation Information Technology System certification and accreditation. We found that while the system security plan provided an adequate basis to conduct the security certification, BEA needs to improve its security control assessments to assure that controls are implemented as intended. We also found that BEA needs to correct its process for tracking and reporting security weaknesses as required by Department policy and OMB's FISMA guidance. Finally, we performed our own assessment of selected BEA's security controls and found weaknesses in those controls that BEA's security certification did not.
NTIS
Economic Analysis; Economics; Information Management; Information Systems; Inspection; Security; United States

20090000997 Commerce Dept., Washington, DC, USA
Office of the Chief Information Officer: Management Attention is Needed to Assure Adequate Computer Incident Response Capability. Final Inspection Report No. OSE-16522
Sep. 2004; 27 pp.; In English
Report No.(s): PB2009-102707; No Copyright; Avail.: CASI: A03, Hardcopy
Information security threats have become more numerous and diverse, as well as more damaging and disruptive. New types of incidents are continually emerging, and not all incidents can be prevented. An effective incident response capability is essential for rapidly detecting incidents, minimizing losses, and restoring services. Our evaluation found that the Department's distributed incident response structure is appropriate for the decentralized organization of the Department. However, improvements are needed to allow the Department CIO to obtain a Commerce-wide view of vulnerabilities and threats and ensure efficient and effective incident response throughout Commerce. Issues we identified include (1) the lack of a centralized entity to promote information sharing and consistency in response processes across the decentralized structure, (2) the absence of adequate incident response procedures in several units, (3) incomplete and inconsistent reporting of incidents by the operating units, and (4) the need for system administrators and IT security officers to improve their intrusion detection approaches and obtain additional specialized tools and training.
NTIS
Commerce; Data Processing; Information Management; Inspection; Management Planning; Security; United States

20090000998 Commerce Dept., Washington, DC, USA
Office of the Secretary: Information Security in Information Technology Service Contracts Is Improving, But Additional Efforts are Needed. Final Inspection Report No. OSE-16513
Sep. 2004; 14 pp.; In English
Report No.(s): PB2009-102708; No Copyright; Avail.: CASI: A03, Hardcopy
To assess the Department's progress in fiscal year 2003, we reviewed its new security policy and a sample of IT service contract actions issued as of October 1, 2002. The findings from this review were summarized in our September 2003 FISMA report. We found that the Department's newly issued information security policy contains appropriate requirements for contractors and other government agencies that support Commerce. The Department also drafted standard contract provisions for safeguarding the security of sensitive but unclassified systems and information, which require, among other things, a certification and accreditation package for contracted IT resources/services that involve connection to Commerce networks or storage of Commerce data on contractor-owned systems. However, while most of the contract actions we reviewed contained some security coverage, adequate provisions for controlling access to departmental systems and networks were still missing. We also found little coordination among the contracting, technical, and security staff responsible for developing contract-specific security requirements and minimal oversight of individual contractor compliance with security requirements.
NTIS
Commerce; Data Processing; Information Systems; Inspection; Management Planning; Security; United States

20090001000 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Equivalence of Recursive Specifications in Process Algebra
Ponse, A.; Usenko, Y. S.; Apr. 30, 2001; 14 pp.; In English
Report No.(s): PB2009-102721; SEN-R0107; Copyright; Avail.: National Technical Information Service (NTIS)
We define an equivalence relation on recursive specifications in process algebra that is model-independent and does not involve an explicit notion of solution. Then we extend this equivalence to the specification language (mu)CRL.
NTIS
Algebra; Equivalence

20090001001 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Converting the Reset
Hoogland, J. K.; Neumann, C. D. D.; Bloch, D.; Apr. 30, 2001; 16 pp.; In English
Report No.(s): PB2009-102722; SEN-R0108; Copyright; Avail.: National Technical Information Service (NTIS)

We give a simple algorithm to incorporate the effects of resets in convertible bond prices, without having to add an extra factor to take into account the value of the reset. Furthermore we show that the effect of a notice period, and additional make-whole features, can be treated in a straightforward and simple manner. Although we present these results with the stock price driven by geometric Brownian and a deterministic interest term structure, our results can be extended to more general cases, i.e., stochastic interest rates.
NTIS
Algorithms; Joints (Junctions)

20090001002 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Visitor Combination and Traversal Control
Visser, J. M. W.; May 2001; 26 pp.; In English
Report No.(s): PB2009-102723; SEN-R0109; Copyright; Avail.: National Technical Information Service (NTIS)

The 'Visitor' design pattern allows the encapsulation of polymorphic behavior outside the class hierarchy on which it operates. A common application of 'Visitor' is the encapsulation of tree traversals. Unfortunately, visitors resist composition and allow little traversal control. To remove these limitations, we introduce visitor 'combinators'. These are implementations of the visitor interface that can be used to compose new visitors from given ones. The set of combinators we propose includes traversal combinators that can be used to obtain full traversal control. A clean separation can be made between the generic parts of the combinator set and the parts that are specific to a particular class hierarchy. The generic parts form a reusable framework. The specific parts can be generated from a (tree) grammar. Due to this separation, programming with visitor combinators becomes a form of 'generic programming' with significant reuse of (visitor) code.
NTIS
Encapsulating; Trees (Mathematics)

20090001003 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Program Comprehension Risks and Opportunities in Extreme Programming
Van Deursen, A.; May 31, 2001; 14 pp.; In English
Report No.(s): PB2009-102724; SEN-R0110; Copyright; Avail.: National Technical Information Service (NTIS)

We investigate the relationship between reverse engineering and program comprehension on the one hand, and software process on the other. To understand this relationship, we select one particular existing software process, extreme programming (XP), and study the role played in it by program comprehension and reverse engineering. To that end, we analyze five key XP practices in depth: pair programming, unit testing, refactoring, evolutionary design, and collaborative planning. The contributions of this paper are: (1) the identification of promising research areas in the field of program comprehension; (2) the identification of new application perspectives for reverse engineering technology; (3) a critical analysis of XP resulting in research questions that could help resolve some of the uncertainties surrounding XP; and (4) a process assessment framework for analyzing software processes from the comprehension and reverse engineering point of view.
NTIS
Reverse Engineering; Risk; Computer Programming

20090001044 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Grammars as Contracts
De Jonge, M.; Visser, J. M. W.; May 31, 2001; 16 pp.; In English
Report No.(s): PB2009-102726; SEN-R0112; Copyright; Avail.: National Technical Information Service (NTIS)

Component-based development of language tools stands in need of meta-tool support. This support can be offered by generation of code - libraries or full-fledged components - from syntax definitions. We develop a comprehensive architecture for such syntax-driven meta-tooling in which grammars serve as contracts between components. This architecture addresses exchange and processing both of full parse trees and of abstract syntax trees, and it caters for the integration of generated parse and pretty-print components with tree processing components. We discuss an instantiation of the architecture for the syntax definition formalism /sdf, integrating both existing and newly developed meta-tools that support /sdf. The /aterm format is

adopted as exchange format. This instantiation gives special attention to adaptability, scalability, reusability, and maintainability issues surrounding language tool development.
NTIS
Grammars; Formalism; Maintainability; Adaptation

20090001045 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Collaborative Software Development
De Jonge, M.; Visser, E.; Visser, J. M. W.; May 31, 2001; 12 pp.; In English
Report No.(s): PB2009-102727; SEN-R0113; Copyright; Avail.: National Technical Information Service (NTIS)

We present an approach to collaborative software development where obtaining components and contributing components across organizational boundaries are explicit phases in the development process. A lightweight generative infrastructure supports this approach with an online package base, and several generators that simplify the construction and composition of component packages. The infrastructure ensures availability, portability, and adaptability of components without centralized orchestration of the development process.
NTIS
Computer Programming; Software Engineering

20090001048 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Bringing Computational Steering to the User
Van Wijk, J. J.; Van Liere, R.; Mulder, J. D.; Aug. 31, 1997; 18 pp.; In English
Report No.(s): PB2009-102319; SEN-R8718; Copyright; Avail.: National Technical Information Service (NTIS)

Computational steering is a technique that combines simulation and visualization. The user is continuously provided with visual feedback about the state of the simulation, and can change parameters on the fly. Designers can vary parameters to optimize their product, users can detect errors in the input early, researchers can do qualitative sensitivity analyses easily. The implementation of computational steering is very tedious. It requires knowledge of the simulation, visualization, user interfacing, and data communication. In this paper we discuss an environment that enables users to implement and use computational steering effectively without much support from user interface experts. We show how the environment is applied to various applications.
NTIS
Simulation; Steering

20090001057 Commerce Dept., Washington, DC, USA
U.S. Census Bureau: Valuable Learning Opportunities Were Missed in the 2006 Test of Address Canvassing. Final Report No. OIG-17524
Mar. 2004; 65 pp.; In English
Report No.(s): PB2009-102689; No Copyright; Avail.: CASI: A04, Hardcopy

At an estimated cost of $11.5 billion, the 2010 census will be the most expensive decennial census ever. The Census Bureaus reengineered plan for 2010 depends heavily on automating critical field operations, such as address canvassing. We evaluated the bureaus (1) efforts to automate address canvassing using handheld computers; (2) methods for correcting the address lists and maps; (3) quality control processes; (4) outreach activities; and (5) staff training, and other components of the management, administrative, and logistical support for the 2006 test.
NTIS
Census; Cost Estimates

20090001062 Mathematica Policy Research, Inc., Princeton, NJ, USA; SRI International Corp., Menlo Park, CA, USA
Effectiveness of Reading and Mathematics Software Products: Findings from the First Student Cohort. Report to Congress. Executive Summary
Dynarski, M.; Agodini, R.; Heaviside, S.; Novak, T.; Carey, N.; January 2007; 16 pp.; In English
Report No.(s): PB2009-102792; NCEE-2007-4006; No Copyright; Avail.: CASI: A03, Hardcopy

With computers now commonplace in American classrooms, and districts facing substantial costs of hardware and software, concerns naturally arise about the contribution of this technology to students' learning. The No Child Left Behind Act (P.L. 107-110, section 2421) called for the U.S. Department of Education (ED) to conduct a national study of the

effectiveness of educational technology. This legislation also called for the study to use scientifically based research methods and control groups or control conditions and to focus on the impact of technology on student academic achievement.
NTIS
Congressional Reports; Education; Reading; Students

20090001066 Mathematica Policy Research, Inc., Princeton, NJ, USA; SRI International Corp., Menlo Park, CA, USA
Effectiveness of Reading and Mathematics Software Products: Findings from the First Student Cohort. Report to Congress
Dynarski, M.; Agodini, R.; Heaviside, S.; Novak, T.; Carey, N.; January 2007; 140 pp.; In English
Report No.(s): PB2009-102793; NCEE-2007-4005; No Copyright; Avail.: CASI: A07, Hardcopy

With computers now commonplace in American classrooms, and districts facing substantial costs of hardware and software, concerns naturally arise about the contribution of this technology to students' learning. The No Child Left Behind Act (P.L. 107-110, section 2421) called for the U.S. Department of Education (ED) to conduct a national study of the effectiveness of educational technology. This legislation also called for the study to use scientifically based research methods and control groups or control conditions and to focus on the impact of technology on student academic achievement.
NTIS
Congressional Reports; Education; Reading; Students

20090001071 Commerce Dept., Washington, DC, USA
USA Patent and Trademark Office: Search System Problems Being Addressed, But Improvements Needed for Future Systems. Inspection Report No. OSE-12679
Mar. 2001; 34 pp.; In English
Report No.(s): PB2009-102808; No Copyright; Avail.: CASI: A03, Hardcopy

Patent examiners determine the uniqueness of a submitted patent by searching previously granted U.S. and foreign patents and relevant non-patent literature, such as technical journals, collectively called prior art. Before the advent of automated searching, examiners searched only paper patents to determine uniqueness. Since the U.S. Patent and Trademark Office (USPTO) introduced its first patent search system in 1986, examiners have increasingly relied on automated systems to search prior art. The objective of automated searching is to improve patent quality and maintain examiner productivity as the volume of patent filings increases. In 1994, USPTO decided to replace its primary search system, Messenger, because the technology was becoming obsolete and capacity limitations were making it difficult to support the needs of the rapidly growing patent examining corps. USPTO also concluded that making Messenger year 2000 compliant would be uneconomical. Consequently, USPTO decided to allow the license for Messenger to expire and remove the system from operations by September 30, 1999. Thus, the new search system had to be ready to support operations at that time. The Patent Commissioner and USPTOs Chief Information Officer (CIO) were the designated decision authorities for the search system program, with responsibility for monitoring progress and approving key decisions. The objectives of this evaluation were to assess the development and operation of USPTOs new search system to (1) determine whether it is adequately supporting patent application processing and (2) identify lessons learned that can be applied to future system programs.
NTIS
Inspection; Patents; United States

20090001074 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Pretty-Printer for Every Occasion
De Jonge, M.; May 31, 2001; 18 pp.; In English
Report No.(s): PB2009-102729; SEN-R0115; Copyright; Avail.: National Technical Information Service (NTIS)

Tool builders dealing with many different languages, and language designers require sophisticated pretty-print techniques to minimize the time needed for constructing and adapting pretty-printers. We combined new and existing pretty-print techniques in a generic pretty-printer that satisfies modern pretty-print requirements. Its features include language independence, customization, and incremental pretty-printer generation. Furthermore, we emphasize that the recent acceptance of XML as international standard for the representation of structured data demands flexible pretty-print techniques, and we demonstrate that our pretty-printer provides such technology.
NTIS
Printers; Document Markup Languages

20090001075 Center for Mathematics and Computer Science, Amsterdam, Netherlands

Generating Robust Parsers Using Island Grammars

Moonen, L. M. F.; Jul. 2001; 20 pp.; In English

Report No.(s): PB2009-102732; SEN-R0118; Copyright; Avail.: National Technical Information Service (NTIS)

Source model extraction, the automated extraction of information from system artifacts, is a common phase in reverse engineering tools. One of the major challenges of this phase is creating extractors that can deal with irregularities in the artifacts that are typical for the reverse engineering domain (for example, syntactic errors, incomplete source code, language dialects and embedded languages). This paper proposes a solution in the form of 'island grammars', a special kind of grammars that combine the detailed specification possibilities of grammars with the liberal behavior of lexical approaches. We show how island grammars can be used to generate robust parsers that combine the accuracy of syntactical analysis with the speed, flexibility and tolerance usually only found in lexical analysis. We conclude with a discussion of the development of Mangrove, a generator for source model extractors based on island grammars and describe its application to a number of case studies.

NTIS

Grammars; Parsing Algorithms

20090001076 Center for Mathematics and Computer Science, Amsterdam, Netherlands

Computer Assisted Manipulation of Algebraic Process Specifications

Groote, J. F.; Lisser, B.; May 31, 2001; 20 pp.; In English

Report No.(s): PB2009-102731; SEN-R0117; Copyright; Avail.: National Technical Information Service (NTIS)

Specifications of system behaviour tend to become large. Analysis of such specifications requires automated tools. Most attention hitherto has been invested in fully automatic tools. We however believe that in many cases human intervention is required, and we therefore propose a number of computer tools to transform process specifications. The concrete manipulation tools that we describe can eliminate constants, redundant sum variables and parameters, and allow to split variables ranging over complex datatypes. These tools can transform specifications with large finite state spaces to variants with state spaces being a fraction of their original size, and transform specifications with infinite state spaces to those with finite state spaces.

NTIS

Algebra; Computer Techniques

20090001077 Center for Mathematics and Computer Science, Amsterdam, Netherlands

Elements of Stream Calculus (An Extensive Exercise in Coinduction)

Rutten, J. J. M. M.; Jul. 2001; 58 pp.; In English

Report No.(s): PB2009-102734; SEN-R0120; Copyright; Avail.: National Technical Information Service (NTIS)

Based on the presence of a final coalgebra structure on the set of streams (infinite sequences of real numbers), a coinductive calculus of streams is developed. The main ingredient is the notion of stream derivative, with which both coinductive proofs and definitions can be formulated. In close analogy to classical analysis, the latter are presented as behavioural differential equations. A number of applications of the calculus are presented, including difference equations, analytical differential equations, continued fractions, and some problems from discrete mathematics and combinatorics.

NTIS

Calculus; Physical Exercise

20090001150 George Mason Univ., Fairfax, VA, USA

Efficient Simulation Budget Allocation for Selecting an Optimal Subset

Chen, Chun-Hung; He, Donghai; Fu, Michael; Lee, Loo Hay; INFORMS Journal on Computing; [2008]; ISSN 1091=9856; Volume 20, No. 4, pp. 579-595; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NSF IIS-0325074; NSF DMI-0540312; NSF DMI-0323220; NNA05CV26G; FAA 00-G-016; FA9550-04-1-0210; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1287/ijoc.1080.0268

We consider a class of the subset selection problem in ranking and selection. The objective is to identify the top m out of k designs based on simulated output. Traditional procedures are conservative and inefficient. Using the optimal computing budget allocation framework, we formulate the problem as that of maximizing the probability of correctly selecting all of the top-m designs subject to a constraint on the total number of samples available. For an approximation of this correct selection probability, we derive an asymptotically optimal allocation and propose an easy-to-implement heuristic sequential allocation

procedure. Numerical experiments indicate that the resulting allocations are superior to other methods in the literature that we tested, and the relative efficiency increases for larger problems. In addition, preliminary numerical results indicate that the proposed new procedure has the potential to enhance computational efficiency for simulation optimization.
Author
Probability Theory; Ranking; Simulation; Design Optimization; Heuristic Methods

20090001234 NASA Johnson Space Center, Houston, TX, USA
Direct Multiple Shooting Optimization with Variable Problem Parameters
Whitley, Ryan J.; Ocampo, Cesar A.; [2009]; 13 pp.; In English; 47th AIAA Aerospace Sciences Meeting, 5 - 8 Jan. 2009, Florida, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Taking advantage of a novel approach to the design of the orbital transfer optimization problem and advanced non-linear programming algorithms, several optimal transfer trajectories are found for problems with and without known analytic solutions. This method treats the fixed known gravitational constants as optimization variables in order to reduce the need for an advanced initial guess. Complex periodic orbits are targeted with very simple guesses and the ability to find optimal transfers in spite of these bad guesses is successfully demonstrated. Impulsive transfers are considered for orbits in both the 2-body frame as well as the circular restricted three-body problem (CRTBP). The results with this new approach demonstrate the potential for increasing robustness for all types of orbit transfer problems.
Author
Three Body Problem; Transfer Orbits; Gravitational Constant; Analysis (Mathematics)

20090001345 National Inst. of Standards and Technology, Gaithersburg, MD USA
Additional Improvements Needed to Strengthen NIST's Information Security Program
Sep. 2002; 30 pp.; In English
Report No.(s): PB2009-102677; FINAL-REPT-OSE-15078; No Copyright; Avail.: CASI: A03, Hardcopy

Information technology is critical to NIST's mission. Much of NIST's research and other work depends on computer models, computer data, and other electronic information. With this increasing reliance on computing technologies, including the use of the Internet and its related information dissemination techniques, the potential for loss, compromise, and misuse of NIST data and systems grows daily. The objective of our evaluation was to determine whether NIST's information security program for unclassified systems complies with the Government Information Security Reform Act (GISRA), which mandates that federal agencies have effective security for the information resources supporting their operations and assets. Using NISTs Security Self-Assessment Guide for Information Technology Systems, as recommended by OMB, we evaluated NISTs information security policies and procedures, roles and responsibilities, and adherence to applicable laws, regulations, and guidance.
NTIS
Computer Information Security; Management Information Systems; Security

20090001371 Commerce Dept., Washington, DC, USA
Bureau of Export Administration: Management of the Commerce Control List and Related Processes Should Be Improved. Inspection Report No. IPE-13744
Mar. 2001; 82 pp.; In English
Report No.(s): PB2009-102844; No Copyright; Avail.: National Technical Information Service (NTIS)

The House and Senate Armed Services Committees, through the National Defense Authorization Act for Fiscal Year 2000, directed the Inspectors General of the Departments of Commerce, Defense, Energy, and State, in consultation with the Director of Central Intelligence and the Director of the Federal Bureau of Investigation, to assess the adequacy of export controls and counterintelligence measures to prevent the acquisition of militarily sensitive U.S. technology and technical information by countries and entities of concern. The legislation mandates that the Inspectors General report to the Congress by March 30 each year until 2007.
NTIS
Inspection; International Trade; Intelligence; Defense Program; Law (Jurisprudence)

20090001765 National Inst. of Standards and Technology, Gaithersburg, MD, USA

Software Write Block: Testing Support Tools Validation. Test and Code Review Report

Black, P. E.; Mar. 2005; 54 pp.; In English

Report No.(s): PB2009-102623; NISTIR-7207-B; No Copyright; Avail.: CASI: A04, Hardcopy

This NIST Internal Report consists of two parts. Part A covers the planning, design, and specification of testing and reviewing the Software write block (SWB) support tools. Part B, which is a companion document, covers the test and code review support report. Part A gives a test plan, test design specification, and test case specification for validation of the disk drive software write block testing support tools. The test plan defines the scope, including specific items and features to be validated, the methodology or approach for validating the SWB test support tools, and some technical background. The test design specification gives requirements for validating SWB tools. These requirements yield assertions. Each assertion leads to one or more code reviews or test cases consisting of preconditions, values, and method(s) for gaining confidence that the SWB test support tools correctly assess those assertions, a test procedure and the expected results. The test case specification gives details of test and review procedures for setting up the test, performing the test, and assessing the results. Appendices include a code review checklist and source code for validation programs. Part B reports the results of reviewing the source code of the SWB test tools and testing them against Part A of the companion NIST Internal Report entitled Software Write Block Testing Support Tools validation Test Plan, Test Design Specification, and Test Case Specification.

NTIS

Program Verification (Computers); Source Programs; Software Development Tools

20090001766 National Inst. of Standards and Technology, Gaithersburg, MD USA; Booz-Allen and Hamilton, Inc., Bethesda, MD, USA

Unified Framework for Mobile Device Security

Jansen, W.; Korolev, V.; Gavrila, S.; Heute, T.; Seveillac, C.; January 2008; 6 pp.; In English

Report No.(s): PB2009-102628; No Copyright; Avail.: CASI: A02, Hardcopy

Present-day handheld devices, such as PDAs, are a useful blend of hardware and software oriented toward the mobile workforce. While they provide the capability to review documents, correspond via electronic mail, manage appointments and contacts, etc., they typically lack a number of important security features. Concerned individuals and organizations aware of the associated risks involved, mitigate them with such add-on mechanisms as improved user authentication, content encryption, organizational policy controls, virus protection, firewall and intrusion detection filtering, and virtual private network communication. Unfortunately, such piecemeal solutions often present problems in software integration, usability, and administration. This paper describes a framework for incorporating core security mechanisms in a unified manner that avoids these problems.

NTIS

Computer Information Security; Security; Electronic Mail; Warning Systems; Detection

20090001873 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Adjoint Estimation of the Variation in a Model Functional Output Due to Assimilation of Data

Daescu, Dacian N.; Todling, Ricardo; [2008]; 41 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06GC67G; Copyright; Avail.: Other Sources

A parametric approach to the adjoint estimation of the variation in a model functional output due to assimilation of data is considered as a tool to analyze and develop observation impact measures. The parametric approach is specialized to a linear analysis scheme and it is used to derive various high-order approximation equations. This framework includes Kalman filter and incremental three- and four-dimensional variational data assimilation schemes implementing a single outer loop iteration. Distinction is made between Taylor series methods and numerical quadrature methods. The novel quadrature approximations require minimal additional software development and are suitable for testing and implementation at operational numerical weather prediction centers where a data assimilation system (DAS) and the associated adjoint DAS are in place. Their potential use as tools for observation impact estimates needs to be further investigated. Preliminary numerical experiments are provided using NASA Goddard Earth Observing System (GEOS-5) atmospheric DAS.

Author

Data Systems; Assimilation; Adjoints; Approximation; Kalman Filters; Iteration

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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*.

20090001098 Carnegie-Mellon Univ., Pittsburgh, PA USA

FAWN: A Fast Array of Wimpy Nodes

Andersen, David G; Franklin, Jason; Phanishayee, Amar; Tan, Lawrence; Vasudevan, Vijay; May 2008; 24 pp.; In English
Contract(s)/Grant(s): CNS-0619525; DAAD19-02-1-0389
Report No.(s): AD-A490226; CMU-PDL-08-108; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper introduces the FAWN-Fast Array of Wimpy Nodes-cluster architecture for providing fast, scalable, and power-efficient key-value storage. A FAWN links together a large number of tiny nodes built using embedded processors and small amounts (2-16GB) of flash memory into an ensemble capable of handling 700 queries per second per node while consuming fewer than 6 watts of power per node. We have designed and implemented a clustered key-value storage system, FAWN-DHT, that runs atop these node. Nodes in FAWN-DHT use a specialized log-like back-end hash-based database to ensure that the system can absorb the large write workload imposed by frequent node arrivals and departures. FAWN uses a two-level cache hierarchy to ensure that imbalanced workloads cannot create hot-spots on one or a few wimpy nodes that impair the system's ability to service queries at its guaranteed rate. Our evaluation of a small-scale FAWN cluster and several candidate FAWN node systems suggest that FAWN can be a practical approach to building large-scale storage for seek-intensive workloads. Our further analysis indicates that a FAWN cluster is cost-competitive with other approaches (e.g., DRAM, multitudes of magnetic disks, solid-state disk) to providing high query rates, while consuming 3-10x less power.
DTIC

Architecture (Computers); Workloads (Psychophysiology); Power Efficiency

20090001404 Naval Research Lab., Washington, DC USA

A New Digital Phase Measurement System

Landis, G P; Galysh, Ivan; Petsopoulos, Thomas; Nov 2001; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485834; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485834

The Naval Research Laboratory (NRL) is developing a digital phase measurement system. The measurement system uses high speed Analog to Digital Converters (ADC) to make tens of millions of measurements per second, Digital Signal Processing (DSP) hardware for intermediate calculations, and a PC for the final phase calculations. Performance of the present configuration is limited by a 12-bit analog-to-digital converter. Averaging times can be as small as 0.0001 seconds. Multiple input frequencies to over 10 MHz can be measured simultaneously. Modular construction will allow for expansion to many channels. Absolute phase measurements are possible. Inputs to channels can be switched between frequencies and then returned to an original frequency without losing phase coherency of the measurements. This system to be used in the laboratory and may be used on the GPS satellites to monitor a hot backup clock. The basic system measures the coefficient of a Discrete Fourier Transform (DFT) at the assumed frequency of the input signal. This paper will describe the special purpose DSP hardware and software used to measure the signal and transform the measurements into conventional clock parameters.
DTIC

Analog Data; Analog to Digital Converters; Digital Systems; Systems Engineering

20090001604 Naval Postgraduate School, Monterey, CA USA

Providing Cryptographic Security and Evidentiary Chain-of-Custody with the Advanced Forensic Format, Library, and Tools

Garfinkel, Simson L; Aug 19, 2008; 46 pp.; In English
Report No.(s): AD-A486255; NPS-CS-08-014; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper presents improvements in the Advanced Forensics Format Library version 3 that provide for digital signatures and other cryptographic protections for digital evidence, allowing an investigator to establish a reliable chain-of-custody for electronic evidence from the crime scene to the court room. No other system for handling and storing electronic evidence

currently provides such capabilities. This paper discusses implementation details, user level commands, and the AFFLIB programmer's API.
DTIC
Cryptography; Digital Systems; Libraries; Security

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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.

20090001092 Naval Postgraduate School, Monterey, CA USA
Shortest-Path Network Interdiction
Israeli, Eltan; Wood, R K; May 2002; 16 pp.; In English
Report No.(s): AD-A490133; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We study the problem of interdicting the arcs in a network in order to maximize the shortest s-t path length 'Interdiction' is an attack on an arc that destroys the arc or increases its effective length; there is a limited interdiction budget. We formulate this bilevel, max-min problem as a mixed-integer program (MIP), which can be solved directly, but we develop more efficient decomposition algorithms. One algorithm enhances Benders decomposition by adding generalized integer cutting planes, called 'supervalid inequalities' (SVIs), to the master problem. A second algorithm exploits a unique set-covering master problem. Computational results demonstrate orders-of-magnitude improvements of the decomposition algorithms over direct solution of the MIP and show that SVIs also help solve the original MIP faster.
DTIC
Algorithms; Integers

20090001099 Carnegie-Mellon Univ., Pittsburgh, PA USA
Perspective: Semantic Data Management for the Home
Salmon, Brandon; Schlosser, Steven W; Cranor, Lorrie F; Ganger, Gregory R; May 2008; 23 pp.; In English
Contract(s)/Grant(s): CNS-0326453; DAAD19-02-1-0389
Report No.(s): AD-A490225; CMU-PDL-08-105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Perspective uses a new semantic filesystem construct, the view, to simplify management of distributed storage in the home. A view is a semantic description of a set of files, specified as a query on file attributes. In Perspective, users can identify and control the files stored on a given device by examining and modifying the views associated with it. This approach allows them to reason about what is where in the same way 'semantic naming' as they navigate their digital content. Thus, in serving as their own administrators, users do not have to deal with a second data organization scheme 'hierarchical naming' to perform replica management tasks, such as specifying redundancy to provide reliability and data partitioning to address device capacity exhaustion. A set of extensive user studies confirm the difficulties created by current approaches and the efficacy of view-based data management.
DTIC
Data Management; Semantics; Data Storage

20090001189 Armstrong Lab., Williams AFB, AZ USA
Perspectives on the Design of Interaction Strategies
Gavors, Mark J; Hannafin, Michael; Feb 1994; 26 pp.; In English
Contract(s)/Grant(s): Proj-1123
Report No.(s): AD-A490132; AFRL-RH-AZ-OP-1994-0001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

While few question the importance of active responding for effective computer-supported learning, insufficient attention has been directed toward understanding the implications of contemporary research and theory for the design of interactions. With technologies of vastly expanded capabilities, the potential for interaction design has expanded still further. What kinds of interactions should be cultivated? Are these strategies truly unique for specific technologies, or are they generalizable? How are differences inherent in diverse learning tasks accommodated in the design of interaction strategies? Can these guidelines

be derived, based upon existing research and theory, that emphasize durable technological attributes rather than transitional media forms? In this paper, several perspectives on interaction and computer technology are presented and critically analyzed.
DTIC
Computer Assisted Instruction; Durability; Tasks

20090001200 Army War Coll., Carlisle Barracks, PA USA
Modeling PMESII Factors to Support Strategic Education
McLarney, Ed; Snyder, Dan; Everson, Paul; Wilson, Matthew; Jun 11, 2008; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490061; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Agenda: ^Introduction, ^M&S Steering Committee/JFCOM PMESII initiative, ^Strategic Education at the Army War College, ^PMESII Modeling Support, ^An Approach to PMESII, ^Way Ahead and Conclusion.
DTIC
Economics; Education; Models; Warfare

20090001219 Army Research Development and Engineering Command, Warren, MI USA
Development of Low Cost Mobile Platforms for Indoor Tracking, Navigation and Geo-Location
Pham, Phuong-Thao; Palaniappan, Ravi; Mangold, L; Tracy, J; Wheeler, A; Dec 2005; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490240; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This paper describes a novel method to locate and track entities in the absence of conventional navigation systems like Global Positioning Systems 'GPS'. The goal of this project is to develop low cost mobile platforms for Army Tactical Engagement Simulation training exercises that can demonstrate alternate and innovative tracking methods in urban combat areas. These platforms will play a crucial role in the Future Combat Force 'FCS', as a soldier, linked to these platforms and sensors will have access to data that can provide a much more accurate picture of his surroundings. We are researching and testing schemes that will enable us to locate and track entities inside buildings, caves and dense foliage where GPS signals cannot be received. A host of sensors including Inertial Measurement Unit, GPS receiver, wireless video, Sonar, and rotary Optical encoders is used to extrapolate the GPS data as the entity loses the GPS signal when moving into an indoor location. A tablet PC acts as the central control and command terminal to receive sensor data and also to control and monitor the platform. A live wireless video from an on-board infra-red camera mounted on the platform is also displayed on the PC. To ensure constant communication with the mobile platform, we are using a Mobile Ad-hoc routing protocol 'MAR' to 'hop' the sensor and control data between the platforms and the central control station through other platforms on the field. We used a 1/6 scale model of an off-road vehicle to mount on-board a small form factor computer, microprocessors and sensors. Software routines in Java are used to control and collect data from the sensors through the microprocessor.
DTIC
Computer Programs; Detectors; Low Cost; Navigation; Position (Location); Warfare

20090001271 NATO Research and Technology Organization, Neuilly-sur-Seine, France
Evolutionary Software Development
August 2008; 62 pp.; In English; Original contains color illustrations
Report No.(s): RTO-TR-IST-026; AC/323(IST-026)TP/190; Copyright; Avail.: CASI: C01, CD-ROM: A04, Hardcopy
This task group investigated iterative processes for software development, especially those (called Evolutionary Software Development) that span many cycles of software implementation, release, fielding of the product, learning from the field experience, then updating the requirements for subsequent releases. This goes beyond the Spiral Model or Agile Methods when they are only used prior to initial delivery, and also beyond incremental delivery. The methodology followed was to review the literature, examine case studies, sponsor a public symposium (IST-034/RSY-010) to collect external input, and then within the task group resolve the best way to present our findings. The group itself did not have the resources to undertake any original research. The principal findings were that iterative processes have been used successfully in military software projects since the 1950?s and continue to be viable and exhibit advantages over strictly sequential processes such as the Waterfall Model or the V-Model. Nevertheless, there remain outstanding research questions to be resolved with potential to improve the process.
Author
Computer Programming; Software Engineering; Computer Systems Design; Systems Engineering; Iteration

20090001366 Naval Postgraduate School, Monterey, CA USA

Use of Trusted Software Modules for Emergency-Integrity Display

Levin, Timothy E; Nguyen, Thuy D; Clark, Paul C; Irvine, Cynthia E; Shifflett, David J; Vidas, Timothy M; Jun 1, 2008; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): CNS-0430566; CNS-0430598

Report No.(s): AD-A485736; NPS-CS-08-012; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485736

This report provides summary of the interface, mechanisms and semantics for high integrity display of information in a secure computer system, based on the use of a high assurance separation kernel and trusted software modules in both the application domain and the trusted software domain.

DTIC

Computer Programs; Display Devices; Emergencies

20090001386 Defence Science and Technology Organisation, Edgecliff, Australia

Review of Software Platforms for Agent Based Models

Berryman, Matthew; Apr 2008; 25 pp.; In English

Report No.(s): AD-A485784; DSTO-GD-0532; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485784

This report reviews both general agent based modelling (ABM) and battlefield-specific ABM toolkits against established criteria, namely flexibility, documentation, speed, and facilities. The other main focus of this report is to consider which ABM toolkits are best suited to studying self-organisation, adaptation, and causality in networks, since these are all essential parts of complex adaptive systems of interest to defence. The ABM toolkits evaluated against these requirements were BactoWars, EINSTein, MANA, MASON, NetLogo, Repast, Swarm and WISDOM-II.

DTIC

Adaptation; Computer Programs; Kits

20090001392 California State Univ., Chico, CA USA

Low-Cost High-Speed Techniques for Real-Time Simulation of Power Electronic Systems

Crosbie, R E; Zenor, J J; Bednar, R; Word, D; Hingorani, N G; Jun 2007; 26 pp.; In English

Contract(s)/Grant(s): N00014-04-1-0373

Report No.(s): AD-A485798; 60296; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485798

A research team at the McLeod Institute of Simulation Sciences (MISS) at California State University, Chico (CSUC) has been developing high-speed, real-time simulations of power electronic systems since 1999. At that time, real-time simulators were available mainly for large-scale power utility applications and offered minimum frame times in the region of 50 microS These simulators were customized to specific applications and were expensive (typically from hundreds of thousands to millions of dollars). With the rapid growth of power electronic applications along with the increasing use of higher-frequency, pulse-width modulation (PWM) controllers a need arose for higher-speed, but lower cost, real-time simulators. This was the motivation for the original research effort at Chico. The principal factors offering the potential for success were the availability of alternative computing architectures capable of achieving fast real-time operation, and the recognition that the algorithms commonly used for power system simulation, including those used in real-time simulation, had changed very little over almost four decades. It was felt that a fresh approach to the choice of numerical techniques offered the potential for significant improvement. Real-time simulation, in which simulated time is exactly equal to real time, is required whenever there is a need to interface the simulation to real hardware, to embedded software running at normal speed, or to a human operator. Hardware-in-the-loop (HIL) simulation, which is interpreted here to include embedded controllers in the loop, provides a convenient, safe and economical test environment for hardware components and subsystems. In the power electronics field, real controllers may be interfaced to a real-time simulator of the actual power system for test and evaluation. The controller will normally incorporate one or more embedded processors that execute the control algorithm. A real-time simulator might also be connected.

DTIC

Computerized Simulation; High Speed; Low Cost; Real Time Operation; Simulation; Simulators

20090001412 CMC Electronics, Inc., Ottawa, Ontario Canada
Evaluation of Simulation Platforms for Training of Command Decision Making
Torenvliet, Gerard; Culligan, Iain; Mar 2008; 20 pp.; In English
Report No.(s): AD-A485847; 1000-1416; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485847

This report details a brief comparison that was made between two software packages, XJTech's AnyLogic and Aptima's Distributed Dynamic Decision-making, for the purpose of evaluating their suitability to microworld research related to the training of command decision-making.
DTIC
Decision Making; Distributed Interactive Simulation; Education; Simulation

20090001442 Bureau International des Poids et Mesures, Sevres, France
Redundancy and Correlations in TAI Time Links
Petit, G; Jiang, Z; Aug 2005; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485934; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485934

The network of time links for the computation of TAI has always be chosen such as to allow a unique solution, i.e. not using any redundancy. In the present situation, many links can be computed with two or more techniques 'mostly TW and GPS' and the TW network itself is highly redundant. In addition, the covariance matrix for the measurements from these two may now be determined with adequate uncertainty, so that it makes sense to use all the available information and to compute TAI links using the available redundant network. In the paper, we examine the formalism to be used in this aim and the consequences of using such a procedure.
DTIC
Correlation; Data Links; Global Positioning System; Redundancy

20090001444 Weapons Systems Research Lab., Adelaide, Australia
Investigations of Lexidata 3400 Image Processor and Diagnostics
Tucker, S P; Apr 1981; 31 pp.; In English
Report No.(s): AD-A485936; ERL-B147-TM; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485936

In this paper an overview of the structure and use of the display hardware to be used in JINDALEE Stage B is given. Some diagnostic programs which test aspects of the hardware are also discussed.
DTIC
Color; Diagnosis; Display Devices; Radar

20090001451 Wales Univ. Inst. of Science and Technology, Cardiff, UK
Network Simulation Tools for Prototyping Scalable P2P Applications
Taylor, Ian; Jun 2004; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485953; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485953

Contents: Background- Triana group, SRSS group. SRSS Framework. Underlying Technology- MANET, NS-2. SRSS Developments- Protolib, PAI. Cardiff P2P Interface- Triana and the GAP, P2PS Binding: discovery mechanisms and Rendezvous nodes. The Whole Picture. Scenarios and Conclusions.
DTIC
Computerized Simulation; Networks; Prototypes; Simulators

20090001452 Carnegie-Mellon Univ., Pittsburgh, PA USA
A Data Specification for Software Project Performance Measures: Results of a Collaboration on Performance Measurement
Kasunic, Mark; Jul 2008; 99 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A485964; CMU/SEI-2008-TR-012; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485964

This document contains a proposed set of defined software project performance measures and influence factors that can

be used by software development projects so that valid comparisons can be made between completed projects. These terms and definitions were developed using a collaborative, consensus-based approach involving the Software Engineering Institute's Software Engineering Process Management program and service provider and industry experts in the area of software project performance measurement. This document will be updated over time as feedback is obtained about its use. The appendix is a primer on benchmarks and benchmarking.
DTIC
Computer Programming; Measurement; Project Management; Software Engineering

20090001540 Air Force Research Lab., Edwards AFB, CA USA
Integration of the Coliseum Plasma Simulation Tool with the Charging Code, Nascap-2k (Preprint)
Brieda, Lubos; Barrie, Alex; Gorrilla, Michael; Mandell, Myron; Davis, Victoria; Jul 6, 2008; 8 pp.; In English
Contract(s)/Grant(s): Proj-4847
Report No.(s): AD-A486110; AFRL-PR-ED-TP-2007-382; IEPC-2007-76; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper presents results from an effort to integrate the AFRL plasma modeling tool Coliseum with the SAIC/SEE, AFRL/VSB charging code Nascap-2k. Coliseum is used to compute the current collected by the test article at a fixed surface potential. Charging of the object is then computed by Nascap-2k and the new surface potential is exported to Coliseum. The process is iterated until surface potential reaches steady state. This approach is validated by modeling the floating potential of a conducting sphere as a function of electron temperature.
DTIC
Computerized Simulation; Plasmas (Physics); Simulation; Spacecraft Charging

20090001561 Naval Postgraduate School, Monterey, CA USA
ELINT Signal Processing Using Choi-Williams Distribution on Reconfigurable Computers for Detection and Classification of LPI Emitters
Upperman, Teresa L; Mar 2008; 104 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486152; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis documents the use of the SRC-6 Reconfigurable Computer for use in analyzing low probability of intercept (LPI) signals using the Choi-Williams distribution. The SRC-6 is a reconfigurable computer manufactured by SRC Computers, Inc. which allows the user to tailor both the software and the hardware to a specific task. This increases the speed at which the task can be accomplished making it useful for applications in electronic intelligence (ELINT). The Choi-Williams distribution is a mathematical technique that was first created using MATLAB and then converted to C code for use on the SRC-6. The purpose of this study is to investigate the feasibility of using a reconfigurable computer for ELINT applications and the timely detection and classification of LPI signals. This thesis is part of a larger study to use reconfigurable computers for the autonomous detection and classification of LPI signals.
DTIC
Autonomy; Classifications; Coding; Computer Programming; Emitters; Reconfigurable Hardware; Signal Detection; Signal Processing

20090001601 Carnegie-Mellon Univ., Pittsburgh, PA USA
CMMI (Registered) for Acquisition (CMMI-ACQ) Primer, Version 1.2
Richter, Karen J; May 2008; 57 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A486250; CMU/SEI-2008-TR-010; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using relevant best practices from the CMMI (registered) (Capability Maturity Model Integration) for Acquisition (CMMI-ACQ) model, this primer defines effective and efficient practices for acquisition projects. These best practices address activities that include monitoring and controlling contractors and suppliers that develop products and services and deliver services. The practices in this primer provide a foundation for acquisition process discipline and rigor that enables product and service development and service delivery to be repeatedly executed for ultimate acquisition success. This primer can be used by projects that acquire products or services in government and nongovernment organizations to improve acquisition processes. Selected content of the CMMI-ACQ model is used in this primer as a basis for helping readers unfamiliar with CMMI to begin their process improvement journey. After using this primer, most organizations will want to implement the

CMMI-ACQ model. This primer can also be used by acquisition organizations that manage several related acquisition projects (e.g., product centers, acquisition commands) to establish an acquisition process improvement program. However, organizations at that level should consider using the CMMI-ACQ model instead because it includes organizational process management practices.
DTIC
Computer Programming; Contract Management; Management Planning; Organizations; Procurement; Project Management; Software Engineering

20090001643 Alabama Univ., Birmingham, AL USA
Quality of Service-Driven Requirements Analyses for Component Composition: A Two-Level Grammar++ Approach
Liu, Shih-Hsi; Cao, Fei; Bryant, Barrett R; Gray, Jeff; Raje, Rajeev R; Olson, Andrew M; Auguston, Mikhail; Jul 2005; 5 pp.; In English
Contract(s)/Grant(s): Proj-N00014-01-1-0746
Report No.(s): AD-A486399; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Component-based software engineering provides developers the opportunity to assemble entire systems from components. When applied to Distributed Real-Time and Embedded (DRE) systems, which components to assemble and how to assemble them are determined not only from functional correctness criteria but also assurance of the system's quality of service (QoS). This paper presents a grammatical QoS-driven approach to optimizing component assembly by reducing the search space of assembly alternatives through the elimination of infeasible components, with feasible components selected based on reasoning about nonfunctional requirements. The reasoning is realized through a rule engine with a knowledge base derived from the requirements phase of the software life cycle. In addition, the grammatical approach introduces well-defined semantics among the components being composed. The semantics assist in precisely and efficiently evaluating the individual component QoS, as well as system-wide QoS in a programmable fashion. The result is to facilitate straightforward and manageable component composition analyses from the perspective of QoS requirements.
DTIC
Computer Programming; Distributed Processing; Grammars; Knowledge Based Systems; Optimization; Quality; Software Engineering

20090001782 RAND Corp., Santa Monica, CA USA
An Examination of Options to Reduce Underway Training Days through the Use of Simulation
Yardley, Roland J; Thie, Harry J; Paul, Christopher; Sollinger, Jerry M; Rhee, Alisa; Jan 2008; 140 pp.; In English
Contract(s)/Grant(s): W74V8H-06-C-0002
Report No.(s): AD-A486311; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Navy trains its surface combatant ship crews through a combination of shore-based, onboard pier-side, and underway training. Much of this training has traditionally involved significant periods of underway time, which allows units to achieve required certifications and readiness levels. Underway training is expensive, however, because fuel and consumables are expended while a ship is underway; wear and tear on operating equipment also drive up maintenance costs. One day's worth of fuel for one surface combatant costs approximately $40,000. Tight budgets and increasing recapitalization costs have forced the Navy to examine various methods to reduce the annual operating costs of the fleet. Technological improvements have increased the fidelity and realism of simulators, and simulation is being used more widely for training within the U.S. Navy. Although the Navy's surface combatant community currently uses simulators in its training regimen, an increased use of simulation could improve training efficiency, sustain training readiness, and potentially reduce underway days. This research identified underway training requirements for surface combatants for unit-level training (ULT), the number of underway days required to accomplish that training, and where credit for meeting training requirements through the use of simulation is currently granted. In addition, it identified which training requirements can only be completed underway, which can be completed in port without simulation, and which can be completed in port via simulation. The authors then surveyed available simulation technologies to determine if they could be substituted for training that is currently being performed underway. The research focused on the DDG-51 Arleigh Burke-class surface combatants because the DDG-51 class has the greatest number of ships in the surface combatant fleet, providing a large data set for an analysis of training exercises performed.
DTIC
Computerized Simulation; Education; Maneuvers; Personnel; Seas; Ships; Simulation; Substitutes

20090001786 Air Force Research Lab., Edwards AFB, CA USA

Implementation and Scalability of a Pure Java Parallel Framework with Application to Hyperbolic Conservation Laws

Kapper, Michael; Cambier, Jean-Luc; Feb 4, 2008; 21 pp.; In English

Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A486114; AFRL-RZ-ED-JA-2008-038; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We introduce a pure Java parallel framework for Single Process, Multiple Dataset (SPMD) applications, intended for time-accurate solutions of hyperbolic conservation laws. The software architecture is based upon an extension of the client-server paradigm, utilizing a tree database abstraction and allowing for multi-tiered network configurations. The framework is designed to be hardware independent, with the ability to handle both shared-memory and distributed-memory hardware alike, allowing execution over heterogeneous networks. Task division is determined through permanent domain decomposition, in which Java threads are created for each computation domain and are then distributed over the available servers. Java Remote Method Invocation (RMI) is used for network-based communication of critical I/O as well as thread communication and cooperation between different Java Virtual Machines (JVM). Parallel efficiency and scalability of the framework for both shared-memory and distributed-memory hardware are evaluated for standardized benchmark problem computed with the Euler equations of gas dynamics. Results show efficient use of multiple process or resources on shared-memory systems with minimal thread overheads and near linear scalability on distributed networks with up to 50 server nodes (100 processors).

DTIC

Application Programming Interface; Computer Programming; Computer Storage Devices; Conservation Laws; Java (Programming Language)

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20090000004 Air Force Research Lab., Rome, NY USA

Distributed Planning in a Mixed-Initiative Environment: Collaborative Technologies for Network Centric Operations

DeStefano, Chad C; Lachevet, Kurt K; Carozzoni, Joseph A; Oct 2008; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-558S

Report No.(s): AD-A489219; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA489219

The USAF Command and Control (C2) is undergoing a transformation to enable a full-spectrum, joint warfighting capability. To be able to meet the future challenge of employing forces anywhere in the world in support of national security objectives, the USAF requires a highly synchronized, distributed planning and re-planning capability that is flexible to adapt to any level of conflict. This paper describes an in-house program underway at the USAF Research Laboratory Information Directorate that is developing technologies to support the concepts of Network-Centric Operations (NCO). The research focus of this program is on the concepts and architecture needed to support the distributed, mixed-initiative, planning required for NCO. Our system builds upon distributed blackboards and multi-agent systems to provide automated opportunistic planning capabilities for distributed C2 operations. An extensible UML model of plans has also been developed to support human-machine dialog for mix-initiative planning. The plan representation is object oriented recursive, and support plan fragment operations, a key concept for distributed planning.

DTIC

Military Operations; Planning; Command and Control

20090001093 Military Academy, West Point, NY USA

Social Network Monitoring of Al-Qaeda

McCulloh, Ian; Carley, Kathleen; Webb, Matthew; Jan 2007; 11 pp.; In English

Report No.(s): AD-A490103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Social network monitoring is the application of statistical process control charts to changing social network measures over time. Quality engineers use control charts to detect slight changes in industrial manufacturing processes. Once detected, the quality engineer will identify a maximum likely change point, when the process began to change, and search for the specific

cause of the change. These tools allow quality engineers to quickly identify changes before they cause significant financial loss to the manufacturing company. In the same manner, analysts can use control charts to detect slight changes in dynamic social network measures. A cumulative sum (CUSUM) control chart is applied to a dynamic social network data set of the Al-Qaeda terrorist organization. The data set ranges from 1988 to 2004. The CUSUM identifies a shift in several network measures in the Al-Qaeda network between 2000 and 2001. The CUSUM most likely change point for all measures is 1997. This example suggests that if analysts were to use social network monitoring to monitor terrorist networks, dangerous shifts in the network might be detected before they become a problem. Furthermore, the specific cause of change could be identified, allowing analysts to exploit positive changes in a terrorist organization and mitigate negative changes.
DTIC
Networks; Communication

20090001273 NATO Research and Technology Organization, Neuilly-sur-Seine, France
Improving Common Security Risk Analysis
September 2008; 100 pp.; In English; Original contains color illustrations
Report No.(s): RTO-TR-IST-049; AC/323(IST-049)TP/193; Copyright; Avail.: CASI: C01, CD-ROM: A05, Hardcopy

This report is the final report resulting from the four meetings of the working group called 'Improving Common Security Risk Analysis' (IST-049 -- RTG-021). The report describes the different methods used by various NATO countries. As a first conclusion, the report shows that these methodologies, even if based on similar principles, differ in their knowledge bases or type of results. This makes the risk assessments difficult or impossible to compare when different methods have been used. In a second part, the report identifies the main steps which are considered as mandatory for a method to be used by NATO. Then the report identifies recommendations which should be taken into account by the existing methods and tools in order to solve the interoperability problem identified in the first part of the document but also to be able to take into account the new NATO concepts such as NNEC. The final chapter of the report identifies the follow on activities to be conducted within RTO/IST or within other NATO entities.
Author
Communication Networks; Computer Networks; Computer Security; Software Engineering; Risk Assessment; Risk Management

20090001397 Foreign Military Studies Office (Army), Fort Leavenworth, KS USA
Al Qaeda and the Internet: The Danger of 'Cyberplanning'
Thomas, Timothy L; Jan 2003; 13 pp.; In English
Report No.(s): AD-A485810; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485810

One can say with some certainty, al Qaeda loves the Internet. When the latter first appeared, it was hailed as an integrator of cultures and a medium for businesses, consumers, and governments to communicate with one another. It appeared to offer unparalleled opportunities for the creation of a 'global village.' Today the Internet still offers that promise, but it also has proven in some respects to be a digital menace. Evidence strongly suggests that terrorists used the Internet to plan their operations for 9/11. Computers seized in Afghanistan reportedly revealed that al Qaeda was collecting intelligence on targets and sending encrypted messages via the Internet. As recently as 16 September 2002, al Qaeda cells operating in America reportedly were using Internet-based phone services to communicate with cells overseas. These incidents indicate that the Internet is being used as a 'cyberplanning' tool for terrorists. It provides terrorists with anonymity, command and control resources, and a host of other measures to coordinate and integrate attack options. Cyberplanning may be a more important terrorist Internet tool than the much touted and feared cyberterrorism option -- attacks against information and systems resulting in violence against noncombatant targets. The Naval Postgraduate School (NPS) has defined cyberterrorism as the unlawful destruction or disruption of digital property to intimidate or coerce people. Cyberplanning, not defined by NPS or any other source, refers to the digital coordination of an integrated plan stretching across geographical boundaries that may or may not result in bloodshed. It can include cyberterrorism as part of the overall plan. Since 9/11, U.S. sources have monitored several web sites linked to al Qaeda that appear to contain elements of cyberplanning.
DTIC
Hazards; Internets; Interprocessor Communication; Planning

20090001558 Naval Postgraduate School, Monterey, CA USA

A Lightweight TwiddleNet Portal

Rimikis, Antonios M; Mar 2008; 87 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

TwiddleNet is a distributed architecture of personal servers that harnesses the power of the mobile devices, enabling real time information and file sharing of multiple data types from commercial-off-the-shelf platforms. This thesis involves research in mobile personal members, mobile social networks and media sharing models and develops a TwiddleNet portal running on a smart phone or a PDA so that the entire TwiddleNet system can be run on handheld devices for rapid deployment in emergencies.

DTIC

Client Server Systems; Wireless Communication

20090001562 Carnegie-Mellon Univ., Pittsburgh, PA USA

Expandable Grids: A User Interface Visualization Technique and a Policy Semantics to Support Fast, Accurate Security and Privacy Policy Authoring

Reeder, Robert W; Jul 2008; 208 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0389; NSF-CNS-0433540

Report No.(s): AD-A486153; CMU-CS-08-143; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis addresses the problem of designing user interfaces to support creating, editing, and viewing security and privacy policies. Policies are declarations of who may access what under which conditions. Creating, editing, and viewing in a word, authoring accurate policies is essential to keeping resources both available to those who are authorized to use them and secure from those who are not. User interfaces for policy authoring can greatly affect whether policies match their authors' intentions; a bad user interface can lead to policies with many errors, while a good user interface can ensure that a policy matches its author's intentions. Traditional methods of displaying security and privacy policies in user interfaces are deficient because they place an undue burden on policy authors to interpret nuanced rules or convoluted natural language. We introduce the Expandable Grid, a novel technique for displaying policies in a user interface. An Expandable Grid is an interactive matrix visualization designed to address the problems that traditional policy-authoring interfaces have in conveying policies to users. This thesis describes the Expandable Grid concept, then presents three pieces of work centered on the concept: a design, implementation, and evaluation of a system using an Expandable Grid for setting file permissions in the Microsoft Windows XP operating system; a description and evaluation of a file-permissions policy semantics that complements the Expandable Grid particularly well for reducing policy-authoring errors; and a design, implementation, and evaluation of a system using an Expandable Grid for displaying website privacy policies to Web users.

DTIC

Computer Information Security; Policies; Privacy; Security; Semantics

20090001579 Carnegie-Mellon Univ., Pittsburgh, PA USA

A Logic for Reasoning About Time-Dependent Access Control Policies

DeYoung, Henry; May 20, 2008; 79 pp.; In English

Contract(s)/Grant(s): FA8750-07-2-0028; NSF-0716469

Report No.(s): AD-A486202; CMU-CS-08-131; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Allowing access to resources, including data and hardware, without compromising their security is a fundamental challenge in computer science. Because of the number and complexity of authorization policies in access control systems, it is clear that ad hoc methods for specifying and enforcing policies cannot inspire a high degree of trust. Authorization logics have been proposed as a theoretically sound alternative. However, for an authorization logic to be useful in practice, it should be able to model most, if not all, naturally occurring policy features. One common feature is the time-dependency of authorizations. For example, a user may only be permitted to access a given resource on workdays. Surprisingly, of the numerous proposals for access control logics, we know of no logic that incorporates time internally. In an attempt to fill this void, this thesis develops a logic with explicit time that permits reasoning about complex, yet natural, time-dependent authorizations. The logic is then extended to account for authorizations that may be used only once. A careful study of the meta-theory of both logics is conducted, and the logics? rich expressive power is demonstrated through several examples. Finally, a proof checker for the latter logic is formalized and discussed.

DTIC

Access Control; Computer Information Security; Policies; Time Dependence

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20090001217 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Line-of-Sight/Non-Line-of-Sight (LOS/NLOS) Testing of Unmanned Ground Vehicle (UGV) Systems
Nov 24, 2008; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490271; TOP-2-2-543; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The procedures in this Test Operating Procedure (TOP) describe the actions needed to test UGVs in Line-of-Sight and Non-Line-of-Sight environments.

DTIC
Evaluation; Line of Sight; Robots; System Effectiveness; Unmanned Ground Vehicles

20090001373 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Job Oriented Training: Onderwijskundige Grondslag en Onderbouwing (Job Oriented Training: Foundation and Empirical Support)
Hulst, A H van der; Muller, T J; Jul 2008; 33 pp.; In English
Report No.(s): AD-A485747; TNO-DV-2008-A194; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485747

A long needed educational paradigm shift is steadily finding its way in the Dutch military organization, namely that of Job Oriented Training (Stehouwer 2005, 2006). When training the JOT way, from day one, military students are confronted with increasingly complex real 'job' challenges to be solved in virtual environments. Along that road, we don't take prisoners; mistake means virtual death. Neither do we supply theory in advance, theoretical insights are acquired while solving realistic issues. Frequent and thorough reflecting makes the insights stick. In this report, we will explain the underlying educational theory, its basic principles and the empirical evidence supporting those principles. In addition we describe the lessons learned of the application of JOT within 7 different military curricula.

DTIC
Education; Personnel Development; Simulators; Tasks

20090001408 Office of Naval Research Liaison Office, Far East, APO San Francisco, CA USA
Human Systems Integration (HSI) Associated Development Activities in Japan
Narita, Hitoshi; Jun 12, 2008; 21 pp.; In English
Contract(s)/Grant(s): FA4869-07-1-4094
Report No.(s): AD-A485839; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485839

This report covers the following topics: 1. Development of a user-friendly Japanese product -- 'Washlet'; 2. Challenges of Suwa industrial accumulation: co-evolution of technologies in industries and researches in universities; 3. High-performance CFD-based global optimization for high-speed multi-hull ship design; 4. Decision making training through gaming simulation and agent-based modeling; 5. Application of genetic algorithms to plant design problems; and 6. Extracting tacit knowledge of plant operations through machine learning and data mining technologies.

DTIC
Japan; Systems Engineering; Systems Integration

20090001569 Carnegie-Mellon Univ., Pittsburgh, PA USA
Data Analysis Project: Leveraging Massive Textual Corpora Using n-Gram Statistics
Carlson, Andrew; Mitchell, Tom M; Fette, Ian; May 2008; 31 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0389
Report No.(s): AD-A486165; CMU-ML-08-107; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We study methods of efficiently leveraging massive textual corpora through n-gram statistics. Specifically, we explore algorithms that use a database of frequency counts for sequences of tokens in a teraword Web corpus to correct spelling mistakes and to extract a list of instances of some category given only the name of the target category. For spelling correction, we use a novel correction algorithm and demonstrate high accuracy in correcting both real-word errors and non-word errors.

For category extraction, we show promising preliminary results for a variety of categories. We conclude that n-gram statistics provide an efficient way to use information contained in a massive corpus of text using relatively simple algorithms. The report ends with a reflection on problems encountered, possible solutions, and future work.
DTIC
Algorithms; Correction; Data Processing; Natural Language (Computers); Texts

20090001611 Carnegie-Mellon Univ., Pittsburgh, PA USA
Conditional Random Fields for Activity Recognition
Vail, Douglas L; Apr 2008; 205 pp.; In English
Contract(s)/Grant(s): F30602-00-2-0549
Report No.(s): AD-A486284; CMU-CS-08-119; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To act intelligently in presence of others, robots must use information from their sensors to recognize behaviors and activities of other agents in their environment. We explore how to bridge the gap from noisy, continuous observations about the world to high-level, discrete activity labels. We contribute the use of conditional random fields (CRFs) for activity recognition in multirobot domains. We explore appropriateness of CRFs with an empirical comparison to hidden Markov models. We elucidate the properties of CRFs that make them well suited to the activity recognition, namely discriminative training, the ability to robustly incorporate rich features of observations, and their nature as conditional models, with a variety of synthetic and real robot data. Accurate activity recognition requires complex and rich features of the observations. We choose the most informative features from a large set of candidates using feature selection. We adapt two feature selection algorithms, grafting and ′1 regularization, to conditional random fields. We also investigate a third feature selection algorithm, which was originally proposed for CRFs in a natural language processing domain, in an activity recognition context. In particular, we focus on scaling feature selection to very large sets of candidate features that we define succinctly using a rich relational feature specification language. The reduced feature sets that we discover via feature selection enable efficient, real-time inference. However, feature selection and training for conditional random fields is computationally expensive. We adapt an M-estimator, introduced by Jeon and Lin for log-density estimation in ANOVA models, for fast, approximate parameter estimation in CRFs. We provided an in depth, empirical evaluation of the properties of the M-estimator and then we introduce a new, efficient feature selection algorithm for CRFs based around M-estimation to identify the most important features.
DTIC
Classifications; Robotics

20090001640 Corps of Engineers, Washington, DC USA
In-Situ Air Sparaing: Engineering and Design
Jan 31, 2008; 193 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486387; EM-1110-1-4005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In-situ air sparging (IAS) is a rapidly emerging remediation technology for treatment of contaminants in saturated zone soils and groundwater. Injection below the water table of air, pure oxygen, or other gases may result in removal of contaminants by volatilization or bioremediation. Less commonly, IAS can be used to immobilize contaminants through chemical changes such as precipitation. This Engineer Manual (EM) provides guidance for evaluation of the feasibility and applicability of IAS for remediation of contaminated groundwater and soil and, as a secondary objective, describes design and operational considerations for IAS systems. The document is primarily intended to set US Army Corps of Engineers (USACE) technical policy on the use of the technology and to help prevent its application in inappropriate settings. The primary focus of this EM is to provide guidance for assessing the feasibility and applicability of IAS. Secondarily, this EM describes design and operational issues related to implementing pilot- and full-scale IAS systems, although it is not meant to address design issues in detail. Because IAS technology is still evolving, this EM is intended to consolidate existing guidance and to stimulate the acquisition and reporting of new information that will continue to refine the technology.
DTIC
Manuals; Pollution Control; Soils; Water Pollution

20090001879 NATO Research and Technology Organization, Neuilly-sur-Seine, France
Integration of Systems with Varying Levels of Autonomy
September 2008; 150 pp.; In English; Original contains color illustrations
Report No.(s): RTO-TR-SCI-144; AC/323(SCI-144)TP/144; Copyright; Avail.: CASI: C01, CD-ROM: A07, Hardcopy

The report begins with a historical background and the evolution of systems engineering. The report then addresses issues

of controlling land, sea and air vehicles in a system of systems. There is a chapter discussing both negative and positive aspects of systems engineering, followed by a presentation of recommended best practices. There is discussion of complexity and automation, man/machine interface, single vs. multiple vehicles, and mission management, especially robust design of autonomous systems. This leads to addressing certification issues, such as verification and validation of non-deterministic systems, followed by discussion of issues and challenges. The report ends with conclusions and suggestions for required future research.
Author
Systems Engineering; Adaptive Control; Systems Integration; Systems Management; Control Equipment; Automation; Autonomy

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20090000978 NASA Marshall Space Flight Center, Huntsville, AL, USA
On the Observed Robustness of Disturbance-Observers; A Technical Explanation and Simulation Validation
Hannan, Michael R.; March 16, 2008; 6 pp.; In English; Southeastern Symposium on System Theory, 16-18 Mar. 2008, New Orleans, LA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090000978

This paper examines the ability of a real-time 'disturbance-observer' to adapt-to and closely estimate the time-behavior of a disturbance-input w(t) (and of it's state-vector z(t)) even when the actual w(t) time-behavior deviates from the observer's 'internal-copy' of the nominal/predicted w(t)-behavior. By means of technical explanations and confirming simulation studies of numerical examples, the disturbance-observer's adaptive ability is explained in terms-of the underlying spline-model used to derive the disturbance state-model and the intrinsic dynamic characteristics of a state-observer.
Author
Simulation; Mathematical Models; Dynamical Systems; Perturbation Theory; Robustness (Mathematics)

20090001426 Chunghwa Telecom, Taoyuan, Taiwan
The Calibration Device for TWSTFT Station at TL
Lin, Huang-Tien; Tseng, Wen-Hung; Lin, Shinn-Yan; Liao, Chia-Shu; Aug 2005; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485903; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485903

Because of the nanosecond time transfer capability of the Two-Way Satellite Time and Frequency Transfer (TWSTFT)[1], it is important to understand the quality of the delay difference between transmission and receiving (Tx/Rx) paths inside TWSTFT earth station. An effective technique using Satellite Simulator to separately calibrate the absolute Tx/Rx delays at each station was developed by VSL (de Jong and Polderman, 1994[2] and TUG (Kirchner et al., 1995[3]). In order to investigate the rigorous calibration method in absolute mode, TL had installed a calibration device, the satellite simulator developed by TimeTech[4], on a Ku-band 1.8 m earth station. By using this device, we performed two serial measurements to obtain the delay values of some internal loops in earth station, and then calculated the difference of the transmission and receiving delays of the TWSTFT earth station. The system structure of the calibration device and the measurement results are illustrated in this paper. The measurement results show that the calibration device at TL is suitable to monitor the change of the Tx/Rx delay difference precisely. In order to have further understanding of the delay measurement of the TWSTFT earth station, more experiments would be performed at TL in the near future.
DTIC
Atomic Clocks; Calibrating; Frequencies; Radio Receivers

20090001429 Naval Observatory, Washington, DC USA
Degrees of Freedom and Three-Cornered Hats
Ekstrom, Christopher R; Koppang, Paul A; Nov 2001; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485909; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485909

The three-cornered hat is a procedure for extracting the stabilities of three clocks when the only available information is

the time or frequency differences between the clocks. To our knowledge, there has been no method of determining a confidence interval for such a siability estimate. In this paper, we present a method for determining the number of degrees of freedom of the estimate, which allows the assignment of a confidence interval to a three-cornered-hat stability estimate.
DTIC
Degrees of Freedom; Estimates

20090001430 Centre National d'Etudes Spatiales, Toulouse, France
Modelization and Extrapolation of Time Deviation of USO and Atomic Clocks in GNSS-2 Context
Delporte, J; Vernotte, F; Brunet, M; Tournier, T; Nov 2000; 13 pp.; In English
Report No.(s): AD-A485913; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485913

In Global Navigation Satellite Systems (GNSS), the on-board time has to be modeled and predicted in order to broadcast the time parameters to final users. As a consequence, the time prediction performance of the on-board clocks has to be characterized. In order to estimate the time uncertainty of the on-board oscillator a linear or parabolic fit is performed over the sequence of observed time difference and extrapolated during the prediction period. In 1998 the Centre National d'Etudes Spatiales (CNES) proposed specifications of orbit determination and time synchronization for GNSS-2. The needs of synchronization were specified as the maximum error of the time difference prediction from the extrapolated fit. Using our work about the estimation of uncertainties in time error extrapolation, we have translated these time domain specifications into a noise level limit or an Allan deviation limit. Of course, these limits depend on the main type of noise for integration time of about 1 day and on the type of adjustment which is performed (linear for cesium clocks and quadratic for other oscillators). A table summarizing these limits is presented. These values are compared to experimental results obtained with different types of oscillators (quartz, rubidium, and cesium).
DTIC
Atomic Clocks; Errors; Extrapolation; Interpolation; Time Measurement

20090001438 Naval Observatory, Schriever AFB, CO USA
USNO Alternate Master Clock Steering
Hutsell, Steven T; Koppang, Paul A; Nov 2000; 12 pp.; In English
Report No.(s): AD-A485924; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485924

The primary mission of the U.S. Naval Observatory (USNO) Alternate Master Clock (AMC) facility, located at Schriever AFB, is to back up the critical functions of the USNO Time Service Department in Washington, D.C. The USNO AMC operates two Master Clocks, AMC #1 and AMC #2. Each one of these [Alternate] Master Clocks is ready to function as the nation's source for precise time, UTC(USNO), should the need arise. This paper summarizes the current status of, and strategies used for, the steering of these Alternate Master Clocks. The various USNO AMC steering strategies utilize clock comparisons from Two-Way Satellite Time Transfer (TWSTT), GPS Common View (CV), and USNO AMC Timescale data. All current Alternate Master Clock steering strategies employ a combination of Kalman filtering and second-order control, first introduced into USNO operations in 1995. The respective designs for these steering strategies are based on several factors, including goals for synchronization and stability, as well as the desire for robustness and simplicity of operation. This paper analyzes the performance of these respective designs.
DTIC
Clocks; Kalman Filters; Steering; Time Measurement

20090001443 Xidian Univ., Shaanxi, China
Study on GPS Common-view Observation Data with Multiscale Kalman Filter Based on Correlation Structure of the Discrete Wavelet Coefficients
Xiaojuan, Ou; Wei, Zhou; Jianguo, Yu; Aug 2005; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485935; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485935

In this paper, we pay our attention to the multiscale kalman algorithm based on correlation structure of the discrete wavelet coefficients for the restoration of the GPS common-view observation data. Based on the hypotheses of that the GPS common-view observation data being pretreatment possess of l/f fractal characteristics. In this condition, we estimate the Hurst parameter of GPS clock difference data based upon the wavelet transform. When 0<H<1, the GPS clock difference data is

taken for as a Gaussian Zero-mean nonstationary stochastic process which can be considered having the 1/f fractal characteristics. So, we can talk about the correlation structure of the discrete wavelet coefficients. During the course of the estimation of the GPS common-view data with the multiscale kalman bank, we process the single-channel and multi-channel common-view observation data, respectively. Comparisons between which results and circular T demonstrate our algorithm's feasibility and effectiveness.
DTIC
Correlation Coefficients; Global Positioning System; Kalman Filters; Wavelet Analysis

20090001533 Colorado School of Mines, Golden, CO USA
Methods for Improving the Tractability of the Block Sequencing Problem for Open Pit Mining
Gaupp, Martin P; Jul 1, 2008; 159 pp.; In English
Report No.(s): AD-A486095; CI09-0017; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A surface mine optimizes its profits by maximizing the net present value (NPV) of minerals extracted from the orebody. This is accomplished by creating a production schedule that defines when each section, or block, of ore is removed. Doing so efficiently requires adherence to geospatial and operational constraints. A common exact method for determining this block extraction sequence is formulating the problem as a mixed integer program where each block is a time-indexed binary variable representing when (and if) a given block is removed from the orebody. We describe the complexities involved in such a formulation and suggest methodologies to expedite the solution times for instances of this block sequencing problem. We adopt three approaches to make the model more tractable: (1) we apply deterministic variable reduction techniques to eliminate blocks from consideration in the model; (2) we produce cuts that strengthen the model's formulation; and (3) we employ Lagrangian relaxation techniques. These three techniques allow us to determine an optimal (or near-optimal) solution more quickly than solving the monolith (original problem). Applying our techniques to data sets ranging from 100 to 10,000 blocks reduces solution times by over 90%, on average.
DTIC
Mining; Sequencing

20090001582 Carnegie-Mellon Univ., Pittsburgh, PA USA
Error Reporting Logic
Jaspan, Ciera; Quan, Trisha; Aldrich, Jonathan; Jun 2008; 22 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0389; NSF-CCF-0546550
Report No.(s): AD-A486209; No Copyright; Avail.: Defense Technical Information Center (DTIC)

When a system fails to meet its specification, it can be difficult to find the source of the error and detenmue how to fix it. In this paper, we introduce error reporting logic (ERL), an algorithm and tool that produces succinct explanations for why a target system violates a specification expressed in first order predicate logic. ERL analyzes the specification to determine which parts contrbuted to the failure, and it displays an error message specific to those parts. Additionally, ERL uses a heuristic to determine which object in the target system is responsible for the error. Results from a small user study suggest that the combination of a more focused error message and a responsible object for the error helps users to find the failure in the system more effectively. The study also yielded insights into how the users find and fix errors that may guide future research.
DTIC
Errors; Message Processing

20090001839 Defence Science and Technology Organisation, Edinburgh, Australia
Proofs and Techniques Useful for Deriving the Kalman Filter
Koks, Don; Feb 2008; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485785; DSTO-TN-0803; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485785

This note is a tutorial in matrix manipulation and the normal distribution of statistics, concepts that are important for deriving and analysing the Kalman Filter, a basic tool of signal processing. We focus on the proof of the well-known fact that the sum of two n-dimensional normal probability density functions is also normal. While this theorem is usually taken for granted in the signal processing field, proving it provides an insightful excursion into techniques such as Gaussian integrals and the Matrix Inversion Lemma.
DTIC
Kalman Filters; Proving; Signal Processing

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20090001097 Cornell Univ., Ithaca, NY USA
Detection of Gauss-Markov Random Field on Nearest-Neighbor Graph
Anandkumar, Animashree; Tong, Lang; Swami, Anathram; Apr 2007; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-01-2-0011
Report No.(s): AD-A489764; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489764

The problem of hypothesis testing against independence for a Gauss- Markov random field (GMRF) with nearest-neighbor dependency graph is analyzed. The sensors measuring samples from the signal field are placed IID according to the uniform distribution. The asymptotic performance of Neyman-Pearson detection is characterized through the large deviation theory. An expression for the error exponent is derived using a special law of large numbers for graph functionals. The exponent is analyzed for different values of the variance ratio and correlation. It is found that a more correlated GMRF has a higher exponent (improved detection performance) at low values of the variance ratio, whereas the opposite is true at high values of the ratio.
DTIC
Markov Processes; Graph Theory; Statistics

20090001199 Army Research Development and Engineering Command, Warren, MI USA
Neural Learning of Predicting Driving Environment
Murphey, Yi L; Chan, ZhiHang; Kiliaris, Leo; Park, Jungme; Kuang, Ming; Masrur, Abul; Phillips, Anthony; Jun 2008; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490066; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Vehicle power management has been an active research area in the past decade, and has intensified recently by the emergence of hybrid electric vehicle technologies. Research has shown that driving style and environment have strong influence over fuel consumption and emissions. In order to incorporate this type of knowledge into vehicle power management, an intelligent system has to be developed to predict the current traffic conditions. This paper presents our research in neural learning for predicting the driving environment. We developed a prediction model, an effective set of features to characterize different types of roadways, and a neural network trained for online prediction of roadway types and traffic congestion levels. This prediction model was then used in conjunction with a power management strategy in a conventional (non-hybrid) vehicle. The benefits of having the predicted drive cycle available are demonstrated through simulation.
DTIC
Hybrid Propulsion; Predictions

20090001441 Arizona State Univ., Tempe, AZ USA
Designing Fractional Factorial Split-Plot Experiments Using Integer Programming
Capehart, Shay R; Aug 2008; 111 pp.; In English
Report No.(s): AD-A485933; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485933

Split-plot designs are commonly used in industrial experiments when there are hard-to-change and easy-to-change factors. Due to the number of factors and resource limitations, it is more practical to run a fractional factorial split-plot (FFSP) design. These designs are variations of the fractional factorial (FF) design, with the restricted randomization structure to account for the whole plots and subplots. We begin by discussing the formulation of FFSP designs using integer programming (IP) to achieve various design criteria. We specifically look at the maximum number of clear two-factor interactions and variations on this criterion. By making restrictions on some of the general linear constraints, we are able to customize the alias structure of these FFSP designs. Additional constraints allow for the generation of blocked FFSP designs that are shown to meet performance standards shown in today's literature. By generalizing the model formulation, we show how designs for

numerous stages can be generated. In addition, we explore using a genetic algorithm heuristic to search for split-plot designs from a candidate matrix of factor effects generated using the Kronecker product.
DTIC
Factorial Design; Integers

20090001610 Library of Congress, Washington, DC USA
Iraq: U.S. Casualties
Chesser, Susan G; Aug 28, 2008; 2 pp.; In English
Report No.(s): AD-A486274; CRS-RS21578; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The casualty data presented in this report was compiled by the Department of Defense (DoD), as tallied from the agency's press releases. Table 1 provides statistics on fatalities during Operation Iraqi Freedom, which began on March 19, 2003, and is ongoing, as well as on the number of fatalities since May 1, 2003, plus statistics on those wounded, but not killed, since March 19, 2003. Statistics may be revised as circumstances are investigated and as all records are processed through the U.S. military's casualty system. More frequent updates are available at DoD's website at [http://www.defenselink.mil/news/] under 'Casualty Update.' A detailed casualty summary that includes data on deaths by cause, as well as statistics on soldiers wounded in action, is available at the following DoD website: [http://siadapp.dmdc.osd.mil/personnel/CASUALTY/castop.htm].
DTIC
Casualties; Injuries

20090001629 California Univ., Berkeley, CA USA
On Model Selection Consistency of the Elastic Net When p >> n
Jia, Jinzhu; Yu, Bin; May 2008; 21 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0104
Report No.(s): AD-A486359; UCB-STAT-756; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we study the model selection property of the Elastic net. In the classical settings when p (the number of predictors) and q (the number of predictors with non-zero coefficients in the true linear model) are fixed, Yuan and Lin (2007) give a necessary and sufficient condition for the Elastic net to consistently select the true model, which is called the Elastic Irrepresentable Condition (EIC) in this paper. Here we study the general case when p, q and n all go to infinity. For general scalings of p, q and n, when gaussian noise is assumed, sufficient conditions on p, q and n are given in this paper such that EIC guarantees the Elastic net's model selection consistency. We show that to make these conditions hold, n should grow at a rate faster than q log(p-q). For the classical case, when p and q are fixed, we also study the relationship between EIC and the Irrepresentable Condition (IC) which is necessary and sufficient for the Lasso to select the true model. Through theoretical results and simulation studies, we provide insights into when and why EIC is weaker than IC and when the Elastic net can consistently select the true model even when the Lasso can not.
DTIC
Consistency; Prediction Analysis Techniques

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SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20090000003 Air Force Research Lab., Rome, NY USA
Synthesizing Disparate Experiences in Episodic Planning
Ford, Anthony J; Lawton, James H; Oct 2008; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-558S
Report No.(s): AD-A489220; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489220

Many decisions are actually made by synthesizing previous experience. Often, this involves many different experiences coming together to form a feasible solution. This paper presents a statistical model for predicting the outcome of solutions based on multiple experiences. In edge organizations, such as emergency first responders, it often requires the expertise of more than one person to form an approach to a complex problem. Unfortunately, each planner only has access to his or her own memories. We propose to use an artificial intelligence decision aide to help bridge this gap, by reasoning over distributed collections of previous experiences. The key research questions that we address include: How can an artificial reasoner form

a plan based on several disparate experiences from different sources? How can we gauge the potential efficacy of such a plan? How can we trust this plan if a clear line cannot be drawn to one author? We will also discuss such critical issues as analogies in planning with disparate experiences, civil-military planning by analogy, trust, provenance, and organizational issues in planning.
DTIC
Decision Making; Statistical Analysis

20090001094 Naval Undersea Warfare Center, Newport, RI USA
Analysis of Field Design Considerations for the Operation of Undersea Sensor Networks
Wettergren, Thomas A; Costa, Russell; Jun 2008; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490198; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A Distributed Sensing Problem: Problem: Determine the proper sizing of sensor fields to obtain tradeoffs between multi-sensor detection and multi-sensor false alarm performance as a function of the anticipated target characteristics. Approach: Build analytical parametric models of system performance as a function of: - (uncertain) target characteristics, - (uncertain) sensor characteristics - (uncertain) environmental characteristics Then exercise the models to examine the effects of various deployment considerations on both detection and false alarm performance of the resulting field. Consider the effects of environment and placement of sensors by examining the functions numerically compared to effective sensor density. Consider parameters such as time for multiple detections as variables to be set by examination of the tradeoffs.
DTIC
Detection; Multisensor Applications; Deployment

20090001095 Military Academy, West Point, NY USA
Mathematical Perspectives on the Federal Thrift Savings Plan (TSP)
Nestler, Scott T; Jun 10, 2008; 50 pp.; In English; Original contains color illustrations
Report No.(s): AD-A489887; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489887

Questions for consideration: Why might I be more risk tolerant than I currently believe? What are the L (Lifecycle) funds? How are they constructed? Why might they be of interest (or not) to me? What if stock and index fund returns are not normally distributed, as is commonly assumed? How does the choice of reward and risk measures effect optimal TSP portfolios?
DTIC
Risk; Selection

20090001206 Office of the Secretary of Defense (Program Analysis and Evaluation), Arlington, VA USA
Strategic Data Farming
Duong, Deborah; Jun 2008; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A489884; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489884

Strategic Data Farming: *Strategic Data Farming may be employed in the first phase of the iterative model-game-model process -Strategic Data Farming is a way to explore how a player or an agent may succeed in a wargame or an agent based simulation (ABS) ^Ways to game the game are exposed *Strategic Data Farming makes use of Game tree technology from Artificial Intelligence *Strategic Data Farming looks at worse-case-scenarios first -Desirable for analysis -Game trees win by the exploration of the worse case
DTIC
Game Theory; War Games

20090001207 TRADOC Analysis Command, Fort Lee, VA USA
Logistics Battle Command Research Program
Byrd, Michael; Hayes, Morris; Jun 10, 2008; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A489862; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489862

Briefing purpose: To outline the Training and Doctrine Command Analysis Center's (TRAC) Logistics Battle Command's (LBC) [formerly known as sustainment Battle Command (SBC)] research program.
DTIC
Logistics; Models

20090001409 Military Operations Research Society, Alexandria, VA USA
Military Operations Research Society Symposium (70th): Military Operations Research at the Next Frontier. Held at Fort Leavenworth, Kansas on 18-20 June 2002. Final Program and Book of Abstracts
Kee, Cynthia L; May 20, 2002; 294 pp.; In English
Report No.(s): AD-A485841; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485841

This publication contains titles of presentations made at the 70th MORS Symposium (70th MORSS), along with names, addresses, phone and fax numbers and e-mail addresses of authors, if available. In addition, abstracts of presentations, which are Unclassified and Approved for Public Release, are included. Some abstracts are missing because they had not been cleared for public release at the time of publication.
DTIC
Abstracts; Conferences; Military Operations; Operations Research

20090001439 Swedish National Testing and Research Inst., Boras, Sweden
Time and Frequency Transfer in an Asynchronous TCP/IP over SDH-network Utilizing Passive Listening
Emardson, R; Hedekvist, P O; Nilsson, M; Ebenhag, S C; Jaldehag, K; Jarlemark, P; Johansson, J; Pendrill, L; Rieck, C; Loethberg, P; Nilsson, H; Aug 2005; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A485925; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485925

A technique for time and frequency transfer over an asynchronous TCP/IP network is being developed by SP, Swedish National Testing and Research Institute together with STUPI. When implemented, users will be able to compare their clocks by connecting to the system. The technique is based on passive listening to existing data traffic in the network. Since the network is asynchronous, intermediate clocks are located and compared at each router. We use the frame alignment bytes of the SONET/SDH protocol as references in order to compare these clocks. As a test bed for the experiment, we will use the Swedish university Computer Network (SUNET). A preliminary assessment of the technique in a lab environment will be performed late 2005.
DTIC
Clocks; Computer Networks; Frequencies; Synchronism

20090001556 Minnesota Univ., Minneapolis, MN USA
Opponent Modeling in Interesting Adversarial Environments
Borghetti, Brett J; Jul 2008; 163 pp.; In English
Report No.(s): AD-A486145; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We advance the field of research involving modeling opponents in interesting adversarial environments: environments in which equilibrium strategies are intractable to calculate or undesirable to use. We motivate the need for opponent models in such environments by showing how successful opponent modeling agents can exploit nonequilibrium strategies and strategies using equilibrium approximations. We develop a new, flexible measurement which can be used to quantify how well our model can predict the opponent's behavior independently from the performance of the agent in which it resides. We show how this metric can be used to find areas of model improvement that would otherwise have remained undiscovered and demonstrate the technique for evaluating opponent model quality in the poker domain. We introduce the idea of performance bounds for classes of opponent models, present a method for calculating them, and show how these bounds are a function of only the environment and thus invariant over the set of all opponents an agent may face. We calculate the performance bounds for several classes of models in two domains: high card draw with simultaneous betting and a new simultaneous-move strategy game we develop. We describe how the performance bounds can be used to guide selection of appropriate classes of models for a given domain as well as guide the level of effort that should be applied to developing opponent models in those domains. We expand the set of opponent modeling methods with new algorithms and study their performance empirically in several domains, including full scale Texas Hold em poker. We develop PokeMinn, a top-performing agent that learns to improve its

performance by observing the opponent, even when the opponent is attempting to approximate equilibrium play. These methods also pave the way for performance optimization using genetic algorithms and efficient model queries using metareasoning.
DTIC
Game Theory; Models

20090001593 Naval Postgraduate School, Monterey, CA USA
The Fast Theater Model (FATHM)
Brown, Gerald G; Washburn, Alan R; Jan 2007; 14 pp.; In English
Report No.(s): AD-A486223; No Copyright; Avail.: Defense Technical Information Center (DTIC)

FATHM is a large-scale attrition model of two-sided ground combat, including air strikes by Blue on Red. While FATHM has borrowed extensively from other combat models, it also exhibits some unique features, particularly its use of linear programming calls to solve a sequence of air-to-ground engagements that are interspersed among ground-to-ground engagements. In spite of making hundreds of such calls, FATHM can still fight a realistically-scaled theater war in about three minutes on a personal computer. This paper gives the genesis and essential features.
DTIC
Combat; Simulation

20090001606 Naval Postgraduate School, Monterey, CA USA
Piled-Slab Searches
Washburn, Alan; Dec 2006; 9 pp.; In English
Report No.(s): AD-A486262; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper deals with the conflict between simplicity and optimality in searching for a stationary target whose location is distributed in two dimensions, thus continuing an analysis that was begun in World War II. The search is assumed to be of the 'piled-slab' type, where each slab consists of a uniform search of some simple region. The measure of simplicity is the number of regions (smaller is simpler). If each of a fixed number of elliptical regions is searched randomly, we find the optimal region size and the optimal division of effort between regions. Rectangular regions are also considered, as are problems where the regional searches are according to the inverse-cube law, instead of random search. There is a strong tendency for optimal inverse-cube law searches to consist of a single slab. We also consider problems where the amount of effort for each region is optimized myopically, with no consideration for the search of future regions.
DTIC
Slabs; Surveillance; Targets

20090001762 Idaho National Lab., Idaho Falls, ID, USA
Practical Issues in Component Aging Analysis. ANS PSA 2008 Topical Meeting (Preprint)
Kelly, D. L.; Rodionov, A.; Uwe-Kluegel, J.; Sep. 2008; 13 pp.; In English
Report No.(s): DE2008-940034; INL/CON-08-14536; No Copyright; Avail.: Department of Energy Information Bridge

This paper examines practical issues in the statistical analysis of component aging data. These issues center on the stochastic process chosen to model component failures. The two stochastic processes examined are repair same as new, leading to a renewal process, and repair same as old, leading to a nonhomogeneous Poisson process. Under the first assumption, times between failures can treated as statistically independent observations from a stationary process. The common distribution of the times between failures is called the renewal distribution. Under the second process, the times between failures will not be independently and identically distributed, and one cannot simply fit a renewal distribution to the cumulative failure times or the times between failures. The paper illustrates how the assumption made regarding the repair process is crucial to the analysis. Besides the choice of stochastic process, other issues that are discussed include qualitative graphical analysis and simple nonparametric hypothesis tests to help judge which process appears more appropriate. Numerical examples are presented to illustrate the issues discussed in the paper.
NTIS
Statistical Analysis; Poisson Density Functions; Qualitative Analysis; Aging (Materials)

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20090000007 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Braking, Wheeled Vehicles. Test Operations Procedure (TOP)
May 20, 2008; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A489156; TOP-2-2-608; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489156

This TOP provides standardized tests for evaluating wheeled vehicle braking systems. Because it is associated with personnel safety, thorough testing and evaluation of a vehicle's braking capability is required to assure dependability and effectiveness under a variety of conditions. Major factors to be considered in the evaluation of vehicle braking systems are stopping and grade holding ability, vehicle stability and control during brake applications, and individual braking component endurance under various operational conditions. The use of advanced technologies in brake system design will dictate the test design necessary to ensure the system is safe and effective. Some of these technologies include the use of auxiliary brake systems in heavy trucks, regenerative braking in hybrid vehicles, antilock braking systems, and electronic stability control brake systems. Requirements and procedures for brake system testing are contained in documents such as the Federal Motor Vehicle Safety Standards and the Society of Automotive Engineers procedures. This TOP identifies procedures and requirements for vehicles designed for military operations.
DTIC
Braking; Motor Vehicles; Electronic Control

20090001046 Los Alamos National Lab., NM USA
Transverse Wake Field Simulations for the ILC Acceleration Structure
Solyak, N.; Lunin, A.; Yakovlev, V.; Jun. 01, 2008; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-935234; FERMILAB-CONF-08-194-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

Details of wake potential simulation in the acceleration structure of ILC, including the RF cavities and input/HOM couplers are presented. Transverse wake potential dependence is described versus the bunch length. Beam emittance dilution caused by main and HOM couplers is estimated, followed by a discussion of possible structural modifications allowing a reduction of transverse wake potential.
NTIS
Simulation; Wakes

20090001050 Fermi National Accelerator Lab., Batavia, IL, USA
Recent Experience in the Fabrication and Brazing of Ceramic Beam Tubes for Kicker Magnets at FNAL
Ader, C. R.; Jensen, C.; Reilly, R.; Snee, D.; Wilson, J. H.; Jun. 01, 2008; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-935236; FERMILAB-CONF-08-188-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Ceramic beam tubes are utilized in numerous kicker magnets in different accelerator rings at Fermi National Accelerator Laboratory. Kovar flanges are brazed onto each beam tube end, since kovar and high alumina ceramic have similar expansion curves. The tube, kovar flange, end piece, and braze foil (titanium/incusil) alloy brazing material are stacked in the furnace and then brazed in the furnace at 1000 C. The ceramic specified is 99.8% Alumina, Al(sub 2)O(sub 3), a strong recrystallized high-alumina fabricated by slip casting. Recent experience at Fermilab with the fabrication and brazing of these tubes has brought to light numerous problems including tube breakage and cracking and also the difficulty of brazing the tube to produce a leak-tight joint. These problems may be due to the ceramic quality, voids in the ceramic, thinness of the wall, and micro-cracks in the ends which make it difficult to braze because it cannot fill tiny surface cracks which are caused by grain

pullout during the cutting process. Solutions which are being investigated include lapping the ends of the tubes before brazing to eliminate the micro-cracks and also metallization of the tubes.
NTIS
Brazing; Ceramics; Fabrication; Magnets

20090001056 Fermi National Accelerator Lab., Batavia, IL, USA
B Physics at CDF
Papadimitriou, V.; Sep. 01, 2008; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-938462; FERMILAB-CONF-08-331; No Copyright; Avail.: Department of Energy Information Bridge

In this paper we are reviewing recent results on the properties of b-mesons and b-baryons and for quarkonia.
NTIS
Baryons; Mesons; Actuators

20090001061 Fermi National Accelerator Lab., Batavia, IL, USA; California Univ., Riverside, CA USA
Single Top Quarks at the Tevatron
Heinson, A. P.; January 2008; 10 pp.; In English
Report No.(s): DE2008-938465; FERMILAB-CONF-08-350-E; No Copyright; Avail.: National Technical Information Service (NTIS)

After many years searching for electroweak production of top quarks, the Tevatron collider experiments have now moved from obtaining first evidence for single top quark production to an impressive array of measurements that test the standard model in several directions. This paper describes measurements of the single top quark cross sections, limits set on the CKM matrix element V(sub tb), searches for production of single top quarks produced via flavor-changing neutral currents and from heavy W' and H+ boson resonances, and studies of anomalous Wtb couplings. It concludes with projections for future expected significance as the analyzed datasets grow.
NTIS
Particle Accelerators; Quarks; Electroweak Interactions (Field Theory); Meson Resonance

20090001087 Stanford Linear Accelerator Center, CA, USA
Search for B+ --> mu+ nu With Inclusive Reconstruction at BaBar. The Babar Collaboration
Jul. 2008; 16 pp.; In English
Contract(s)/Grant(s): DE-AC03-76SF00515
Report No.(s): DE2008-935687; SLAC/PUB-13325; No Copyright; Avail.: National Technical Information Service (NTIS)

We search for the purely leptonic decay B(sup (+-)) (yields) (mu)(sup (+-))(nu)(sub (mu)) in the full BABAR dataset, having an integrated luminosity of approximately 426 fb(sup -1). We adopt a fully inclusive approach, where the signal candidate is identified by the highest momentum lepton in the event and the companion B is inclusively reconstructed without trying to identify its decay products. We set a preliminary upper limit on the branching fraction of (Beta)(B(sup (+-)) (yields) (mu)(sup (+-))(nu)(sub (mu))) < 1.3 x 10(sup -6) at the 90% confidence level, using a Bayesian approach.
NTIS
Mesons; Bayes Theorem; Confidence Limits; Nuclides

20090001088 Stanford Linear Accelerator Center, CA, USA
One-Loop Calculations with BlackHat
Berger, C. F.; Bern, Z.; Dixon, L. J.; Cordero, F. F.; Forde, D.; Jul. 2008; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-935692; SLAC/PUB-13295; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe BlackHat, an automated C++ program for calculating one-loop amplitudes, and the techniques used in its construction. These include the unitarity method and on-shell recursion. The other ingredients are compact analytic formulae for tree amplitudes for four-dimensional helicity states. The program computes amplitudes numerically, using analytic formula only for the tree amplitudes, the starting point for the recursion, and the loop integrals. We make use of recently developed on-shell methods for evaluating coefficients of loop integrals, in particular a discrete Fourier projection as a means of

improving numerical stability. We illustrate the good numerical stability of this approach by computing six-, seven- and eight-gluon amplitudes in QCD and comparing against known analytic results.
NTIS
C++ (Programming Language); Numerical Stability; Coefficients; Integrals

20090001089 Stanford Linear Accelerator Center, CA, USA
Distortion of Crabbed Bunch Due to Electron Cloud and Global Crabbing
Wang, L.; Raubenheimer, T. O.; Cai, Y.; Jul. 2008; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-935693; SLAC/PUB-13273; No Copyright; Avail.: National Technical Information Service (NTIS)

Crab cavities may be used improve the luminosity in colliding beam colliders with crab crossing. In a global crab crossing correction, only one crab cavity is installed in each ring and the crab cavities generate a horizontally titled bunch oscillating around the ring. The electron cloud in positively charged rings may distort the crabbed bunch and cause the luminosity drop. This paper briefly estimates the distortion of positron bunch due to the electron cloud with global crab and estimates the effect in the KEKB and possible LHC upgrades.
NTIS
Distortion; Electron Clouds; Electrons

20090001090 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Noninvariance of Space and Time Scale Ranges under a Lorentz Transformation and the Implications for the Numerical Study of Relativistic Systems
Vay, J. L.; Oct. 2008; 11 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-935700; HIFAN-1581; No Copyright; Avail.: Department of Energy Information Bridge

We present an analysis which shows that the ranges of space and time scales spanned by a system are not invariant under the Lorentz transformation. This implies the existence of a frame of reference which minimizes an aggregate measure of the range of space and time scales. Such a frame is derived for example cases: free electron laser, laser-plasma accelerator, and particle beam interacting with electron clouds. Implications for experimental, theoretical and numerical studies are discussed. The most immediate relevance is the reduction by orders of magnitude in computer simulation run times for such systems.
NTIS
Lorentz Transformations; Relativity; Time

20090001091 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Advances in U.S. Heavy Ion Fusion Science. IAEA-08 Topic IF
Logan, B. G.; Barnard, J. J.; Bieniosek, F. M.; Cohen, R. H.; Coleman, J. E.; January 2008; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-935714; HIFAN-1618; No Copyright; Avail.: Department of Energy Information Bridge

During the past two years, the US heavy ion fusion science program has made significant experimental and theoretical progress in simultaneous transverse and longitudinal beam compression, ion-beam-driven warm dense matter targets, high-brightness beam transport, advanced theory and numerical simulations, and heavy ion target physics for fusion. First experiments combining radial and longitudinal compression (pi) of intense ion beams propagating through background plasma resulted in on-axis beam densities increased by 700X at the focal plane. With further improvements planned in 2008, these results enable initial ion beam target experiments in warm dense matter to begin next year. They are assessing how these new techniques apply to higher-gain direct-drive targets for inertial fusion energy.
NTIS
Heavy Ions; Ion Beams; Transport Theory

20090001105 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; European Synchrotron Radiation Facility, Grenoble, France
Paraxial SGM Beamlines for Coherence Experiments at the Advanced Light Source
Warwick, T.; Howells, M.; Jul. 2008; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2008-935719; LBNL-758E; No Copyright; Avail.: Department of Energy Information Bridge

Beamlines have been designed for coherence experiments at the ALS based on brightness preserving spherical grating

monochromators. The operation is almost paraxial so that a very simple scheme can deliver the modest spectral resolution required, with just two focusing optics, one of which is the spherical grating.
NTIS
Light Sources; Spectral Resolution

20090001106 Rochester Univ., NY, USA
LLE Review 114 (January-March 2008)
Zuegel, J. D.; Jul. 30, 2008; 67 pp.; In English
Contract(s)/Grant(s): DE-FC52-08NA28302
Report No.(s): DE2008-935224; DOE/NA/28302-826; No Copyright; Avail.: National Technical Information Service (NTIS)

This volume of the LLE Review, covering January-March 2008, features 'Cryogenic Targets: Current Status and Future Development', by D. R. Harding, D. H. Edgell, M. D. Wittman, L. M. Elasky, S. J. Verbridge, A. J. Weaver, L. D. Lund, W. Seka, W. T. Shmayda, R. T. Janezic, M. J. Shoup III, M. Moore, R. Junquist, and A. V. Okishev. In this article, the authors report on the status of layering cryogenic DT and D(sub 2) targets at LLE for inertial confinement fusion (ICF) targets. This critical effort achieves the important milestone of routinely providing cryogenic DT targets that meet the 1.0-(micro)m (rms) OMEGA ice-quality-surface specification. The best D(sub 2)-ice layers produced so far (rms roughness of 1.1 (micro)m) are approaching the quality typically achieved in DT targets. Efforts to improve the consistency of this process are reported along with investigations supporting the National Ignition Campaign studying issues relevant to indirect-drive and direct-drive cryogenic targets.
NTIS
Laser Targets; Cryogenics; Inertial Confinement Fusion; Surface Roughness

20090001107 Stanford Linear Accelerator Center, CA, USA; Istituto Nazionale di Fisica Nucleare, Rome, Italy
Recent Measurements of (bar)V(Ub)(bar) and Gamma in BaBar
Rotondo, M.; Oct. 17, 2007; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-918041; SLAC-PUB-12894; No Copyright; Avail.: National Technical Information Service (NTIS)

We present recent results of the measurements, employed by the BaBar Collaboration, of the Cabibbo-Kobayashi-Maskawa (CKM) matrix element V(sub ub) in absolute value (bar)V(sub ub)(bar), and phase (gamma).
NTIS
Mesons; Linear Accelerators

20090001108 Stanford Linear Accelerator Center, CA, USA; Grenoble-1 Univ., Annecy, France
Charm Meson Spectroscopy at BaBar and CLEO-C
Zghiche, A.; Oct. 16, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-918044; SLAC-PUB-12889; No Copyright; Avail.: National Technical Information Service (NTIS)

In this mini-review we report on the most recent progress in charm meson spectroscopy. We discuss the precision measurements performed by the BABAR and CLEO-c experiments in the non strange charm meson part and we present the newly discovered strange charmed meson excited states.
NTIS
Charm (Particle Physics); Mesons; Spectroscopy

20090001110 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Analysis of CLAS Data on Double Charged -Pion Electroproduction.
January 2007; 5 pp.; In English
Report No.(s): DE2008-918574; No Copyright; Avail.: Department of Energy Information Bridge

Studies of nucleon resonance electrocouplings at various photon virtualities in double charged-pion electroproduction play an important role in the N* program with the CLAS detector. Single and double pion photo and electroproduction are two major exclusive channels, contributing to the total photon-proton cross section in the N* excitation region. Both of these

channels are sensitive to excited states. Photo and electroproduction of two pions are particularly sensitive to resonances with masses above 1.6 GeV.
NTIS
Pions; Resonance

20090001111 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Electroexcitation of the Roper Resonance from CLAS Data
Aznauryan, I.; Burkert, V.; January 2007; 3 pp.; In English
Report No.(s): DE2008-918575; No Copyright; Avail.: Department of Energy Information Bridge
This document reports the results on the electroexcitation of the Roper resonance extracted from a large body of CLAS data on differential cross sections and polarized beam asymmetries for the process.
NTIS
Scattering Cross Sections; Resonance; Asymmetry

20090001112 Cambridge Univ., Cambridge, UK
Design, Fabrication, and Test of a 5-kWh/100-kW Flywheel Engery Storage Utilizing a High-Temperature Superconducting Bearing
Strasik, M.; Johnson, P. E.; Day, A. C.; Mittleider, J.; Higgins, M. D.; Nov. 15, 2007; 29 pp.; In English
Contract(s)/Grant(s): DE-FC36-99G010825
Report No.(s): DE2008-918580; No Copyright; Avail.: National Technical Information Service (NTIS)
The summaries of this project are: (1) Program goal is to design, develop, and demonstrate a 100 kW UPS flywheel electricity system; (2) flywheel system spin tested up to 15,000 RPM in a sensorless, closed loop mode; (3) testing identified a manufacturing deficiency in the motor stator--overheats at high speed, limiting maximum power capability; (4) successfully spin tested direct cooled HTS bearing up to 14,500 RPM (limited by Eddy current clutch set-up); (5) Testing confirmed commercial feasibility of this bearing design--Eddy Current losses are within acceptable limits; and (6) Boeing's investment in flywheel test facilities increased the spin-test capabilities to one of the highest in the nation.
NTIS
Energy Storage; Fabrication; Flywheels; High Temperature Superconductors; Magnetic Bearings

20090001113 Idaho National Lab., Idaho Falls, ID, USA; Argonne National Lab., IL USA
Validation of Simulation Codes for Future Systems: Motivations, Approach, and the Role of Nuclear Data. 4th Workshop on Neutron Mesurements, Evaluations and Applications Nuclear Data Needs for Generation IV and Accelerator-Drive Systems
Palmiotti, G.; Salvatores, M.; Aliberti, G.; Oct. 2007; 6 pp.; In English
Report No.(s): DE2008-918699; INL/CON-07-13351; No Copyright; Avail.: Department of Energy Information Bridge
The validation of advanced simulation tools will still play a very significant role in several areas of reactor system analysis. This is the case of reactor physics and neutronics, where nuclear data uncertainties still play a crucial role for many core and fuel cycle parameters. The present paper gives a summary of validation motivations, objectives and approach. A validation effort is in particular necessary in the frame of advanced (e.g. Generation-IV or GNEP) reactors and associated fuel cycles assessment and design.
NTIS
Computerized Simulation; Motivation; Neutrons

20090001115 Fermi National Accelerator Lab., Batavia, IL, USA
Latest Results on Bottom Spectroscopy and Production with CDF
Gorelov, I. V.; January 2007; 5 pp.; In English
Report No.(s): DE2008-918718; FERMILAB-CONF-07-552-E; No Copyright; Avail.: National Technical Information Service (NTIS)
Using data collected with the CDF Run II detector, new measurements on bottom production cross-sections are presented. The latest achievements in bottom hadron spectroscopy are discussed. The results are based on a large sample of semileptonic and hadronic decays of bottom states made available by triggers based on the precise CDF tracking system.
NTIS
Spectroscopy; Actuators; Particle Decay

20090001116 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Electronic Structure Characterization and Bandgap Engineering of Solar Hydrogen Materials
Guo, J.; January 2007; 9 pp.; In English
Report No.(s): DE2008-918939; No Copyright; Avail.: National Technical Information Service (NTIS)

Bandgap, band edge positions as well as the overall band structure of semiconductors are of crucial importance in photoelectrochemical and photocatalytic applications. The energy position of the band edge level can be controlled by the electronegativity of the dopants, the pH of the solution (flatband potential variation of 60 mV per pH unit), as well as by quantum confinement effects. Accordingly, band edges and bandgap can be tailored to achieve specific electronic, optical or photocatalytic properties. Synchrotron radiation with photon energy at or below 1 keV is giving new insight into such areas as condensed matter physics and extreme ultraviolet optics technology. In the soft x-ray region, the question tends to be, what are the electrons doing as they migrated between the atoms. This document will present a number of soft x-ray spectroscopic study of nanostructured 3d metal compounds Fe(sub 2)O(sub 3) and ZnO.
NTIS
Electronic Structure; Energy Gaps (Solid State); Hydrogen; Hydrogen Production; Solar Energy

20090001117 Stanford Linear Accelerator Center, CA, USA
Improved Measurement of CP Observables in B+- to D0 CP K+- Decays (Revised July 2008)
Aubert, B.; Bona, M.; Karyotakis, Y.; Lees, J. P.; Poireau, V.; Jul. 2008; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-925458-REV1; SLAC/PUB-13142; No Copyright; Avail.: Department of Energy Information Bridge

We present a study of the decay B(sup -) (yields) D(sub (CP))(sup 0)K(sup -) and its charge conjugate, where D(sub (CP))(sup 0) is reconstructed in both a non-CP flavor eigenstate and in CP (CP-even and CP-odd) eigenstates, based on a sample of 382 million (Upsilon)(4S) (yields) B(bar B) decays collected with the BABAR detector at the PEP-II e(sup +)e(sup -) storage ring. We measure the direct CP asymmetries A(sub CP(+-)) and the ratios of the branching fractions R(sub CP(+-)): A(sub CP+) = 0.27 (+-) 0.09(stat) (+-) 0.04(syst), A(sub CP-) = -0.09 (+-) 0.09(stat) (+-) 0.02(syst), R(sub CP+) = 1.06 (+-) 0.10(stat) (+-) 0.05(syst), R(sub CP-) = 1.03 (+-) 0.10(stat) (+-) 0.05(syst). These results will help to better constrain the gamma phase parameter of the Cabibbo-Kobayashi-Maskawa quark mixing matrix.
NTIS
Invariance; Mesons

20090001118 Idaho National Lab., Idaho Falls, ID, USA
First Principle Quantum Description of the Energetics Associated with LaBr3, LaC13, and Ce Doped Scintillators
McIlwain, M. E.; Thompson, N.; Gao, D.; Mar. 01, 2008; 7 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID-13727
Report No.(s): DE2008-927632; INL/CON-07-13547; No Copyright; Avail.: National Technical Information Service (NTIS)

Considerable interest is given to the excellent scintillation properties of cerium doped lanthanum chloride (LaCl3) and lanthanum bromide (LaBr3). The scintillation efficiencies are much greater than other materials, even those containing cerium. This high efficiency is attributed to the high mobility of electrons and holes, unique placement of the cerium 5d states within the band gap, and energy of the band gap. To better understand the scintillation process and better define the nature of the Self Trapped Exciton (STE) within these unique scintillation materials, density functional theory (DFT), and Ab-inito (HF-MP2) calculations are reported. DFT calculations have yielded a qualitative description of the orbital composition and energy distribution of the band structure in the crystalline material. MP2 and single configuration interaction calculations have provided quantitative values for the band gap and provided energies for the possible range of excited states created following hole and electron creation. Based on this theoretical treatment, one possible description of the STE is the combination of Vk center (Br2-1) and LaBr+1 species that recombine to form a distorted geometry LaBr3* (triplet state). Depending on the distance between the LaBr and Br2, the STE emission band can be reproduced.
NTIS
Bromides; Doped Crystals; Lanthanum; Lanthanum Chlorides; Scintillation Counters

20090001119 National Security Technologies, LLC, Las Vegas, NV, USA
Conducting Polymers for Neutron Detection
Kimblin, C.; Miller, K.; Vogel, B.; Quam, B.; McHugh, H.; Dec. 01, 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC52-06NA25946
Report No.(s): DE2008-934438; DOE/NV/25946--330; No Copyright; Avail.: Department of Energy Information Bridge

Conjugated polymers have emerged as an attractive technology for large-area electronic applications. As organic semiconductors, they can be used to make large-area arrays of diodes or transistors using fabrication techniques developed for polymer coatings, such as spraying and screen-printing. We have demonstrated both neutron and alpha detection using diodes made from conjugated polymers and have done preliminary work to integrate a boron carbide layer into the conventional polymer device structure to capture thermal neutrons. The polymer devices appear to be insensitive to gamma rays, due to their small physical thickness and low atomic number.
NTIS
Conducting Polymers; Detection; Neutrons

20090001121 Fermi National Accelerator Lab., Batavia, IL, USA; Karlsruhe Univ., Germany
Direct CP Violation in B Decays
Kreps, M.; Jun. 01, 2008; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-934848; FERMILAB-CONF-08-214-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Measurements of the direct CP violation form an important test of the CKM mechanism of CP violation in the standard model. In addition it provides a window for searches for new physics beyond the standard model.
NTIS
CP Violation; Invariance; Mesons

20090001123 Brookhaven National Lab., Upton, NY USA
15-T Pulsed Solenoid for a High-Power Target Experiment
Kirk, H. G.; Efthymiopoulos, I.; Fabich, A.; Haug, F.; Pereira, H.; Jul. 2008; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2008-935742; BNL-81328-2008-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

The MERIT experiment, which ran at CERN in 2007, is a proof-of-principle test for a target system that converts a 4-MW proton beam into a high-intensity muon beam for either a neutrino factory complex or a muon collider. The target system is based on a free mercury jet that intercepts an intense proton beam inside a 15-T solenoidal magnetic field. Here, we describe the design and performance of the 15-T, liquid-nitrogen-precooled, copper solenoid magnet.
NTIS
Solenoids; Targets

20090001124 Brookhaven National Lab., Upton, NY USA
Melting Sequence of Quarkonia
Mocsy, A.; Aug. 07, 2008; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-CH10886
Report No.(s): DE2008-936841; BNL-81422-2008-CP; No Copyright; Avail.: Department of Energy Information Bridge

In this talk I discuss what we can learn about quarkonium dissociation from lattice-potential based models, and summarize the current understanding of lattice data on quarkonium.
NTIS
Melting; Quarks

20090001129 Fermi National Accelerator Lab., Batavia, IL, USA
Gamme V: Fermilab Axion-like Particle Photon Regeneration Results
Wester, W.; January 2008; 4 pp.; In English
Report No.(s): DE2008-936886; FERMILAB/CONF-08-340-A-E; No Copyright; Avail.: Department of Energy Information Bridge

GammeV is an axion-like particle photon regeneration experiment conducted at Fermilab that employs the light shining

through a wall technique. They obtain limits on the coupling of a photon to an axion-like particle that extend previous limits for both scalar and pseudoscalar axion-like particles in the milli-eV mass range. They are able to exclude the axion-like particle interpretation of the anomalous PVLAS 2006 result by more than 5 standard deviations.
NTIS
Bosons; Photons

20090001130 Fermi National Accelerator Lab., Batavia, IL, USA
Phase Stability of a Microtron Driving a Terahertz FEL
Kazakevich, G. M.; Pavlov, V. M.; Jeong, Y. U.; Lee, B. C.; January 2008; 5 pp.; In English
Report No.(s): DE2008-936887; FERMILAB-CONF-08-262-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The phase stability of bunches accelerated by a magnetron-driven microtron-injector of a terahertz Free Electron Laser (FEL) has been studied to optimize the microtron regimes providing good operation of the FEL. The study is based on a simulation of the beam dynamics in the microtron considering 2-D motion of the electrons in the median plane. This allows the computation of the current loading the accelerating cavity as well as the output microtron current. The loading current has been used to calculate the frequency deviations caused by the incremental loading in the accelerating cavity coupled with the magnetron. Further computations using the 2-D simulation show noticeable phase oscillation of the accelerated bunch leaving the microtron on the macro-pulse front. The phase oscillation is in agreement with the measured one and affects the lasing in the microtron-based FEL. Optimization of the microtron regimes allows one to minimize the effect. As a result, the terahertz microtron-based FEL provides radiated macro-pulse energy up to 0.2 mJ tunable in the range of 0.85-3 THz with good stability.
NTIS
Free Electron Lasers; Microtrons; Stability

20090001131 Fermi National Accelerator Lab., Batavia, IL, USA
HINS Superconducting Lens and Cryostat Performance
Page, T. M.; DiMarco, J.; Huang, Y.; Orris, D. F.; Tartaglia, M. A.; January 2008; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2008-936890; FERMILAB-CONF-08-266-TD; No Copyright; Avail.: Department of Energy Information Bridge

Fermi National Accelerator Laboratory is involved in the development of a 60 MeV superconducting linac. This linac is part of the High Intensity Neutrino Source (HINS) R&D Program. The initial beam acceleration in the front end section of the linac is achieved using room temperature spoke cavities, each of which is combined with a superconducting focusing solenoid. These solenoid magnets are cooled with liquid helium at 4.5K, operate at 250 A and have a maximum magnetic field strength of 7.5 T. A prototype solenoid cryostat was built and tested at the Fermilab Magnet Test Facility. This paper discusses the test results of the prototype and compares the measured and estimated performance of the cryostat. We also present the methods and results for measuring and fiducializing the axis of the solenoid lens.
NTIS
Cryostats; Lenses; Linear Accelerators; Superconductivity

20090001132 Fermi National Accelerator Lab., Batavia, IL, USA
Top Quark Mass Measurements at the Tevatron (FERMILAB-CONF-08-276-E)
Adelman, J.; Aug. 05, 2008; 8 pp.; In English
Report No.(s): DE2008-936896; FERMILAB-CONF-08-276-E; No Copyright; Avail.: Department of Energy Information Bridge

Top quark mass measurements from the Tevatron using up to 2.0 fb(sup -1) of data are presented. Prospects for combined Tevatron measurements by the end of Run II are discussed.
NTIS
Particle Accelerators; Quarks

20090001134 Stanford Linear Accelerator Center, CA, USA; Bergen Univ., Norway; Warwick Univ., Coventry, UK; Wisconsin Univ., Madison, WI, USA

Amplitude Analysis of the Decay B0->K+pi-pi0

Aubert, B.; Bona, M.; Karyotakis, Y.; Lees, J. P.; Poireau, V.; Sep. 03, 2008; 24 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2008-937193; SLAC-PUB-13331; No Copyright; Avail.: National Technical Information Service (NTIS)

We report an updated amplitude analysis of the charmless hadronic decays of neutral B mesons to K(sup +) (pi)(sup -)(pi)(sup 0). With a sample of 454 million (Upsilon)(4S) (yields) B(bar B) decays collected by the BABAR detector at the PEP-II asymmetric-energy B Factory at SLAC, we measure the magnitudes and phases of the intermediate resonant and nonresonant amplitudes for B(sup 0) and B(sup 0) decays and determine the corresponding CP-averaged fit fractions and charge asymmetries.

NTIS

Mesons; Particle Decay; Hadrons

20090001135 Stanford Linear Accelerator Center, CA, USA

Study of the Ds+ to K+K-e+ nu Decay Channel with the Babar Experiment

Serrano, J.; Sep. 2008; 236 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2008-937199; SLAC-R-903; No Copyright; Avail.: National Technical Information Service (NTIS)

Charm semileptonic decays allow a validation of lattice QCD calculations through the measurement of the hadronic form factors, which characterize the effect of strong interaction in these reactions. The accuracy of such calculations is crucial for the improvement of the test of the standard model in flavor physics. This thesis presents a study of the D(sub s)(sup +) (yields) K(sup +)K(sup -)e(sup +)(nu)(sub e) channel using 214 fb(sup -1) recorded by de BAbar experiment. For events with a K(sup +)K(sup -) mass in the range between 1.01 GeV/c(sup 2) and 1.03 Gev/c(sup 2), the (phi) (yields) K(sup +)K(sup -) is the dominant component. Using the simple pole model to parameterize the q(sup 2) dependence of the form factors -V(q(sup 2)), A(sub 1)(q(sup 2)) and A(sub 2)(q(sup 2))- the following ratios are measured at q(sup 2) = 0; (tau)(sub V) = V(0)/A(sub 1)(0) = 1.868 (+-) 0.061 (+-) 0.079, r(sub 2) = A(sub 2)(0)/A(sub 1)(0) = 0.763 (+-) 0.072 (+-) 0.062. The mass pole of the axial-vector form factor is also obtained: m(sub A) = (2.30(sub -0.18)(sup +0.42) (+-) 0.21) GeV/c(sup 2). In the same mass range, the semileptonic branching fraction, relative to the D(sub s)(sup +) (yields) (phi)(pi)(sup +) channel, is measured, and the absolute normalization of the axial-vector form factor is extracted: A(sub 1)(q(sup 2) = 0) and = 0.605 (+-) 0.012 (+-) 0.018 (+-) 0.018. The stated errors refer to the statistical, systematic and errors from external inputs, respectively.

NTIS

Particle Decay; Hadrons; Parameterization

20090001140 Brookhaven National Lab., Upton, NY, USA

Quarkyonic Matter and the Phase Diagram of QCD

McLerran, L.; January 2008; 11 pp.; In English

Contract(s)/Grant(s): DE-AC02-CH10886

Report No.(s): DE2008-936840; BNL-81417-2008-CP; No Copyright; Avail.: Department of Energy Information Bridge

Quarkyonic matter is a new phase of QCD at finite temperature and density which is distinct from the confined and de-confined phases. Its existence is unambiguously argued in the large numbers of colors limit, N(sub c) (yields) (infinity), of QCD. Hints of its existence for QCD, N(sub c) = 3, are shown in lattice Monte-Carlo data and in heavy ion experiments.

NTIS

Phase Diagrams; Quantum Chromodynamics

20090001149 Alabama Agricultural and Mechanical Univ., Normal, AL, USA

New Scintillator Materials (K2CeBr5) and (Cs2CeBr5)

Hawrami, R.; Volz, M. P.; Batra, A. K.; Aggarwal, M. D.; Roy, U. N.; Groza, M.; Burger, A.; Cherepy, Nerine; Niedermayr, Thomas; Payne, Stephen A.; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Cesium cerium bromide (Cs2CeBr5) and potassium cerium bromide (K2CeBr5) are new scintillator materials for X-ray and gamma ray detector applications. Recently halide scintillator materials, such as Ce doped lanthanum bromide has been proved to be very important material for the same purpose. These materials are highly hygroscopic; a search for high light yield non-hygroscopic materials was highly desirable to advance the scintillator technology. In this paper, we are reporting the

crystal growth of novel scintillator materials, cesium cerium bromide (Cs2CeBr5) and potassium cerium bromide (K2CeBr5). Crystals were successfully grown from the melt using the vertical Bridgman-Stockbarger technique, in a comparison with the high performance LaBr3 or LaCl3 crystals, cerium based alkali halides crystals, (Cs2CeBr5) and (K2CeBr5) have similar scintillation properties, while being much less hygroscopic. Furthermore, cesium based compounds will not suffer from the self-activity present in potassium and lanthanum compounds. However the Cs2CeBr5 crystals did not grow properly probably due to non-congruent melting or to some phase transition during cooling. Keywords.' Scintillator materials; Ce3+; Energy resolution; Light yield; K2CeBr5

Author

Bridgman Method; Cesium Bromides; Potassium Bromides; Cesium Compounds; Potassium Compounds; Doped Crystals; Hygroscopicity; X Ray Detectors; Lanthanum Compounds; Scintillation; Gamma Rays

20090001171 Fermi National Accelerator Lab., Batavia, IL, USA

Status of the Manx Muon Cooling Experiment

Yonehara, K.; Broemmelsick, D.; Hu, M.; Jansson, A.; Kashikhin, V. S.; January 2008; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-07CH-11359

Report No.(s): DE2008-935256; No Copyright; Avail.: National Technical Information Service (NTIS)

A demonstration experiment of six-dimensional (6D) phase space muon beam cooling is a key milestone on the roadmap toward to a real muon collider. In order to achieve this goal, they have designed the Muon Collider and Neutrino Factory Experiment (MANX) channel, which consists of the Helical Cooling Channel (HCC). They discuss the status of the simulation study of the MANX in this document.

NTIS

Cooling; Muons; Neutrinos

20090001172 Department of Energy, Washington, DC USA

Search for WW and WZ Production in Lepton, Neutrino Plus Jets Final States at CDF Run II and Silicon Module Production and Detector Control System for the ATLAS Semiconductor Tracker

Sfyrla, A.; January 2008; 196 pp.; In English

Report No.(s): DE2008-935479; No Copyright; Avail.: National Technical Information Service (NTIS)

In the first part of this work, we present a search for WW and WZ production in charged lepton, neutrino plus jets final states produced in p(bar p) collisions with (radical)s = 1.96 TeV at the Fermilab Tevatron, using 1.2 fb(sup -1) of data accumulated with the CDF II detector. This channel is yet to be observed in hadron colliders due to the large singleWplus jets background. However, this decay mode has a much larger branching fraction than the cleaner fully leptonic mode making it more sensitive to anomalous triple gauge couplings that manifest themselves at higher transverse W momentum. Because the final state is topologically similar to associated production of a Higgs boson with a W, the techniques developed in this analysis are also applicable in that search. An Artificial Neural Network has been used for the event selection optimization. The theoretical prediction for the cross section is (sigma)(sub WW/WZ)(sup theory) x Br(W (yields) (ell)(nu); W/Z (yields) jj) = 2.09 (+-) 0.14 pb. They measured N(sub Signal) = 410 (+-) 212(stat) (+-) 102(sys) signal events that correspond to a cross section (sigma)(sub WW/WZ) x Br(W (yields) (ell)(nu); W/Z (yields) jj) = 1.47 (+-) 0.77(stat) (+-) 0.38(sys) pb. The 95% CL upper limit to the cross section is estimated to be (sigma) x Br(W (yields) (ell)(nu); W/Z (yields) jj) < 2.88 pb. The second part of the present work is technical and concerns the ATLAS SemiConductor Tracker (SCT) assembly phase. Although technical, the work in the SCT assembly phase is of prime importance for the good performance of the detector during data taking. The production at the University of Geneva of approximately one third of the silicon microstrip end-cap modules is presented. This collaborative effort of the university of Geneva group that lasted two years, resulted in 655 produced modules, 97% of which were good modules, constructed within the mechanical and electrical specifications and delivered in the SCT collaboration for assembly on the end-cap disks. The SCT end-caps and barrels consist of 4088 silicon modules, with a total of 6.3 million readout channels. The coherent and safe operation of the SCT during commissioning and subsequent operation is the essential task of the Detector Control System (DCS). The main building blocks of the DCS are the cooling system, the power supplies and the environmental system. The DCS has been initially developed for the SCT assembly phase and this system is described in the present work. Particular emphasis is given in the environmental hardware and software components, that were my major contributions. Results from the DCS testing during the assembly phase are also reported.

NTIS

Elementary Particles; Higgs Bosons; Leptons; Neutrinos; Production Management; Semiconductors (Materials); Silicon

20090001173 Stanford Linear Accelerator Center, CA, USA
Search for B+ Meson Decay to a1+ K*0
Aubert, B.; Aug. 07, 2008; 15 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-935674; SLAC-PUB-13346; No Copyright; Avail.: National Technical Information Service (NTIS)

We present the preliminary result of a search for the decay B(sup (+-)) (yields) a(sub 1)(sup (+-)) K*(sup 0). The data, collected with the BABAR detector at the Stanford Linear Accelerator Center, represent 465 million B(bar B) pairs produced in e(sup +)e(sup -) annihilation at the (Upsilon)(4S) energy. The result for the branching fraction is: (Beta)(B(sup +) (yields) a(sub 1)(sup +)K*(sup 0)) x (Beta)(a(sub 1)(sup +) (yields) (pi)(sup +)(pi)(sup -)(pi)(sup +)) = (0.7(sub -0.4-0.7)(sup +0.5+0.7)) x 10(sup -6), corresponding to an upper limit at 90% confidence level of 1.6 x 10(sup -6). The first error quoted is statistical, the second systematic.
NTIS
Mesons; Particle Decay

20090001174 Fermi National Accelerator Lab., Batavia, IL, USA; London Univ., UK
W and Z Properties at the Tevatron
Nurse, E. L.; Aug. 01, 2008; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-935799; FERMILAB-CONF-08-282-E; No Copyright; Avail.: National Technical Information Service (NTIS)

I present measurements of W and Z boson properties by the CDF and DO collaborations. This includes measurements that test the production mechanism of the bosons and precision measurements of electroweak parameters. In the former category I present CDF measurements of the Z rapidity and W charge asymmetry that will help further constrain Parton Distribution Functions in future global fits, and a DO measurement of the Z transverse momentum distribution that can be used to test the predictions of quantum-chromodynamics.
NTIS
Bosons; Particle Accelerators

20090001175 Stanford Linear Accelerator Center, CA, USA; Milan Univ., Italy
Hadronic B Decays at BaBar and Belle
Lombardo, V.; Aug. 11, 2008; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-935955; SLAC-PUB-13240; No Copyright; Avail.: Department of Energy Information Bridge

The authors review recent results of the BABAR and Belle Collaborations on the (alpha) and (gamma) angles of the unitarity triangle, on the B (yields) K(pi)(pi) Dalitz-plot analyses, and on the searches for baryonic B decays and for B (yields) D(bar D) decays.
NTIS
Hadrons; Particle Decay

20090001176 California Univ., Davis, CA, USA
Top Physics at CDF
Schwarz, T. A.; Jul. 01, 2008; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-936266; FERMILAB-CONF-08-226-E; No Copyright; Avail.: Department of Energy Information Bridge

Recent results in top physics at CDF presented at the Lake Louise Winter Institute 2008 are discussed, including updates to the top mass, single top search, a search for flavor changing neutral currents in top decay, and W-helicity measurements. Several newer measurements are also presented including the forward-backward asymmetry, the t(bar t) differential cross-section d(sigma)/dM(sub t(bar t)), and a search for top pair production from massive gluons. Most of the discussed measurements utilize close to 2 fb(sup -1) of data collected at CDF.
NTIS
Quarks; Neutral Currents; Gluons; Asymmetry

20090001177 Fermi National Accelerator Lab., Batavia, IL, USA; Argonne National Lab., IL USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Stanford Linear Accelerator Center, CA, USA

Community Petascale Project for Accelerator Science and Simulation: Advancing Computational Science for Future Accelerators and Accelerator Technologies

Spentzouris, P.; Cary, J.; Mcinnes, L. S.; Ng, E.; Ryne, R.; Jul. 01, 2008; 14 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2008-936267; FERMILAB-CONF-08-220-APC-CD; No Copyright; Avail.: National Technical Information Service (NTIS)

The design and performance optimization of particle accelerators is essential for the success of the DOE scientific program in the next decade. Particle accelerators are very complex systems whose accurate description involves a large number of degrees of freedom and requires the inclusion of many physics processes. Building on the success of the SciDAC1 Accelerator Science and Technology project, the SciDAC2 Community Petascale Project for Accelerator Science and Simulation (ComPASS) is developing a comprehensive set of interoperable components for beam dynamics, electromagnetics, electron cooling, and laser/plasma acceleration modeling. ComPASS is providing accelerator scientists the tools required to enable the necessary accelerator simulation paradigm shift from high-fidelity single physics process modeling (covered under SciDAC1) to high-fidelity multi-physics modeling. Our computational frameworks have been used to model the behavior of a large number of accelerators and accelerator R&D experiments, assisting both their design and performance optimization. As parallel computational applications, the ComPASS codes have been shown to make effective use of thousands of processors.

NTIS

Research and Development; Technologies

20090001181 Fermi National Accelerator Lab., Batavia, IL, USA; Boston Univ., Boston, MA USA

Single Top Quark Production at D0, (Updated)

Jabeen, S.; Jul. 01, 2008; 8 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2008-936635; FERMILAB-CONF-08-234-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We present first evidence for the production of single top quarks at the Fermilab Tevatron p(bar p) collider. Using a 0.9 fb(sup -1) dataset, we apply a multivariate analysis to separate signal from background and measure cross section for single top quark production. We use the cross section measurement to directly determine the CKM matrix element that describes the Wtb coupling. We also present results of W0 and charged Higgs searches with the same final states as standard model single top quark production.

NTIS

Quarks; Multivariate Statistical Analysis

20090001182 Fermi National Accelerator Lab., Batavia, IL, USA; Johns Hopkins Univ., Baltimore, MD, USA

Heavy Flavour Physics at CDF. (Updated)

Giurgiu, G.; Aug. 01, 2008; 8 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2008-936637; FERMILAB-CONF-08-336-E; No Copyright; Avail.: Department of Energy Information Bridge

The CDF detector at Fermilab has accumulated more that 3 fb(-1) of data which enables unprecedented studies of heavy flavor hadron properties. We present recent CDF measurements of mass and lifetime of the B(sub c) meson as well as lifetime, mixing and CP violation properties of B(sub s) mesons.

NTIS

Accumulations; CP Violation; Hadrons; Mesons

20090001183 Fermi National Accelerator Lab., Batavia, IL, USA; Katholieke Univ., Nijmegen, Netherlands

Searches for Higgs Bosons beyond the Standard Model at the Tevatron Collider

Filthaut, F.; Jul. 01, 2008; 9 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2008-936642; FERMILAB-CONF-08-268-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The rapidly increasing integrated luminosity collected by the CDF and D0 detectors at the Tevatron Collider has resulted

in a wealth of new results from searches for Higgs bosons in the extensions of the Standard Model. Tighter limits are set on the parameters governing the Higgs sector in these models.
NTIS
Higgs Bosons; Particle Accelerators

20090001184 California Univ., Berkeley, CA USA
Quantum Dynamical Behaviour in Complex Systems - A Semiclassical Approach
Ananth, N.; Apr. 2008; 165 pp.; In English
Report No.(s): DE2008-936732; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the biggest challenges in Chemical Dynamics is describing the behavior of complex systems accurately. Classical MD simulations have evolved to a point where calculations involving thousands of atoms are routinely carried out. Capturing coherence, tunneling and other such quantum effects for these systems, however, has proven considerably harder. Semiclassical methods such as the Initial Value Representation (SC-IVR) provide a practical way to include quantum effects while still utilizing only classical trajectory information. For smaller systems, this method has been proven to be most effective, encouraging the hope that it can be extended to deal with a large number of degrees of freedom. Several variations upon the original idea of the SCIVR have been developed to help make these larger calculations more tractable; these range from the simplest, classical limit form, the Linearized IVR (LSC-IVR) to the quantum limit form, the Exact Forward-Backward version (EFB-IVR). In this thesis a method to tune between these limits is described which allows us to choose exactly which degrees of freedom we wish to treat in a more quantum mechanical fashion and to what extent. This formulation is called the Tuning IVR (TIVR). We further describe methodology being developed to evaluate the prefactor term that appears in the IVR formalism.
NTIS
Complex Systems; Dynamical Systems; Quantum Theory

20090001605 Army Tank-Automotive Research and Development Command, Warren, MI USA
Angular Dependence of the Microwave-Generation Threshold in a Nanoscale Spin-Torque Oscillator
Gerhart, G; Bankowski, E; Melkov, G A; Tiberkevich, V S; Slavin, A N; Jul 20, 2007; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0247
Report No.(s): AD-A486258; No Copyright; Avail.: Defense Technical Information Center (DTIC)

It is shown that in a spin-torque microwave oscillator based on a magnetic nanocontact, the nature of the microwave spin wave mode generated at the threshold critically depends on the angle between the external bias magnetic field and the plane of the free layer. When the external bias field is rotating from normal to in-plane orientation, an abrupt transition from a propagating cylindrical wave with the frequency higher than the frequency of the linear ferromagnetic resonance (FMR) to a self-localized standing nonlinear spin wave 'bullet' with the frequency lower than the FMR frequency takes place at a certain intermediate angle. This transition manifests itself as an abrupt jump (of the order of several gigahertz) in the generated microwave frequency. This mechanism of mode switching might explain abrupt jumps of the generated microwave frequency observed in recent experiments on spin-torque oscillators.
DTIC
Ferromagnetic Resonance; Magnetic Fields; Microwave Oscillators; Microwaves; Oscillators; Torque

20090001617 Stanford Linear Accelerator Center, CA, USA
Measurement and Analysis of Field Emission Electrons in the LCLS Gun
Dowell, D. H.; Jongewaard, E.; Limborg-Deprey, C.; Schmerge, J. F.; Vlieks, A.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76-SF00515
Report No.(s): DE2008-918952; SLAC-PUB-12945; No Copyright; Avail.: National Technical Information Service (NTIS)

The field emission was measured during the high-power testing of the LCLS photocathode RF gun. A careful study and analysis of the field emission electrons, or dark current is important in assessing the gun's internal surface quality in actual operation, especially those surfaces with high fields. The first indication of a good RF gun design and fabrication is short processing time to the required fields and low electron emission at high fields. The charge per 2 microsecond long RF pulse (the dark charge) was measured as a function of the peak cathode field for the 1.6 cell, 2.856GHz LCLS RF gun. Faraday cup data was taken for cathode peak RF fields up to 120MV/m producing a maximum of 0.6nC/RF pulse for a diamond-turned polycrystalline copper cathode installed in the gun. Digitized images of the dark charge were taken using a 100 micron thick

YAG crystal for a range of solenoid fields to determine the location and angular distribution of the field emitters. The FN plots and emitter image analysis will be described in this paper.
NTIS
Electron Emission; Electrons; Field Emission; Particle Accelerators

20090001645 Stanford Linear Accelerator Center, CA, USA; Ohio State Univ., Columbus, OH, USA
Search for Tau-Lepton Decays to Seven or More Pions with BABAR
Kass, R.; Hast, C.; Ter-Antonyan, R.; January 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-918974; SLAC-PUB-12939; No Copyright; Avail.: Department of Energy Information Bridge

We report the results of searches for several decay modes of the (tau)-lepton with (ge) 7 pions in the final state using 207 x 10(sup 6) (tau)-pairs collected with the BaBar detector. For the decays with 7 charged pions in the final state we find the following 90% CL upper limits: B((tau)(sup -) (yields) 4(pi)(sup -)3(pi)(sup +)((pi)(sup 0))(nu)(sub (tau))) < 3.0 x 10(sup -7), B((tau)(sup -) (yields) 4(pi)(sup -)3(pi)(sup +)(nu)(sub (tau))) < 4.3 x 10(sup -7) and B((tau)(sup -) (yields)) B((tau)(sup -) (yields) 4(pi)(sup -)3(pi)(sup +)(pi)(sup 0)(nu)(sub (tau))) < 2.5 x 10(sup -7). We also search for the decay (tau)(sup -) (yields) 3(pi)(sup -)2(pi)(sup +)2(pi)(sup 0)(nu)(sub (tau)) and report a 90% CL upper limit of < 3.4 x 10(sup -6) for its branching fraction. Finally, we search for the exclusive final state (tau)(sup -) (yields) 2(sigma)(pi)(sup -)(nu)(sub (tau)) and find a 90% CL upper limit for its branching fraction of < 5.4 x 10(sup -7).
NTIS
Leptons; Particle Decay

20090001712 Fermi National Accelerator Lab., Batavia, IL, USA; Pittsburgh Univ., PA, USA
Search for CP Violation in B0(s) ---> J / Psi Phi at CDF
Liu, C.; Jul. 01, 2008; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-935486; FERMILAB-CONF-08-264; No Copyright; Avail.: National Technical Information Service (NTIS)

none
NTIS
CP Violation; Hadrons

20090001724 Fermi National Accelerator Lab., Batavia, IL, USA; Tsukuba Univ., Japan; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Search for Technicolor Particles Produced in Association with W Boson at CDF
Nagai, Y.; Masubuchi, T.; Kim, S.; Yan, W. M.; Aug. 01, 2008; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-935798; FERMILAB-CONF-08-278-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We present a search for technicolor particles produced in association with W bosons when really technirho decays to a technipion and a W boson with the techniopion decaying to quarks in p-pbar collisions at square root of s= 1.96 TeV. This search uses data corresponding to an integrated luminosity of 1.9fb-1.
NTIS
Bosons; Collisions; Quarks

20090001742 Fermi National Accelerator Lab., Batavia, IL, USA
Search for Anomalous Production of Photon, B-Jet, and Missing Transverse Energy at CDF
Yu, S. S.; Aug. 01, 2008; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-936268; FERMILAB-CONF-08-299-E; No Copyright; Avail.: National Technical Information Service (NTIS)

NONE
NTIS
Photons; Transverse Momentum

20090001743 Fermi National Accelerator Lab., Batavia, IL, USA

Design Considerations of Translmission Line Superconductors for Fast-Cycling Accelerator Magnets

Piekarz, H.; Jul. 01, 2008; 5 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2008-936343; FERMILAB-CONF-08-217-APC; No Copyright; Avail.: National Technical Information Service (NTIS)

Novel design options of HTS and LTS superconductor lines for fast-cycling accelerator magnets are presented. The cryogenic power losses in using these conductors in transmission line application to energize the accelerator magnet string are discussed. A test arrangement to measure power loss of the proposed superconductor lines operating up to 2 T/s ramp rate and 0.5 Hz repetition cycle is described.

NTIS

Cycles; Magnets; Particle Accelerators; Transmission Lines

20090001744 Fermi National Accelerator Lab., Batavia, IL, USA; London Univ., UK

Measurements of Vector Bosons Produced in Association with Jets

Cooper, B.; Jul. 01, 2008; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2008-936347; FERMILAB-CONF-08-251-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The latest D0 and CDF measurements of the W + jets and Z/(gamma)* + jets processes are described, along with a discussion of the comparisons that have been made to LO and NLO perturbative QCD predictions. The direct production of W(sup (+-))/Z bosons in association with jets is a process of crucial importance at hadron collider experiments. The presence of a vector boson in the hard scatter means that these interactions occur at a scale that should make perturbative QCD applicable, and thus it is an excellent channel to test such predictions. Furthermore, many of the potential discovery channels for the Higgs boson and beyond standard model processes share a final state signature with the W(sup (+-))/Z + jets process. It is thus vital for the success of existing and future hadron collider experiments that this process is understood, and recently there has been a huge amount of work put into the modeling of this process, with the appearance of many new Monte Carlo generators that are already widely used at both the Tevatron and LHC. In Sections 2 and 3 the latest W + jets and Z/(gamma)+ jets measurements from the Tevatron are presented, and in Section 4 we discuss the results and implications of some of the theory comparisons that have thus far been made.

NTIS

Bosons; Vectors (Mathematics)

20090001745 Brookhaven National Lab., Upton, NY USA

Dipole Picture in DIS: Saturation and Heavy Quarks

Soyez, G.; January 2008; 6 pp.; In English

Contract(s)/Grant(s): DE-AC02-98CH10886

Report No.(s): DE2008-937152; BNL-91349-2008-CP; No Copyright; Avail.: Department of Energy Information Bridge

We discuss the description of the proton structure function within the dipole factorization framework. We parameterize the forward dipole amplitude to account for saturation as predicted by the small-x QCD evolution equations. Contrarily to previous models, the saturation scale does not decrease when taking heavy quarks into account. We show that the same dipole amplitude also allows to reproduce diffractive data and exclusive vector meson production.

NTIS

Elementary Particles; Images; Quarks

20090001747 Stanford Linear Accelerator Center, CA, USA

Observation of the Bottomonium Ground State Eta(beta), at BABAR

Grenier, P.; Sep. 2008; 6 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2008-937170; SLAC-PUB-13384; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

Ground State; Particle Accelerators

20090001756 Ames Lab., IA, USA

Inductively Coupled Plasma: Fundamental Particle Investigations with Laser Ablation and Applications in Magnetic Sector Mass Spectrometry, (Thesis/Dissertation)

Saetveit, N. J.; Aug. 18, 2008; 93 pp.; In English

Contract(s)/Grant(s): DE-AC02-07CH11358

Report No.(s): DE2008-939379; IS-T 2468; No Copyright; Avail.: National Technical Information Service (NTIS)

Particle size effects and elemental fractionation in laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) are investigated with nanosecond and femtosecond laser ablation, differential mobility analysis, and magnetic sector ICP-MS. Laser pulse width was found to have a significant influence on the LA particle size distribution and the elemental composition of the aerosol and thus fractionation. Emission from individual particles from solution nebulization, glass, and a pressed powder pellet are observed with high speed digital photography. The presence of intact particles in an ICP is shown to be a likely source of fractionation. A technique for the online detection of stimulated elemental release from neural tissue using magnetic sector ICP-MS is described. Detection limits of 1 (micro)g L(sup -1) or better were found for P, Mn, Fe, Cu, and Zn in a 60 (micro)L injection in a physiological saline matrix.

NTIS

Ablation; Laser Ablation; Magnetic Fields; Mass Spectroscopy

20090001757 Stanford Linear Accelerator Center, CA, USA; California Inst. of Tech., Pasadena, CA, USA

Radiative Leptonic B Decays, (Thesis/Dissertation)

Chen, E. T.; Oct. 06, 2008; 312 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2008-939371; SLAC-R-900; No Copyright; Avail.: National Technical Information Service (NTIS)

We present the results of a search for B(sup +) meson decays into (gamma)(ell)(sup +)(nu)(sub (ell)), where (ell) = e,(mu). We use a sample of 232 million B(bar B) meson pairs recorded at the (Upsilon)(4S) resonance with the BABAR detector at the PEP-II B factory. We measure a partial branching fraction (Delta)(beta) in a restricted region of phase space that reduces the effect of theoretical uncertainties, requiring the lepton energy to be in the range 1.875 and 2.850 GeV, the photon energy to be in the range 0.45 and 2.35 GeV, and the cosine of the angle between the lepton and photon momenta to be less than -0.36, with all quantities computed in the (Upsilon)(4S) center-of-mass frame. We find (Delta)(Beta)(B(sup +) (yields) (gamma)(ell)(sup +)(nu)(sub (ell))) = (-0.3(sub 1.5)(sup +1.3)(statistical)(sub -0.6)(sup +0.6)(systematic) (+-) 0.1(theoretical)) x 10(sup -6), under the assumption of lepton universality. Interpreted as a 90% confidence-level Bayesian upper limit, the result corresponds to 1.7 x 10(sup -6) for a prior at in amplitude, and 2.3 x 10(sup -6) for a prior at in branching fraction.

NTIS

Leptons; Particle Decay

20090001761 Fermi National Accelerator Lab., Batavia, IL, USA; Duke Univ., Durham, NC, USA

Diboson Physics at CDF, (DE2008-939439)

Phillips, T. J.; Jul. 01, 2008; 5 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2008-939439; FERMILAB-CONF-08-240-E; No Copyright; Avail.: National Technical Information Service (NTIS)

We have studied diboson events produced by p(bar p) collisions at (radical)s = 1.96 TeV using the CDF detector. Our observations of Z(gamma), WZ, and ZZ production are consistent with Standard Model predictions, and we set limits on some anomalous couplings.

NTIS

Mesons; Standard Model (Particle Physics)

20090001789 Air Force Research Lab., Edwards AFB, CA USA

Study of the Synchronous Operation of an Annular Field Reversed Configuration Plasma Device

Kirtley, David E; May 5, 2008; 282 pp.; In English

Report No.(s): AD-A486076; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Field Reversed Configuration (FRC) plasmas are high-density, magnetized, pulsed plasmas with unique translational and efficient formation properties that lend themselves to many uses. This dissertation furthers the understanding and empirical

investigations into a slow-formation FRC, the low-voltage Annular Field Reversed Configuration plasma (AFRC) by successfully operating with heavy gases, at low-voltages, and in a synchronous discharge configuration.
DTIC
Plasmas (Physics); Synchronism

20090001833 NASA Marshall Space Flight Center, Huntsville, AL, USA
Electron Calorimeter Experiment
Adams, James H.; July 13, 2008; 26 pp.; In English; 37th COSPAR Scientific Assembly, 13 - 20 Jul. 2008, Montreal, Canada; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001833

Boron loaded scintillators are suitable for measuring secondary neutrons produced by high-energy particles: protons & electrons Neutron flux can be used to discriminate hadron and electro-magnetic particles Combined effectiveness of all e/p discriminators techniques employedTBD Only moderate improvement in detection efficiency for B-10 concentrations >few% in thick moderators Bottom scintillator might serve as cascade penetration counter (TBC)
Author
Boron 10; Calorimeters; Protons; Hadrons; Flux (Rate); Electrons

71
ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20090001225 NASA Johnson Space Center, Houston, TX, USA
Acoustics Inside the Space Shuttle Orbiter and the International Space Station
Goodman, Jerry R.; January 2009; 10 pp.; In English; SAE Noise and Vibration Conference and Exhibition, 19 - 21 May 2009, Illinois, USA; Original contains color and black and white illustrations
Report No.(s): 09NVC-340; Copyright; Avail.: Other Sources

The acoustics environment in enclosed habitable space vehicles and modules is important to mission safety, crew health, and efficient operations. Noise is unwanted sound that can interfere with crew communications and sleep, creating habitability concerns, hearing loss, or other health issues. This paper discusses the acoustic environment and the noise control efforts in the Space Shuttle Orbiter and the International Space Station, and the lessons learned from these efforts. Included is the need to apply the design discipline of acoustics early in the design process, to establish reasonable acoustic limits and 'design them into' vehicles/modules, and to apply noise control to ensure that limits are met. It is important that program management be supportive of these efforts.
Author
Space Shuttle Orbiters; Habitability; Acoustics; Auditory Defects; Spacecrews; Noise Reduction; International Space Station; Environmental Control

20090001341 NASA Glenn Research Center, Cleveland, OH, USA
Collaboration with Williams International to Demonstrate the Characteristics of a Foam-Metal-Liner Installed Over-the-Rotor of a Turbofan Engine
Sutliff, Daniel; Elliott, Dave; Jones, Mike; Hartley, Tom; September 23, 2008; 24 pp.; In English; Acoustics Technical Working Group Meeting, 23-24 Sep. 2008, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 685676.01.03.08.05; Copyright; Avail.: CASI: A03, Hardcopy

A Williams International FJ44-3A 3000-lb thrust class turbofan engine was used as a demonstrator for foam-metal liner installed in close proximity to the fan. Two foam metal liner designs were tested and compared to the hardwall. Traditional Single-Degree-of-Freedom liner designs were also evaluated to provide a comparison. Normalized information on farfield acoustics is presented in this paper. The results show that up to 5 dB PWL overall attenuation was achieved in the forward quadrant. In general, the foam-metal liners performed better when the fan tip speed was below sonic.
Derived from text
Linings; Rotors; Turbofan Engines; Test Facilities; Aeroacoustics; Metal Foams

20090001641 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Improving an Empirical Formula for the Absorption of Sound in the Sea
Moll, C A van; Ainslie, M A; Janmaat, J; May 2008; 66 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486388; TNO-DV-2008-A202; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A new empirical formula for the absorption of sound in seawater is derived. The starting point of this investigation is the formula proposed by Ainslie and McColm for attenuation due to the boron and magnesium relaxations. Constants in the expression are treated as parameters to be determined. Since this is a nonlinear inverse problem, a global search is used to find the parameter setting that yields the best fit to in situ absorption measurements. The obtained formula is simpler than and at least as accurate as the widely used absorption formula of Francois and Garrison.
DTIC
Absorptivity; Acoustic Attenuation; Sea Water; Seas

20090001835 L-3 Communications Corp., Mesa, AZ USA
Development and Evaluation of a Virtual Terrain Board for Night Vision Goggle Training
Joralmon, DeForest Q; Dunham, Jeanette M; Price, Christina J; Mar 18, 2008; 42 pp.; In English
Contract(s)/Grant(s): FA8650-05-D-6502
Report No.(s): AD-A485814; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485814

This report describes the development and evaluation of the Night Readiness, LLC Virtual Terrain Board (VTB) (V2.0c) and its instructional modules for NVG ground training. The evaluation consisted of a training effectiveness assessment of the VTB, using feedback from qualified NVG Training Course terrain board instructors and students undergoing refresher training and students attending initial NVG ground training at six military VTB installations. The primary objectives of the training effectiveness evaluation were to determine if the established terrain board learning objectives could be accomplished with the VTB, to identify additional learning objectives that could be accomplished using the VTB, and to identify areas of improvement required to increase the training value of the VTB system. The results indicated that the VTB is an effective training device that can accomplish most aspects of the established terrain board learning objectives. Specific limitations identified by some instructors and students included demonstrations of the effects of different color/wavelengths of light, illumination levels on halos, and effects related to NVG gain. VTB development currently in progress along with the improvements recommended in this evaluation will provide a balanced, practical approach to improving the usability, versatility and training effectiveness of the VTB.
DTIC
Education; Flight Training; Goggles; Night Vision; Terrain; Training Devices

20090001848 NASA Dryden Flight Research Center, Edwards, CA, USA
Initial Results from the Variable Intensity Sonic Boom Propagation Database
Bunce, Thomas J.; Haering, Edward A., Jr.; July 2007; In English; Original contains color and black and white illustrations
Report No.(s): AIAA-2008-3034; No Copyright; Avail.: CASI: C01, CD-ROM

This CD rom presents a database of the 10m Tower Sonic Boom recordings.
CASI
Data Bases; Sonic Booms; Acoustic Propagation

20090001855 NASA Glenn Research Center, Cleveland, OH, USA
Restricted Modal Analysis Applied to Internal Annular Combustor Autospectra and Cross-Spectra Measurements
Miles, Jeffrey Hilton; AIAA Journal; May 2007; Volume 45, No. 5, pp. 988-999; In English; 12th AIAA/CEAS Aeroacoustics Conference, 8-10 May 2006, Cambfidge, MA, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.18.03
Report No.(s): AIAA-0001-1452; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001855; http://dx.doi.org/10.2514/1.25179

A treatment of the modal decomposition of the pressure field in a combustor as determined by two pressure time history measurements is developed herein. It is applied to a Pratt and Whitney PW4098 engine combustor over a range of operating conditions. For modes other than the plane wave the assumption is made that there are distinct frequency bands in which the individual modes, including the plane wave mode, overlap such that if circumferential mode m and circumferential mode m-1 are present then circumferential mode m-2 is not. In the analysis used herein at frequencies above the first cutoff mode

frequency, only pairs of circumferential modes are individually present at each frequency. Consequently, this is a restricted modal analysis. As part of the analysis one specifies mode cut-on frequencies. This creates a set of frequencies that each mode spans. One finding was the successful use of the same modal span frequencies over a range of operating conditions for this particular engine. This suggests that for this case the cut-on frequencies are in proximity at each operating condition. Consequently, the combustion noise spectrum related to the circumferential modes might not change much with operating condition.
Author
Combustion; Noise Spectra; Mathematical Models; Aeroacoustics; Internal Combustion Engines; Turbofan Engines

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

20090001576 Useful Bias, Inc., Edgewood, NM USA
Technologies for Developing Predictive Atomistic and Coarse-Grained Force Fields for Ionic Liquid Property Prediction
Martin, Marcus G; Maginn, Edward J; Rogers, Robin D; Voth, Greg; Gordon, Mark S; Jul 29, 2008; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-07-C-0159
Report No.(s): AD-A486185; UBI-0001AE; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Report developed under STTR contract for topic AF07-T004: Force Fields for Modeling of Ionic Liquids. A force field was developed for the systems 1-Ethyl-1-methylphospholinium Tricyanomethanide and 1-Ethyl-3-methylimidazolium Butanesulfonate using a combination of theoretical calculations and experimental data. The force field parameters simulation results are presented in this final report. In addition, experimental data on related ionic liquid systems is presented and discussed.
DTIC
Coarseness; Field Theory (Physics); Grain Size; Independent Variables; Molecular Properties; Parameterization; Predictions

20090001845 Air Force Research Lab., Hanscom AFB, MA USA
Temperature Dependence of Raman Scattering in ZnO
Cusco, Ramon; Alarcon-Llado, Esther; Ibanez, Jordi; Artus, Luis; Jimenez, Juan; Wang, Buguo; Callahan, Michael J; Apr 6, 2007; 12 pp.; In English
Contract(s)/Grant(s): Proj-2305
Report No.(s): AD-A485744; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485744

We present a Raman scattering study of wurtzite ZnO over a temperature range from 80 to 750 K. Second order Raman features are interpreted in the light of recent ab initio phonon density of states calculations. The temperature dependence of the Raman intensities allows the assignment of difference modes to be made unambiguously. Some weak, sharp Raman peaks are detected whose temperature dependence suggests they may be due to impurity modes. High-resolution spectra of the E2 high, A1(LO), and E1(LO) modes were recorded, and an analysis of the anharmonicity and lifetimes of these phonons is carried out. The E2 high mode displays a visibly asymmetric line shape. This can be attributed to anharmonic interaction with transverse and longitudinal acoustic phonon combinations in the vicinity of the K point, where the two-phonon density of states displays a sharp edge around the E2 high frequency. The temperature dependence of the linewidth and frequency of the E2 high mode is well described by a perturbation-theory renormalization of the harmonic E2 high frequency resulting from the interaction with the acoustic two-phonon density of states. In contrast, the A1(LO) and E1(LO) frequencies lie in a region of nearly flat two-phonon density of states, and they exhibit a nearly symmetric Lorentzian line shape with a temperature dependence that is well accounted for by a dominating asymmetric decay channel.
DTIC
Line Spectra; Phonons; Raman Spectra; Temperature Dependence; Thermodynamic Properties; Zinc Sulfides

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*.

20090001411 ITT Corp., Alexandria, VA USA
Animal Effects from Soviet Atmospheric Nuclear Tests
Logachev, V A; Mikhalikhina, L A; Mar 2008; 118 pp.; In English
Contract(s)/Grant(s): DTRA01-03-D-0022; Proj-BD
Report No.(s): AD-A485845; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485845

This two-part document describes the effect on animal models of atmospheric nuclear weapons tests performed by the Soviet Union at the Semipalatinsk Test Site. Part I describes the air blast and thermal radiation effects. Part 2 covers the effects of primary (prompt) radiation and secondary (fallout) radiation on the test subjects. It also covers combined radiation injuries, defined as a combination of radiation and non-radiation injuries. Several different animal species were used. Animals were emplaced at varying distances from the explosion's epicenter, and in a variety of terrain configurations (open ground, trenches oriented parallel and perpendicular to the blast, etc.) The protective effects of shielding from different military vehicles and buildings were also studied. The types, degrees of severity, and clinical course of illness from the injuries produced were carefully studied in order to better understand the pathogenic mechanisms of injury and the likelihood of efficacy of proposed treatment measures.
DTIC
Animals; Biological Effects; Injuries; Nuclear Explosions; Nuclear Weapons; Radiation Effects

20090001616 George Mason Univ., Fairfax, VA USA
Ultrahigh-Temperature Microwave Annealing of Al+- and P+-Implanted 4H-SiC
Sundaresan, Siddarth G; Rao, Mulpuri V; Tian, Yong-lai; Ridgway, Mark C; Schreifels, John A; Kopanski, Joseph J; Jan 2007; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-04-1-0428
Report No.(s): AD-A486316; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this work, an ultrafast solid-state microwave annealing has been performed, in the temperature range of 1700 2120 deg C on Al+- and P+-implanted 4H-SiC. The solid-state microwave system used in this study is capable of raising the SiC sample temperatures to extremely high values, at heating rates of ~600 deg C/s. The samples were annealed for 5-60 s in a pure nitrogen ambient. Atomic force microscopy performed on the annealed samples indicated a smooth surface with a rms roughness of 1.4 nm for 5x5 sq micrometer scans even for microwave annealing at 2050 deg C for 30 s. Auger sputter profiling revealed a < 7 nm thick surface layer composed primarily of silicon, oxygen, and nitrogen for the samples annealed in N2, at annealing temperatures up to 2100 deg C. X-ray photoelectron spectroscopy revealed that this surface layer is mainly composed of silicon oxide and silicon nitride.
DTIC
Annealing; High Temperature; Microwaves

20090001627 George Mason Univ., Fairfax, VA USA
Solid-State Microwave Annealing of Ion-Implanted 4H-SiC
Sundaresan, Siddarth G; Tian, Yong-lai; Ridgway, Mark C; Mahadik, Nadeemullah A; Qadri, Syed B; Rao, Mulpuri V; Jan 2007; 5 pp.; In English
Contract(s)/Grant(s): W911NF-04-1-0428
Report No.(s): AD-A486333; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Solid-state microwave annealing was performed at temperatures up to 2120 deg C for 30 s on ion-implanted 4H SiC in N2 ambient. The surface roughness in the samples annealed without a surface cap at 1950 deg C is 2.65 nm for 10 micrometers x 10 micrometers atomic force microscopy scans. The sheet resistances measured on Al+- and P+-implanted 4H SiC, annealed by microwaves, are lower than the best conventional furnace annealing results reported in literature. X-ray diffraction spectra

indicate alleviation of the lattice damage induced by the ion-implantation and also incorporation of most of the implanted species into substitutional lattice sites.
DTIC
Annealing; Microwaves; Solid State

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*.

20090001100 Marine Corps Systems Command, Quantico, VA USA
Using VFT and Optimization to Create the Acquisition Portfolio for the Marines Infantry Optics
Smith, J E; Jun 2008; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490220; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Since 2003 the USMC Program Manager for Optics has invested considerable resources to meet Urgent Universal Needs Statements from the Operating Forces for enhanced optics. Since the needs identified were urgent, there was not time to fully understand how these different systems would work together. How useful is our current optics portfolio, and what are some cost effective solutions to improve it? The objectives of this study are to 1) identify capability gaps and technological shortcomings of current and near-term optics systems, and 2) provide recommendations and courses of action on a suite of systems to resolve those capability gaps and technological shortcomings.
DTIC
Optical Equipment; Cost Effectiveness

20090001122 Intelligent Optical Systems, Inc., Torrance, CA, USA
Hydrogen Optical Fiber Sensors, (Final)
Lieberman, R. A.; Beshay, M.; Cordero, S. R.; Jul. 28, 2008; 22 pp.; In English
Contract(s)/Grant(s): DE-FG36-06GO86057
Report No.(s): DE2008-935171; DOE/GO/86057-1; No Copyright; Avail.: National Technical Information Service (NTIS)

Optically-based hydrogen sensors promise to deliver an added level of safety as hydrogen and fuel cell technologies enter the mainstream. More importantly, they offer reduced power consumption and lower cost, which are desirable for mass production applications such as automobiles and consumer appliances. This program addressed two of the major challenges previously identified in porous optrode-based optical hydrogen sensors: sensitivity to moisture (ambient humidity), and interference from the oxygen in air. Polymer coatings to inhibit moisture and oxygen were developed in conjunction with newer and novel hydrogen sensing chemistries. The results showed that it is possible to achieve sensitive hydrogen detection and rapid response with minimal interference from oxygen and humidity. As a result of this work, a new and more exciting avenue of investigation was developed: the elimination of the porous optrode and deposition of the sensor chemistry directly into the polymer film. Initial results have been promising, and open up a wider range of potential applications from extended optical fiber sensing networks, to simple plastic ‘stickers’ for use around the home and office.
NTIS
Hydrogen; Optical Fibers; Optical Measuring Instruments

20090001137 Argonne National Lab., IL, USA
Operation of the APS Photoinjector Drive Laser System
Li, Y.; Aug. 04, 2007; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-06CH11357
Report No.(s): DE2008-937413; ANL/APS/LS-307-REV-1; No Copyright; Avail.: National Technical Information Service (NTIS)

The APS photoinjector drive laser system has been in operation since 1999 and is achieving a performance level exceeding the requirement of stable operation of the LEUTL FEL system. One remarkable number is the UV energy stability of better than 2% rms, sometimes less than 1% rms. This report summarizes the operation experience of the laser system and

the improvements made along the way. We also outline the route of upgrade of the system and some frontier laser research and development opportunities in ultrabright electron beam generation.
NTIS
Beam Injection; Electron Beams; Free Electron Lasers; Lasers; Photons

20090001642 Rochester Univ., NY USA
Study of Wide Field of View Optical Systems Based on Animal Eyes
Moore, Duncan; Sep 2008; 38 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-07-1-0001
Report No.(s): AD-A486390; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The study examines the compound eye and its potential role as a wide field of view optical system. A prototype system based on the apposition compound eye is designed and built. An alternative design based on the neural superposition compound eye is also presented. The effects of incorporating gradient index lenses into the system are also examined, as well as potential manufacturing methods.
DTIC
Animals; Eye (Anatomy); Field of View; Insects; Optical Equipment

20090001773 Stanford Linear Accelerator Center, CA, USA
Commissioning of the LCLS Linac and Bunch Compressors
Akre, R.; Brachmann, A.; Decker, F. J.; Ding, Y.; Dowell, D.; Aug. 2008; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2008-937178; SLAC-PUB-13373; No Copyright; Avail.: National Technical Information Service (NTIS)
The Linac Coherent Light Source (LCLS) is a SASE x-ray Free-Electron Laser (FEL) project under construction at SLAC. The injector section, from drive-laser and RF photocathode gun through the first bunch compressor, was commissioned in the spring and summer of 2007. The second phase of commissioning, including the second bunch compressor and various main linac modifications, was completed in January through August of 2008. We report here on experience gained during this second phase of machine commissioning, including the injector, the first and second bunch compressor stages, the linac up to 14 GeV, and beam stability measurements. The final commissioning phase, including the undulator and the long transport line from the linac, is set to begin in December 2008, with first light expected in July 2009.
NTIS
Compressors; Linear Accelerators; Particle Accelerators

20090001908 NASA Marshall Space Flight Center, Huntsville, AL, USA
South Pole Telescope Optics
Padin, S.; Staniszewski, Z.; Keisler, R.; Joy, M.; Stark, A. A.; Ade, P. A. R.; Aird, K. A.; Benson, B. A.; Bleem, L. E.; Carlstrom, J. E.; Chang, L.; Crawford, T. M.; Crites, A. T.; Dobbs, M. A.; Halverson, N. W.; Heimsath, S.; Hills, R. E.; Holzapfel, W. L.; Lawrie, C.; Lee, A. T.; Leitch, E. M.; Leong, J.; Lu, W.; Lueker, M.; McMahon, J. J., et al.; [2008]; 37 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NSF OPP-0130612; Copyright; Avail.: Other Sources
The South Pole Telescope is a 10 m diameter, wide-field, offset Gregorian telescope with a 966-pixel, millimeter-wave, bolometer array receiver. The telescope has an unusual optical system with a cold stop around the secondary. The design emphasizes low scattering and low noise. All the optical components except the primary are cold, and the entire beam from prime focus to the detectors is surrounded by cold absorber.
Author
Optical Equipment; Telescopes; Fabrication; Cryogenics

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20090001282 NASA Marshall Space Flight Center, Huntsville, AL, USA
On Alfvenic Waves and Stochastic Ion Heating with 1Re Observations of Strong Field-aligned Currents, Electric Fields, and O+ ions
Coffey, Victoria; Chandler, Michael; Singh, Nagendra; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The role that the cleft/cusp has in ionosphere/magnetosphere coupling makes it a very dynamic region having similar fundamental processes to those within the auroral regions. With Polar passing through the cusp at 1 Re in the Spring of 1996, we observe a strong correlation between ion heating and broadband ELF (BBELF) emissions. This commonly observed relationship led to the study of the coupling of large field-aligned currents, burst electric fields, and the thermal O+ ions. We demonstrate the role of these measurements to Alfvenic waves and stochastic ion heating. Finally we will show the properties of the resulting density cavities.
Author
Magnetohydrodynamic Waves; Stochastic Processes; Plasma Heating; Ions; Field Aligned Currents; Electric Fields

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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*.

20090001138 Stanford Linear Accelerator Center, CA, USA; Oak Ridge National Lab., TN USA
Next Generation IGBT Switch Plate Development for the SNS High Voltage Converter Modulator
Kemp, M. A.; Burkhart, C.; Nguyen, M. N.; Anderson, D. E.; Sep. 2008; 3 pp.; In English
Report No.(s): DE2008-937467; SLAC-PUB-13385; No Copyright; Avail.: National Technical Information Service (NTIS)

The RF source High Voltage Converter Modulator (HVCM) systems installed on the Spallation Neutron Source (SNS) have operated well in excess of 200,000 hours, during which time numerous failures have occurred. An improved Insulated Gate Bipolar Transistor (IGBT) switch plate is under development to help mitigate these failures. The new design incorporates two significant improvements. The IGBTs are upgraded to 4500 V, 1200 A, press-pack devices, which increase the voltage margin, facilitate better cooling, and eliminate explosive disassembly of the package in the event of device failure. The upgrade to an advanced IGBT gate drive circuit decreases switching losses and improves fault-condition response. The upgrade design and development status will be presented.
NTIS
High Voltages; Modulators; Particle Accelerators; Switches

20090001180 Fermi National Accelerator Lab., Batavia, IL, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Determination of the B-s Lifetime Using Hadronic Decays
Deisher, A. J.; Jul. 01, 2008; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2008-936634; FERMILAB-CONF-08-238-E; No Copyright; Avail.: Department of Energy Information Bridge

The authors present a measurement of the B(sub s)(sup 0) meson lifetime using fully and partially reconstructed hadronic decays B(sub s)(sup 0) (yields) D(sub s)(sup -) (pi)(sup +)(X) followed by D(sub s)(sup -) (yields) (phi)(pi)(sup -). The data sample was recorded with the CDF II detector at the Fermilab Tevatron and corresponds to an integrated luminosity of 1.3 fb(sup -1) from p(bar p) collisions at (radical)s = 1.96 TeV.
NTIS
Hadrons; Particle Acceleration; Particle Decay

20090001198 Air Force Research Lab., Wright-Patterson AFB, OH USA; El Arroyo Enterprises, Sedona, AZ, USA; Cornell Univ., NY, USA; Drexel Univ., Philadelphia, PA, USA

A Comparison of Deformation Textures and Mechanical Properties Predicted by Different Crystal Plasticity Codes

Hartley, Craig S; Dawson, Paul R; Boyce, Donald E; Kalidindi, Surya R; Knezevic, Marko; Tome, Carlos; Lebensohn, Ricardo; Semiatin, S L; Turner, Todd J; Salem, Ayman A; Apr 2008; 14 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A490076; AFRL-RX-WP-TP-2008-4317; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Four crystal plasticity codes, the viscoplastic Material Point Simulator (MPS) developed at Cornell, and the ViscoPlastic Self-Consistent code (VPSC7b), developed at LANL, and two elastic-viscoplastic codes developed at Drexel University, were employed to calculated deformation textures and mechanical properties of model polycrystalline specimens by simulating isochoric, free upsetting. Uniaxial compression of a model sample with a starting random texture of 5000 grains was carried out at a constant true stain rate of 0.001/s to a true strain of 1.0 with 0.02 strain increments. Material properties simulated a face-centered cubic (FCC) alloy, Type 304 Stainless Steel, and a hexagonal close-packed (HCP) material, unalloyed Ti, both non-hardening and linear hardening conditions were investigated. Different strain-rate sensitivities simulated deformation conditions appropriate to ambient and elevated temperature conditions. All codes permitted use of the Taylor homogenization hypothesis, resulting in an upper bound for the mechanical properties.

DTIC

Crystals; Deformation; Mechanical Properties; Plastic Properties; Polycrystals; Textures; Viscoelasticity; Viscoplasticity

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20090001626 George Mason Univ., Fairfax, VA USA

Comparison of Solid-State Microwave Annealing with Conventional Furnace Annealing of Ion-Implanted SiC

Sundaresan, Siddarth G; Rao, Mulpuri V; Tian, Yonglai; Schreifels, John A; Wood, Mark C; Jones, Kenneth A; Davydov, Albert V; Jan 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-04-1-0428

Report No.(s): AD-A486332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Rapid solid-state microwave annealing was performed for the first time on N+-, Al+-, and B+-implanted SiC, and the results were compared with the conventional furnace annealing. For microwave annealing, temperatures up to 2,000 deg C were attained with heating rates exceeding 600 deg C/s. An 1,850 deg C/35 s microwave anneal yielded a root-mean-square (RMS) surface roughness of 2 nm, which is lower than the 6 nm obtained for 1,500 deg C/15 min conventional furnace annealing. For the Al implants, a minimum room-temperature sheet resistance (Rs) of 7 kW/h was measured upon microwave annealing. For the microwave annealing, Rutherford backscattering (RBS) measurements indicated a better structural quality, and secondary-ion-mass-spectrometry (SIMS) boron implant depth profiles showed reduced boron redistribution compared to the corresponding results of the furnace annealing.

DTIC

Annealing; Furnaces; Microwaves; Solid State

20090001866 Air Force Research Lab., Edwards AFB, CA USA

Thermal Stability and Heat Transfer Characteristics of RP-2

Billingsley, Matthew; Jun 30, 2008; 11 pp.; In English

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

Report No.(s): AD-A486029; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA486029

In an effort to enable reusable, high-performing liquid rocket engines, a comprehensive experimental and numerical investigation of the thermal performance (thermal stability and heat transfer characteristics) of RP-2 is underway at the Air Force Research Laboratory (AFRL), Edwards AFB, CA. In the current work, the High Heat Flux Facility (HHFF) was used

to provide initial RP-2 thermal performance information under conditions simulative of those encountered in the cooling channels of a real engine. RP-2 was thermally stressed while flowing through circular copper tube test sections. Short-duration thermal stressing tests provided heat transfer information which closely followed existing empirical correlations for RP-1. Effects of wall temperature, bulk temperature, and flow rate on heat transfer were observed and were consistent with expected behavior. Longer-duration tests at elevated wall temperatures provided the first steps in elucidating the conditions under which solid carbon deposits form. The test sections were analyzed post-test with optical and scanning electron microscope and carbon deposition burn-off for signs of coke formation. The results from these analyses indicate the presence of solid carbon deposition for high-wall temperature tests exceeding 30 min. in duration, although further testing is required to make more conclusive comparisons.
DTIC
Heat Transfer; Thermal Stability

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20090001236 NASA, Washington, DC, USA
William H. Pickering: America's Deep Space Pioneer
Mudgway, Douglas J.; October 2008; 276 pp.; In English; See also 20070038305; See also 2007039230; Original contains black and white illustrations
Report No.(s): NASA-SP-2008-4113; No Copyright; Avail.: CASI: EA5, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001236

William Pickering first came to the attention of the world in January 1958 when the media triumphantly announced the successful launch of Explorer 1, the American response to the Soviet deployment a few months earlier of the first Earth-orbiting satellite Sputnik. Along with Wernher von Braun and James Van Allen, William Pickering shared the limelight and the accolades. In that instant of time the Space Age was born and with it the professional reputation of William H. Pickering. Under Pickering's leadership, JPL designed, built, and dispatched NASA's first Ranger spacecraft to take close-up pictures of the surface of the Moon. Building on its Ranger experience, JPL sent the first spacecraft to Venus and, as technology improved, to Mars. The scientific data returns from each successive mission greatly increased our understanding of the composition and dynamics of the solar system and its planets. When he retired as Director in 1976, Pickering had presided over NASA-JPL's missions to the Moon, Venus, and Mars and laid the basis for the fabulous Voyager Grand Tour of all the planets that would sound the praises of NASA-JPL for the next 25 years. Not all of the missions were successful, but Pickering accepted the responsibility that devolved from his position as Director, regardless of the outcome.
Derived from text
NASA Programs; Space Exploration; Leadership; Biography; Histories; Scientists; Research and Development; Project Management; Astronautics

20090001897 NASA Marshall Space Flight Center, Huntsville, AL, USA
NASA's Agency-Wide Strategy for Environmental Regulatory Risk Analysis and Communication
Scroggins, Sharon; Duda, Kristen; June 24, 2008; 16 pp.; In English; Air and Waste Management Annual Conference, 24-27 Jun. 2008, Portland, OR, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001897

This viewgraph presentation gives an overview of NASA's risk analysis communication programs associated with changing environmental policies. The topics include: 1) NASA Program Transition; 2) Principal Center for Regulatory Risk Analysis and Communication (RRAC PC); and 3) Regulatory Tracking and Communication Process.
CASI
NASA Programs; Risk Management; Regulations; Communication

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20090000009 Office of Inspector General, Arlington, VA USA
SIGIR Quarterly Report and Semiannual Report to the USA Congress
Bowen, Jr, Stuart W; Jul 30, 2005; 109 pp.; In English
Report No.(s): AD-A489359; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489359

During this reporting period, the Special Inspector General for Iraq Reconstruction (SIGIR) has conducted audits and investigations to prevent fraud, waste, and abuse in the programs and operations funded by the Iraq Relief and Reconstruction Fund1 (IRRF). The SIGIR continued to aggressively promote economy, ef ciency, and effectiveness in the administration of programs funded by the IRRF. Since the April 2005 Quarterly Report, the SIGIR has increased its capability to provide independent and objective leadership to coordinate the diverse activities of the multiple agencies and organizations involved in Iraq reconstruction.
DTIC
Congressional Reports; United States

20090000010 Office of Inspector General, Arlington, VA USA
SIGIR Quarterly Report and Semiannual Report to the USA Congress
Bowen, Jr, Stuart W; Jan 30, 2005; 120 pp.; In English
Report No.(s): AD-A489361; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489361

This is the first report of the new Office of the Special Inspector General for Iraq Reconstruction (SIGIR), which succeeded the Coalition Provisional Authority Inspector General (CPA-IG). The SIGIR is carrying on the work of the former CPA-IG with modified authorities. The CPA-IG provided oversight of the operations and programs of the Coalition Provisional Authority (CPA), and now the mandate of the SIGIR focuses on the programs and operations funded by the Iraq Relief and Reconstruction Fund (IRRF)1. The SIGIR provides timely information to the Congress and the Secretaries of State and Defense. In November 2003, the Congress created the CPA-IG by Public Law 108-106 (P.L. 108-106) to provide oversight of the CPA's operations and programs. Under this law, the CPA-IG worked to promote the efficient, legal, and effective use of billions of dollars of U.S. appropriated and other funds committed to Iraq relief and reconstruction by coordinating and conducting audits and investigations of the reconstruction effort. P.L. 108-375 re-designated the CPA-IG as the SIGIR on October 29, 2004. The continuing insurgency remains the most significant challenge to the reconstruction of Iraq, according to the Department of State (DoS) Section 2207 Report of January 5, 2005. During this reporting period, the U.S. Mission Iraq continued to shift the focus of U.S. reconstruction efforts to address the need for improved security, to improve Iraq s economic and political environment, and to create jobs for Iraqis. The shift began in September 2004, when the Administration s strategic spending plan review reallocated $3.46 billion of the IRRF from the Electricity sector and the Water Resources and Sanitation sector to four other sectors.
DTIC
Congressional Reports; International Relations; Iraq; United States

20090001052 Commerce Dept., Washington, DC, USA
Bureau of the Census: Weakenesses in Census Bureau's Certification and Accreditation Process Leave Security of Critical Information Systems in Question. Final Inspection Report No. OSE-16519-1
Aug. 2004; 24 pp.; In English
Report No.(s): PB2009-102687; No Copyright; Avail.: CASI: A03, Hardcopy

The final inspection report of the annual review of the Census Bureau,s information security program. The IT security program generally conformed in structure and intent with requirements of the Department's IT security program policy and other mandates but in practice it did not always appropriately apply those requirements, with the result that critical systems may not be adequately protected.
NTIS
Census; Information Systems; Inspection; Security; Warning Systems

20090001059 Commerce Dept., Washington, DC, USA

U.S. Census Bureau: Improving our Measure of America: What the 2004 Census Test Can Teach Us in Planning for the 2010 Decennial Census. Final Report No. OIG-16949

Sep. 2004; 48 pp.; In English

Report No.(s): PB2009-102688; No Copyright; Avail.: CASI: A03, Hardcopy

The final report of the review of selected aspects of the 2004 Census Test.The review was conducted from March 2004 through July 2004. Observations and conclusions are offered but no recommendations are made. An important focus is the nonresponse followup (NRFU) in which temporary Census employees visit addresses for which the Bureau has not received a mailed back questionnaire. Automating NRFU's paper-based processes is a key feature of the Bureau's redesign for Census 2010. The transformation is built around a handheld computer (HHC)

NTIS

Census; Harmonic Control

20090001064 Commerce Dept., Washington, DC, USA

Office of the Secretary: Review of Fiscal Year 2006 Congressional Earmarks. Final Audit Report No. DEN-192021

May 2008; 17 pp.; In English

Report No.(s): PB2009-102690; No Copyright; Avail.: CASI: A03, Hardcopy

In August 2006, Senator Tom Coburn-R, OK, then chairman of the Subcommittee on Federal Financial Management, Government Information, and International Security, requested the Office of Inspector General (OIG) to conduct an analysis of the Departments congressional earmarks for FY 2006. Senator Coburn requested that we determine (1) the total number and cost, of congressional earmarks; (2) what specific oversight is conducted on earmarks and how the oversight compares to that of other expenditures such as grants and contracts, and (3) the overall impact of earmarks on the primary mission and goals of the Department.

NTIS

Commerce; Financial Management; Management Information Systems; Information Management

20090001067 Commerce Dept., Washington, DC, USA

National Institute of Standards and Technology: CRADA with the Coblentz Society Should Receive Greater Scrutiny. Final Inspection Report No. IPE-13200

Feb. 2001; 28 pp.; In English

Report No.(s): PB2009-102810; No Copyright; Avail.: CASI: A03, Hardcopy

In November 1994, the National Institute of Standards and Technology entered into a cooperative research and development agreement (CRADA) with the Coblentz Society, a nonprofit professional organization. The purpose of the CRADA, which is to run for a period of 10 years, was to establish a joint NIST/Coblentz Society infrared spectral database. Infrared spectra are often regarded as the 'fingerprint' of a specific chemical substance and are used in a wide range of applications, including the identification of chemical substances and the determination of their amounts. To develop the database, approximately 10,000 spectra in paper format owned by the Coblentz Society were provided to NIST for scanning and conversion into an electronic format. These spectra are to be combined with approximately 10,000 infrared spectra in NISTs possession to form the database that will be sold by NIST to the public. NIST plans to make the database available in early spring 2001. Over time, NIST and the Coblentz Society intend to increase the size of the collection by soliciting contributions of spectra from the many laboratories (private, government, and academic) where infrared spectra are measured.

NTIS

Agreements; Data Bases; Infrared Radiation; Inspection

20090001073 Commerce Dept., Washington, DC, USA

International Trade Administration: USEACs are Meeting Client Needs, but Better Management Oversight is Needed. Final Inspection Report No. IPE-16728

Sep. 2004; 45 pp.; In English

Report No.(s): PB2009-102693; No Copyright; Avail.: CASI: A03, Hardcopy

The Department of Commerce's International Trade Administration plays a major role in leading the federal government's efforts to increase US exports. There are 106 US Export Assistance Centers (USEACs),grouped geographically into 12 networks. During 2003 and 2004, 3 of the 12 networks were evaluated. The inspections focused on management oversight, as well as the programmatic and financial operations of selected networks during fiscal year 2003. The final report recognizes

that, overall, the networks are operating well. However, there are issues that need further attention and these are described in the final report.
NTIS
Commerce; Inspection; International Trade

20090001145 Department of Justice, Washington, DC, USA
Attorney General's Guidelines for Domestic FBI (Federal Bureau of Investigation) Operations
January 2008; 46 pp.; In English
Report No.(s): PB2009-101985; No Copyright; Avail.: CASI: A03, Hardcopy

As the primary investigative agency of the federal government, the Federal Bureau of Investigation (FBI) has the authority and responsibility to investigate all violations of federal law that are not exclusively assigned to another federal agency. The FBI is further vested by law and by Presidential directives with the primary role in carrying out investigations within the USA of threats to the national security. This includes the lead domestic role in investigating international terrorist threats to the USA, and in conducting counterintelligence activities to meet foreign entities' espionage and intelligence efforts directed against the USA. The FBI is also vested with important actions in collecting foreign intelligence as a member agency of the U.S. Intelligence Community. The FBI accordingly plays crucial roles in the enforcement of federal law and the proper administration of justice in the USA, in the protection of the national security, and in obtaining information needed by the USA for the conduct of its foreign affairs. These roles reflect the wide range of the FBI's current responsibilities and obligations, which require the FBI to be both an agency that effectively detects, investigates, and prevents crimes, and an agency that effectively protects the national security and collects intelligence. The general objective of these Guidelines is the full utilization of all authorities and investigative methods, consistent with the Constitution and laws of the USA, to protect the USA and its people from terrorism and other threats to the national security, to protect the USA and its people from victimization by all crimes in violation of federal law, and to further the foreign intelligence objectives of the USA.
NTIS
Law (Jurisprudence); Intelligence; Protection; Terrorism

20090001349 Commerce Dept., Washington, DC, USA
Office of the Chief Information Officer: Additional Focus Needed on Information Technology Security Policy and Oversight. Inspection Report No. OSE-13573
Mar. 2001; 39 pp.; In English
Report No.(s): PB2009-102843; No Copyright; Avail.: National Technical Information Service (NTIS)

IT security is a growing concern in government as vulnerabilities, threats, and attacks grow with the dramatic increase in the number of government networks and use of the Internet. In 1997 the General Accounting Office identified IT security as a new high-risk area that touches virtually every major aspect of government operations. Although there is no single action agencies can take to make their networks completely secure, there are steps that can be taken to mitigate risk, which include developing and overseeing an effective security program based on sound policy. Commerce Department Organization Order 15-23, July 2000, tasks the Chief Information Officer (CIO) to develop and implement a Departmental Information Technology (IT) security program to ensure the confidentiality, integrity, and availability of information and IT resources. The CIOs responsibilities include developing policies, procedures, and directives for IT security and providing oversight of the Departments operating units. The IT security program is the responsibility of the IT Security Program Manager under the Direction of the CIOs Office of Information Policy, Planning and Review. The objective of this inspection was to assess the effectiveness of the CIOs policy and oversight of the Departments IT security program, generally excluding classified systems, which are the primary responsibility of the Office of Security.
NTIS
Information Systems; Inspection; Policies; Security; Technologies

20090001350 Naval Postgraduate School, Monterey, CA USA
Measuring the Return on Information Technology: A Knowledge-Based Approach for Revenue Allocation at the Process and Firm Level
Pavlou, Paul A; Housel, Thomas J; Rodgers, Waymond; Jansen, Erik; Jul 2005; 30 pp.; In English
Report No.(s): AD-A485305; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485305

This study proposes an approach for measuring the return on Information Technology (IT) investments. A review of

existing methods suggests the difficulty in adequately measuring the returns of IT at various levels of analysis (e.g., firm or process level). To address this issue, the study aims to develop a method for allocating the revenue and cost of IT initiatives at any level of analysis using a common unit of measurement. Following the knowledge-based view (KBV), the study proposes an analytic method for measuring the historical revenue and cost of IT investments by estimating the amount of knowledge necessary to generate a common unit of output from any business process. The amount of required knowledge is operationalized using the 'average learning time' measure. The proposed operationalization is illustrated with a practical case example. The proposed KBV approach is extended specifically for IT resources, allowing the authors to assess the Return on IT (ROIT) using a typical productivity ratio (similar to ROI or ROA) that accurately captures the true business value of IT (despite any complementarities) at virtually any level of analysis.
DTIC
Allocations; Commerce; Cost Estimates; Information Systems; Knowledge Based Systems; Learning; Measurement; Productivity; Revenue

20090001393 Joint Chiefs of Staff, Washington, DC USA
Department of Defense Dictionary of Military and Associated Terms
May 30, 2008; 781 pp.; In English
Report No.(s): AD-A485800; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485800

The 'Department of Defense Dictionary of Military and Associated Terms' (short title: Joint Pub 1-02 or JP 1-02) sets forth standard U.S. military and associated terminology to encompass the joint activity of the Armed Forces of the USA in both U.S. joint and allied joint operations, as well as to encompass the Department of Defense (DoD) as a whole. These military and associated terms, together with their definitions, constitute approved DoD terminology for general use by all components of the Department of Defense. The Secretary of Defense, by DoD Directive 5025.12, 23 August 1989, 'Standardization of Military and Associated Terminology,' has directed the use of JP 1-02 throughout the Department of Defense to ensure standardization of military and associated terminology. The main body of the dictionary contains all terms and definitions approved for use within the Department of Defense, to include those terms and definitions that are approved for both DoD and NATO use. Each entry approved for both DoD and NATO appears with an asterisk in parentheses, i.e., (*), after the term to denote DoD-NATO acceptance. Appendix A contains a listing of current abbreviations and acronyms in common use within the Department of Defense. This is by no means a complete list of DoD abbreviations and acronyms. Rather, it serves as a guide to current DoD usage in abbreviations and acronyms.
DTIC
Defense Program; Dictionaries; English Language; North Atlantic Treaty Organization (NATO); Standardization; Terminology

20090001410 Berkeley Policy Associates, Oakland, CA, USA
Early Implementation of Generation I of the Workforce Innovation in Regional Economic Development (WIRED) Initiative. 2007 Interim Evaluation Report
May 20, 2008; 439 pp.; In English
Report No.(s): PB2009-102846; No Copyright; Avail.: National Technical Information Service (NTIS)

Global competition is a compelling national challenge. Increasingly, the globalization of the economy is determining where Americans work, how much money they are paid, and the level of prosperity in the regions in which they live. New jobs and markets are being created, the vast majority of them in what many refer to as the new economy of small entrepreneurial and innovative companies. In today's global economy, focusing on knowledge-based industries and high value-added jobs is essential, whether a communitys concern is building, renewing, or sustaining its prosperity. Diversification, adaptation, and continuous innovation are essential to long-term regional prosperity in the U.S. To carry out the development and implementation of such strategies, and to support President George W. Bush's broader Competitiveness Agenda, Secretary of Labor Elaine L. Chao announced the Workforce Innovation in Regional Economic Development (WIRED) Initiative in November 2005. The premise of the WIRED Initiative is that national competitiveness and regional prosperity are possible if communities learn how to link their varied knowledge resources with their business and innovation assets, and ensure that their workforces have the new skills and knowledge required to work effectively in new and emerging industries.
NTIS
Competition; Economic Development

20090001416 Library of Congress, Washington, DC USA

Sudan: The Crisis in Darfur and Status of the North-South Peace Agreement

Dagne, Ted; Jul 23, 2008; 34 pp.; In English

Report No.(s): AD-A485870; CRS-RL33574; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485870

Sudan, geographically the largest country in Africa, has been ravaged by civil war intermittently for four decades. More than 2 million people have died in Southern Sudan over the past two decades due to war-related causes and famine, and millions have been displaced from their homes. There were many failed attempts to end the civil war in southern Sudan. In July 2002, the Sudan government and the Sudan People's Liberation Movement (SPLM) signed a peace framework agreement in Kenya. On May 26, 2004, the government of Sudan and the SPLM signed three protocols on Power Sharing, on the Nuba Mountains and Southern Blue Nile, and on the long disputed Abyei area. The signing of these protocols resolved all outstanding issues between the parties. On June 5, 2004, the parties signed the Nairobi Declaration on the Final Phase of Peace in the Sudan. On January 9, 2005, the government of Sudan and the SPLM signed the final peace agreement at a ceremony held in Nairobi, Kenya. In October 2007, the government of Southern Sudan suspended the participation of its Ministers, State Ministers, and Presidential Advisors from the Government of National Unity to protest measures taken by the National Congress Party and to demand full implementation of the Comprehensive Peace Agreement (CPA). In response to these demands and unexpected developments, President Bashir reportedly accepted a number of the government of South Sudan (GoSS) demands in late October, except those related to the Abyei issue. In late December 2007, the new ministers were sworn in office. The crisis in Darfur began in February 2003, when two rebel groups emerged to challenge the National Congress Party (NCP) government in Darfur. The crisis in Darfur in western Sudan has led to a major humanitarian disaster, with an estimated 2.45 million people displaced, more than 240,000 people forced into neighboring Chad, and an estimated 450,000 people killed.

DTIC

Africa; International Relations

20090001417 Library of Congress, Washington, DC USA

The Reliable Replacement Warhead Program: Background and Current Developments

Medalia, Jonathan; Jul 23, 2008; 60 pp.; In English

Report No.(s): AD-A485876; CRS-RL32929; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485876

Most current U.S. nuclear warheads were built in the 1970s and 1980s and are being retained longer than was planned. Yet they deteriorate and must be maintained. To correct problems, a Life Extension Program (LEP), part of a larger Stockpile Stewardship Program (SSP), replaces components. Modifying some components would require a nuclear test, but the USA has observed a test moratorium since 1992. Congress and the Administration prefer to avoid a return to testing, so LEP rebuilds these components as closely as possible to original specifications. With this approach, the Secretaries of Defense and Energy have certified stockpile safety and reliability for the past 12 years without nuclear testing. The National Nuclear Security Administration (NNSA), which operates the U.S. nuclear weapons program, would develop the Reliable Replacement Warhead (RRW). For FY2005, Congress provided an unrequested $9.0 million to start RRW. The FY2006 RRW appropriation was $24.8 million, the FY2007 operating plan had $35.8 million, and the FY2008 request was $88.8 million for NNSA and $30.0 million for the Navy. The Department of Defense Appropriations Act, P.L. 110-116, included $15.0 million for the Navy for RRW. The FY2008 Consolidated Appropriations Act, P.L. 110-161, provided no NNSA funds for RRW. For FY2009, DOE requests $10.0 million for RRW. The Navy requests $23.3 million for RRW but says its request was prepared before Congress eliminated NNSA RRW funds and that the Navy funds would not be used for RRW. The House Armed Services Committee, in its report on H.R. 5658, the FY2009 defense authorization bill, recommended eliminating the Navy and NNSA RRW funds while adding funds for the Navy and NNSA for related purposes. The House defeated an amendment to add $10.0 million in NNSA RRW funds to H.R. 5658.

DTIC

Nuclear Warheads; Replacing; Warheads

20090001423 Army War Coll., Carlisle Barracks, PA USA

War Policy, Public Support, and the Media

Darley, William M; Jan 2005; 15 pp.; In English

Report No.(s): AD-A485899; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA485899

Perhaps no element of the current conflict in Iraq engenders more emotion and acrimony within the military than debate

concerning the role and influence of the news media on public opinion and national policy. Debates regarding this subject are nothing new. Since at least the Civil War, anecdotal assertions associated with media influence on American wars have caused controversy among government officials, members of the military, scholars, pundits, and members of the press as they continue to argue the media's effects. Historically, contention over the issue of media influence has become particularly acute when the policies of the administration executing the conflict are perceived as being either too slow, or failing, to achieve their political objectives at the cost of mounting casualties.
DTIC
Policies; Warfare

20090001446 National Marine Fisheries Service, Seattle, WA, USA
Studies to Establish Biological Design Critera for Fish Passage Facilities: Prototype Testing of a Cylindrical Dewatering Screen at McNary Dam, 2001-2002
Gessel, M. H.; Sandford, B. P.; Ferguson, J. W.; Mar. 2004; 25 pp.; In English
Report No.(s): PB2009-103569; No Copyright; Avail.: CASI: A03, Hardcopy

Juvenile salmonid bypass facilities at hydroelectric dams on the Snake and Columbia Rivers are used to route fish past the dam through a non-turbine route and to collect juveniles for subsequent transportation and release below the dams. A major component of these systems is the primary dewatering screen, which removes excess water from the fish bypass channel and diverts juvenile migrants to holding and collection facilities. A combination of vertical and floor dewatering screens is used as the primary dewatering system at several dams on the Snake and Columbia Rivers. Problems occur at these sites when debris accumulates on the screens, and this often leads to mechanical breakdowns of the screen cleaning systems and structural components, as well as fish injury. Repairs require that gatewell orifices leading to the bypass channel be closed, which can cause fish to hold in the gatewells and delay their downstream migrations. A new and untested method of removing or passing debris from juvenile bypass systems is the cylindrical dewatering screen (CDS). The CDS allows fish and some flow to be carried downstream while the flow that is being dissipated impinges debris on the inner walls of rotating screen sections. As the screens rotate, impinged debris rises above the water level and either falls or is washed off the inner walls into a debris flume.
NTIS
Cylindrical Bodies; Dams; Dewatering; Fishes; Prototypes

20090001612 Carnegie-Mellon Univ., Pittsburgh, PA USA
OraGIS and Loom: Spatial and Temporal Extensions to the ORA Analysis Platform
Davis, George B; Olson, Jamie; Carley, Kathleen M; Jun 2008; 18 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0973; N00014-06-1-0921
Report No.(s): AD-A486288; CMU-ISR-08-121; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Increasingly, data available to network analysts includes not only relationships between actors but measurements of entity attributes and relations through time and space. Integrating this information with existing dynamic network analysis techniques demands new models and tools. This paper introduces two extensions to the ORA dynamic network analysis platform intended to meet this need. The first, OraGIS, provides geospatial visualization and clustering algorithms. The second, Loom, assists in the analysis of agent movements through a discrete state space 'such as a set of named locations' over time. We discuss the capabilities of both tools and their integration with the traditional analytics in the ORA platform.
DTIC
Computer Programs; Display Devices; Multisensor Fusion; Network Analysis

20090001623 General Accounting Office, Washington, DC USA
DOD Systems Modernization: Maintaining Effective Communication Is Needed to Help Ensure the Army's Successful Deployment of the Defense Integrated Military Human Resources System
Farrell, Brenda S; Sep 8, 2008; 18 pp.; In English
Report No.(s): AD-A486326; GAO-08-927R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

DOD has taken some recent steps to improve communications with the Army about DIMHRS's capabilities in an effort to better prepare the Army for deployment of the system in March 2009. However, Army officials still have some concerns about the extent to which Army requirements are being incorporated into DIMHRS. In addition, DOD has not established a

clear, well-defined process for maintaining effective communications to better prepare the Army to deploy DIMHRS. Effective communication is a key federal internal control standard that calls for communications to constantly flow down, across, and up the organization to help it achieve all of its objectives. Such communication would improve the Army's understanding of what the system will deliver thus enabling the Army to better design and implement effective business processes to work with DIMHRS. The Army has had problems receiving assurance from DOD about the extent to which its requirements would be included in DIMHRS. we recommend that you direct the Deputy Secretary of Defense to develop a clearly defined process for maintaining effective communications of the differences between DIMHRS's capabilities and Army requirements to help ensure that the Army will have adequate time to prepare for deployment of the system. In commenting on a draft of this report, the department concurred with this recommendation.
DTIC
Defense Program; Deployment; Human Resources; Information Systems; Systems Integration

20090001625 Calspan-Buffalo Univ. Research Center, NY USA
Hierarchical High Level Information Fusion (H2LIFT)
Sudit, Moises; Stotz, Adam; Crassidis, John; Crassidis, Aggamemnon; Nagi, Rakesh; VonGonten, Tracy; Sep 15, 2008; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-06-C-0019
Report No.(s): AD-A486330; CUBRC-06823; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary objective of this effort was the progression of Level 2/3 fusion of informational content to obtain an advanced multi-intelligent system for hierarchical high-level decision making processes. The goal was to develop an information integration mechanism to simplify human decision making solving operational problems. As technology continues to advance and the proliferation of sensors in all platform increases, human decision makers are being overwhelmed with data. In this research, the CUBRC proposed a cost effective two-year program of a novel approach in the near 'real-time' ranking/ formulation of hypotheses in asymmetric warfare scenarios. In particular, CUBRC introduced the Hierarchical High Level Information Fusion Technologies (H2LIFT) architecture with the following objectives: develop H2LIFT Architecture and algorithms for GWOT/MDA threats; develop prototype software that implements H2LIFT architecture and algorithms; and develop a simulation based tool for performance evaluation and analysis.
DTIC
Artificial Intelligence; Decision Making; Multisensor Fusion; Situational Awareness

20090001748 Commerce Dept., Washington, DC, USA
Independent Evaluation of the Department of Commerce's information Security Program Under the Federal Information Security Management Act
Sep. 2003; 57 pp.; In English
Report No.(s): PB2009-102668; FINAL-RPT-OSE-16146; No Copyright; Avail.: CASI: A04, Hardcopy

The Federal Information Security Management Act (FISMA), signed into law on December 17, 2002, provides a comprehensive framework for ensuring that information resources supporting federal operations and assets employ effective security controls. FISMA requires agencies to conduct annual information security program reviews and Offices of Inspector General (OIGs) to perform annual independent evaluations of those programs. Our independent evaluation for FY 2003 sought to determine whether the Department of Commerce's information security program and practices for unclassified systems comply with FISMA. As a performance-based organization, the USA Patent and Trademark Office (USPTO) has submitted its budget materials, information security review, and Performance and Accountability Report separate from those of the Department. For the past 2 fiscal years, we prepared a separate independent evaluation report on USPTO. For fiscal year 2003, however, we have included USPTO in this single, Commerce-wide evaluation report, as has the Department in its OMB submission. This consolidation is in keeping with OMBs FY 2002 Report to Congress on federal government information security reform, in which it combined USPTO with the rest of Commerce.
NTIS
Commerce; Computer Information Security; Information Management; Procedures; Security

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*.

20090001896 NASA Marshall Space Flight Center, Huntsville, AL, USA
Development and Testing of Space Fission Technology at NASA-MSFC
Polzin, Kurt; Pearson, J. Boise; Houts, Michael; July 20, 2008; 16 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 20-23 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001896

The Early Flight Fission Test Facility (EFF-TF) at NASA-Marshall Space Flight Center (MSFC) provides a capability to perform hardware-directed activities to support multiple inspace nuclear reactor concepts by using a non-nuclear test methodology. This includes fabrication and testing at both the module/component level and near prototypic reactor configurations allowing for realistic thermal-hydraulic evaluations of systems. The EFF-TF is currently performing non-nuclear testing of hardware to support a technology development effort related to an affordable fission surface power (AFSP) system that could be deployed on the Lunar surface. The AFSP system is presently based on a pumped liquid metal-cooled reactor design, which builds on US and Russian space reactor technology as well as extensive US and international terrestrial liquid metal reactor experience. An important aspect of the current hardware development effort is the information and insight that can be gained from experiments performed in a relevant environment using realistic materials. This testing can often deliver valuable data and insights with a confidence that is not otherwise available or attainable. While the project is currently focused on potential fission surface power for the lunar surface, many of the present advances, testing capabilities, and lessons learned can be applied to the future development of a low-cost in-space fission power system. The potential development of such systems would be useful in fulfilling the power requirements for certain electric propulsion systems (magnetoplasmadynamic thruster, high-power Hall and ion thrusters). In addition, inspace fission power could be applied towards meeting spacecraft and propulsion needs on missions further from the Sun, where the usefulness of solar power is diminished. The affordable nature of the fission surface power system that NASA may decide to develop in the future might make derived systems generally attractive for powering spacecraft and propulsion systems in space. This presentation will discuss work on space nuclear systems that has been performed at MSFC's EFF-TF over the past 10 years. Emphasis will be place on both ongoing work related to FSP and historical work related to in-space systems potentially useful for powering electric propulsion systems.
Author
Fission; Technology Utilization; Test Facilities; Fabrication; Circuits

20090001898 Lockheed Martin Space Systems Co., New Orleans, LA, USA
Application of Terahertz Imaging and Backscatter Radiography to Space Shuttle Foam Inspection
Ussery, Warren; July 21, 2008; 13 pp.; In English; American Society for Nondestructive Testing (ASNT), 21-23 Jul. 2008, Mashantucket, CT, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS8-00016; Copyright; Avail.: CASI: A03, Hardcopy

Two state of the art technologies have been developed for External Fuel Tank foam inspections. Results of POD tests have shown Backscatter Radiography and Terahertz imaging detect critical defects with no false positive issue. These techniques are currently in use on the External Tank program as one component in the foam quality assurance program.
Derived from text
Backscattering; Imaging Techniques; Inspection; Space Shuttles; Radiography; Polyurethane Foam

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20090001231 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Images of an Exosolar Planet 25 Light-Years from Earth
Clampin, Mark; November 19, 2008; 1 pp.; In English; Molecules the Atmospheres of Extrasolar Planets, 17 - 21 Nov. 2008, Nice, France; No Copyright; Avail.: Other Sources; Abstract Only

Fomalhaut is a bright star 7.7 parsec (25 light year) from Earth that harbors a belt of cold dust with a structure consistent

with gravitational sculpting by an orbiting planet. Here, we present optical observations of an exoplanet candidate. Fomalhaut b. In the plane of the belt, Fomalhaut b lies approximately 119 astronomical units (AU) from the star, and within 18 All of the dust belt. We detect counterclockwise orbital motion using Hubble Space Telescope observations separated by 1.73 years. Dynamical models of the interaction between the planet and the belt indicate that the planet's mass is at most three times that of Jupiter for the belt to avoid gravitational disruption. The flux detected at 0.8 micron flux is also consistent with that of a planet with mass a few limes that of Jupiter. The brightness at 0.6 microns and the lack of detection at longer wavelengths suggest that the detected flux may include starlight reflected off a circumplanetary disk, with dimension comparable to the orbits of the Galilean satellites. We also observed variability of unknown origin at 0.6 microns.
Author
Extrasolar Planets; Brightness; Hubble Space Telescope; Visual Observation; Astronomy; Images

20090001317 NASA Johnson Space Center, Houston, TX, USA
Photometric Studies of Orbital Debris at GEO
Seitzer, Patrick; Abercromby, Kira J.; Rodriguez-Cowardin, Heather M.; Barker, Ed; Foreman, Gary; Horstman, Matt; January 2009; 2 pp.; In English; 5th European Conference on Space Debris, 30 Mar. - 2 Apr. 2009, Darmstadt, Germany; Copyright; Avail.: CASI: A01, Hardcopy

We report on optical observations of debris at geosynchronous Earth orbit (GEO) using two telescopes simultaneously at the Cerro Tololo Inter-American Observatory (CTIO) in Chile. The University of Michigan s 0.6/0.9-m Schmidt telescope MODEST (for Michigan Orbital DEbris Survey Telescope) was used in survey mode to find objects that potentially could be at GEO. Because GEO objects only appear in this telescope s field of view for an average of 5 minutes, a full six-parameter orbit can not be determined. Interrupting the survey for follow-up observations leads to incompleteness in the survey results. Instead, as objects are detected with MODEST, initial predictions assuming a circular orbit are done for where the object will be for the next hour, and the objects are reacquired as quickly as possible on the CTIO 0.9-m telescope. This second telescope follows-up during the first night and, if possible, over several more nights to obtain the maximum time arc possible, and the best six parameter orbit. Our goal is to obtain an initial orbit and calibrated colors for all detected objects fainter than R = 15th in order to estimate the orbital distribution of objects selected on the basis of two observational criteria: magnitude and angular rate. One objective is to estimate what fraction of objects selected on the basis of angular rate are not at GEO. A second objective is to obtain magnitudes and colors in standard astronomical filters (BVRI) for comparison with reflectance spectra of likely spacecraft materials.
Author
Geosynchronous Orbits; Schmidt Telescopes; Visual Observation; Field of View; Space Debris; Circular Orbits; Astronomy

20090001398 Communications Research Lab., Tokyo, Japan
Millisecond Pulsar Observation at CRL
Hanado, Y; Shibuya, Y; Hosokawa, M; Sekido, M; Imae, M; Nov 2000; 8 pp.; In English
Report No.(s): AD-A485815; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA485815

We will report the current status of millisecond pulsar timing observation at CRL. Weekly observation of PSR1937+21 using the 34-m antenna at Kashima Space Research Center has been on going since November 1997. Recently we eliminated systematic trends that were apparent in the data, and estimated the pulsar parameters of PSR1937+21. Standard deviation of timing residuals is 2.4 microsecs for about 3 hours pulse-integration. The frequency stability of PSR1937+21 is 10(-13) for an averaging time of one year, which demonstrates the possibility of constructing a pulsar time scale with a system using a small antenna.
DTIC
Magnetic Dipoles; Neutron Beams; Pulsars

20090001465 National Academy of Sciences - National Research Council, Washington, DC, USA
Scientific Context for Exploration of the Moon
January 2008; 120 pp.; In English
Report No.(s): PB2009-103584; No Copyright; Avail.: CASI: A06, Hardcopy

We know more about many aspects of the Moon than about any world beyond our own, and yet we have barely begun to solve its countless mysteries. The Moon is, above all, a witness to 4.5 billion years (Ga) of solar system history, and it has recorded that history more completely and more clearly than has any other planetary body. Nowhere else can we see back with

such clarity to the time when Earth and the other terrestrial planets were formed and life emerged on Earth. Planetary scientists have long understood the Moons unique place in the evolution of rocky worlds. Many of the processes that have modified the terrestrial planets have been absent on the Moon. The lunar interior retains a record of the initial stages of planetary evolution. Its crust has never been altered by plate tectonics, which continually recycle Earths crust; or by planetwide volcanism, which resurfaced Venus only half a billion years ago; or by the action of wind and water, which have transformed the surfaces of both Earth and Mars. The Moon today presents a record of geologic processes of early planetary evolution in the purest form. Lunar science provides a window into the early history of the Earth-Moon system, can shed light on the evolution of other terrestrial planets such as Mars and Venus, and can reveal the record of impacts within the inner solar system. By dint of its proximity to Earth, the Moon is accessible to a degree that other planetary bodies are not. For these reasons, the Moon is priceless to planetary scientists. It remains a cornerstone for deciphering the histories of those more complex worlds. But because of the limitations of current data, researchers cannot be sure that they have read these histories correctly. Now, thanks to the legacy of the Apollo program and subsequent missions, such as Clementine and Lunar Prospector, and looking forward to the newly established Vision for Space Exploration (VSE), scientists are able to pose sophisticated questions that are more relevant and focused than those that could be asked over three decades ago. Only by returning to the Moon to carry out new scientific explorations can we hope to narrow the gaps in understanding and learn the secrets that the Moon alone has kept for eons. The Moon is not only of intrinsic interest as a cornerstone of the Earth-Moon system science, but it also provides a unique location for research in several other fields of science. The Moons surface is in direct contact with the interplanetary medium, and the interaction of the Moon with the solar wind plasma flowing from the Sun forms a unique plasma physics laboratory. Astronomical and astrophysical observations as well as observations of Earth, its atmosphere, ionosphere, and magnetosphere may be made from the stable platform of the Moon. The absence of a significant ionosphere on the Moon should enable low-frequency radio astronomy to be carried out, particularly from the farside of the Moon where radio interference from terrestrial sources should be absent.
NTIS
Lunar Atmosphere; Lunar Composition; Lunar Environment; Lunar Exploration; Moon

20090001466 Naval Observatory, Washington, DC USA
Discovery of Planetary Systems With SIM
Marcy, Geoffrey W; Butler, Paul R; Frink, Sabine; Fischer, Debra; Oppenheimer, Ben; Monet, David G; Quirrenbach, Andreas; Scargle, Jeffrey D; Jan 2008; 5 pp.; In English
Report No.(s): AD-A486007; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA486007

We are witnessing the birth of a new observational science: the discovery and characterization of extrasolar planetary systems. In the past five years, over 70 extrasolar planets have been discovered by precision Doppler surveys, most by members of this SIM team. We are using the data base of information gleaned from our Doppler survey to choose the best targets for a new SIM planet search. In the same way that our Doppler database now serves SIM, our team will return a reconnaissance database to focus Terresrial Planet Finder (TPF) into a more productive, e cient mission. Goals: 1. Detect terrestrial planets of 1-3 M(Earth) around stars closer than 8 pc. 2. Detect 3-20 M(Earth) planets around stars at a distance of 8-30 pc. 3. Determine absolute masses of Doppler-detected planets and search for additional planets 4. Determine the degree of coplanarity in known multiple systems 5. Reconnaissance for TPF.
DTIC
Doppler Effect; Planetary Systems; Planets; SIM

20090001615 Naval Observatory, Washington, DC USA
Adaptive Optics Photometry and Astrometry of Binary Stars. III. A Faint Companion Search of O-Star Systems
Turner, Nils H; Brummelaar, Theo A; Roberts, Lewis C; Mason, Brian D; Hartkoff, William I; Gies, Douglas R; Aug 2008; 13 pp.; In English
Contract(s)/Grant(s): Proj-F29601-00-D-0204; Proj-ST-0088498
Report No.(s): AD-A486312; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present the results of an adaptive optics survey for faint companions among Galactic O-type star systems (with V 8) using the Advanced Electro-Optical System (AEOS) 3.6 m telescope on Haleakala. We surveyed these O-star systems in the I -band, typically being able to detect a companion with a magnitude difference of deltam(sub I) < or ~ 6 in the projected separation range 0'.5 < rho < 1'.0, and deltam(sub I) < or ~ 9.5 in the range 1'.0 < rho < 5'.0. In the course of the survey, we discovered 40 new companions among 31 of the 116 objects examined and made astrometric and differential magnitude measurements of 24 additional known pairs, several of them being confirmation detections. We present new astrometric orbits

for two binaries, BU 1032AB (WDS 05387- 0236; sigma Ori AB) and SEE 322 (WDS 17158-3344; HD 155889AB). We lack magnitude differences for other filter bands, so it is difficult to determine physical from line-of-sight companions, but we present empirical arguments for the limiting magnitude difference where field contamination is significant.
DTIC
Adaptive Optics; Astrometry; Astronomical Photometry; Binary Stars; Companion Stars; O Stars; Orbits; Photometry

20090001846 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Chase to Capture Gamma Ray Bursts
Gehrels, Neil; February 02, 2008; 17 pp.; In English; AAAS Meeting, 15-16 Feb. 2008, Boston, MA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001846

Gamma-ray bursts are the most powerful explosions in the universe, thought to be the birth cries of black holes. It has taken 40 years of international cooperation and competition to begin to unravel the mystery of their origin. The most recent chapter in this field is being written by the SWIFT mission, a fast-response satellite with 3 power telescopes. An international team from countries all over the world participates in the chase to capture the fading light of bursts detected by SWIFT. This talk will discuss the challenges and excitement of building this space observatory. New results will be presented on our growing understanding of exploding stars and fiery mergers of orbiting stars.
Author
Gamma Ray Bursts; Swift Observatory; Gamma Ray Astronomy

20090001862 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Implications for High Energy Blazar Spectra from Intergalactic Absorption Calculations
Stecker, F; October 06, 2008; 1 pp.; In English; Science with the New Generation of High Energy Gamma-Ray Experiments, 6-11 Oct. 2008, Padova, Italy; No Copyright; Avail.: Other Sources; Abstract Only

Given a knowledge of the density spectra intergalactic low energy photons as a function of redshift, one can derive the intrinsic gamma-ray spectra and luminosities of blazars over a range of redshifts and look for possible trends in blazar evolution. Stecker, Baring & Summerlin have found some evidence hinting that TeV blazars with harder spectra have higher intrinsic TeV gamma-ray luminosities and indicating that there may be a correlation of spectral hardness and luminosity with redshift. Further work along these lines, treating recent observations of the blazers lES02291+200 and 3C279 in the TeV and sub-TeV energy ranges, has recently been explored by Stecker & Scully. GLAST will observe and investigate many blazars in the GeV energy range and will be sensitive to blazers at higher redshifts. I examine the implications high redshift gamma-ray absorption for both theoretical and observational blazer studies.
Author
Blazars; Energy Spectra; Intergalactic Media; Absorption

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20090001538 Utah State Univ., Logan, UT USA
Extending F10.7's Time Resolution to Capture Solar Flare Phenomena
Acebal, Ariel O; Jul 1, 2008; 187 pp.; In English
Report No.(s): AD-A486104; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Solar ultraviolet (UV) radiation ionizes the neutral components in the atmosphere, which is partly responsible for the formation of the ionosphere, and contributes to heating of the atmosphere. Solar ares change the solar spectrum at times by several orders of magnitude. These changes modify the Earth's upper atmosphere, causing problems to communication systems and space operations, such as increased satellite drag. Unfortunately, solar UV measurements are limited since they can only be observed with space-based sensors. In order to work around this limitation, the solar radio emissions at a wavelength of 10.7 cm have been used as a proxy for the solar UV radiation. These measurements, known as the F10.7 index, are a snapshot of the solar activity at the time they are taken and do not capture the changes that occur throughout the day, such as ares. In order to capture this daily variation, we used 1-second cadence solar radio data and compared it to solar UV measurements taken once per orbit by the TIMED satellite. We found significant correlations between some radio frequencies

and different UV wavelengths during quiet times. These correlations changed in terms of radio frequency and UV wavelength during solar flares.
DTIC
Measurement; Solar Flares; Solar Radiation; Temporal Resolution; Ultraviolet Radiation

20090001628 Naval Observatory, Washington, DC USA
Microarcsecond Scintillation-Induced Variability (MASIV) Survey of the Northern Sky
Jauncey, D L; Lovell, J E; Senkbeil, C; Shabala, S; Bignall, H E; Pursimo, T; Ojha, R; Dutka, M; Macquart, J; Rickett, B J; Kedziora-Chudczer, L; Dec 2007; 10 pp.; In English
Report No.(s): AD-A486341; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present the results of a large-scale 5-GHz Very Large Array (VLA) survey of the northern sky searching for sources that exhibit intraday variability (IDV). The observations were made over four epochs, each of 3 days in January, May and September 2002 and January 2003. The objective is to obtain a large sample of IDV sources in order to derive reliable statistics of the microarcsecond properties of the source population and the scattering properties of the interstellar medium.
DTIC
Active Galactic Nuclei; Interstellar Matter; Northern Sky; Scintillation; Surveys; Variability

20090001864 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Triennial Report 2006-2009. Commission 10: Solar Activity
Klimchuk, James A.; [2008]; 25 pp.; In English; Copyright; Avail.: Other Sources

Commission 10 deals with solar activity in all of its forms, ranging from the smallest nanoflares to the largest coronal mass ejections. This report reviews scientific progress over the roughly two-year period ending in the middle of 2008. This has been an exciting time in solar physics, highlighted by the launches of the Hinode and STEREO missions late in 2006. The report is reasonably comprehensive, though it is far from exhaustive. Limited space prevents the inclusion of many significant results. The report is divided into following sections: Photosphere and Chromosphere; Transition Region; Corona and Coronal Heating; Coronal Jets; Flares; Coronal Mass Ejection Initiation; Global Coronal Waves and Shocks; Coronal Dimming; The Link Between Low Coronal CME signatures and Magnetic Clouds; Coronal Mass Ejections in the Heliosphere; and Coronal Mass Ejections and Space Weather. Primary authorship is indicated at the beginning of each section.
Derived from text
Coronal Mass Ejection; Solar Activity; Solar Physics; Space Weather

20090001907 Alabama Univ., Huntsville, AL, USA
Magnetic Reconnection by a Self-Retreating X-Line
Oka, M.; Fujimoto, M.; Nakamura, T. K. M.; Shinohara, I.; Nishikawa, K.-I.; August 15, 2008; 4 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 17GS208; Copyright; Avail.: Other Sources

Particle-in-cell (PIC) simulations of collisionless magnetic reconnection are performed to study asymmetric reconnection in which an outflow is blocked by a hard wall while leaving sufficiently large room for the outflow of the opposite direction. This condition leads to a slow, roughly constant motion of the diffusion region away from the wall, the so-called 'X-line retreat'. The typical retreat speed is approximately 0.1 times the Alfven speed. At the diffusion region, ion flow pattern shows strong asymmetry and the ion stagnation point and the X-line are not collocated. A surprise, however, is that the reconnection rate remains the same unaffected by the retreat motion.
Author
Magnetic Field Reconnection; Flow Distribution; Magnetohydrodynamics; Ions; Electron Diffusion

91
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*.

20090001228 NASA Johnson Space Center, Houston, TX, USA
Lunar Dust and Lunar Simulant Activation, Monitoring, Solution and Cellular Toxicity Properties
Jeevarajan, A.S.; Wallace, W.T.; [2009]; 1 pp.; In English; Human Research Program Investigators Workshop, 2 - 4 Feb. 2009, Texas, USA; Copyright; Avail.: CASI: A01, Hardcopy

During the Apollo missions, many undesirable situations were encountered that must be mitigated prior to returning

humans to the moon. Lunar dust (that part of the lunar regolith less than 20 m in diameter) was found to produce several problems with astronaut s suits and helmets, mechanical seals and equipment, and could have conceivably produced harmful physiological effects for the astronauts. For instance, the abrasive nature of the dust was found to cause malfunctions of various joints and seals of the spacecraft and suits. Additionally, though efforts were made to exclude lunar dust from the cabin of the lunar module, a significant amount of material nonetheless found its way inside. With the loss of gravity correlated with ascent of the lunar module from the lunar surface to rendezvous with the command module, much of the major portions of the contaminating soil and dust began to float, irritating the astronaut s eyes and being inhaled into their lungs. Our goal has been to understand some of the properties of lunar dust that could lead to possible hazards for humans. Due to the lack of an atmosphere, there is nothing to protect the lunar soil from ultraviolet radiation, solar wind, and meteorite impacts. These processes could all serve to activate the soil, or produce reactive surface species. In order to understand the possible toxic effects of the reactive dust, it is necessary to reactivate the dust, as samples returned during the Apollo missions were exposed to the atmosphere of the Earth. We have used grinding and UV exposure to mimic some of the processes occurring on the Moon. The level of activation has been monitored using two methods: fluorescence spectroscopy and electron paramagnetic resonance spectroscopy (EPR). These techniques allow the monitoring of hydroxyl radical production in solution. We have found that grinding of lunar dust produces 2-3 times the concentration of hydroxyl radicals as lunar simulant and 10 times that of quartz. Exposure of the lunar dust to UV radiation under vacuum was also found to lead to hydroxyl radical production. After grinding, we have also monitored loss of reactivity of the dusts by exposing them to conditions of known humidity and temperature. From these tests, it was found that the reactivity half-life of lunar simulant is approximately 3 hours, while that of quartz is approximately 2 hours. Placing lunar dust in solution could lead to effects on mechanical and physiological systems, as well as other biological systems. For instance, while it is known that lunar dust is highly abrasive and caused a variety of problems with suits and equipment during Apollo, it is unknown as to how these properties might be affected in the presence of water or other liquids. It is possible that the dust may release minerals (e.g., metallic nanophase Fe) into solution that could speed corrosion or rust. Also, as lunar dust produces hydroxyl radicals (and possibly other reactive oxygen species) in solution, these radicals could also lead to the breakdown of suit or habitat materials. In the body (i.e., in lung solution), the effects could be two-fold. First, if the lunar dust dissolves, it may release an excess of elements (such as zero-valence metallic Fe) that are necessary for bodily functions but only in certain concentration ranges. For lunar dust, the presence of nanophase iron being released into the body is a concern. Secondly, the hydroxyl radicals or other reactive oxygen species produced by the dust in solution could conceivably interact with cells, leading to various problems. We have studied the dissolution of both ground and unground lunar simulant in buffer solutions of different pH. The concentration of a number of species was determined using mass spectrometry. These studies showed that lowering the pH of the solution causes a dramatic increase in the amount of each element released into solution and that grinding also produces higher concentrations. Finally, we have perfmed initial tests aimed at understanding the effects of lunar simulant on cellular systems. Alveolar epithelial cells were cultured and exposed to different concentrations of dust suspended in cell culture media. After predetermined amounts of time, the media was removed and the concentrations of important inflammatory cytokines (IL6, IL8, and TNF-alpha) were measured. The results of these tests are being used to develop the correct protocols for tests to be performed using lunar dust samples.

Author

Lunar Dust; Lunar Soil; Toxicity; Cells (Biology); Regolith; Lunar Rocks; Electron Paramagnetic Resonance

20090001233 NASA Johnson Space Center, Houston, TX, USA

A Case for Ancient Springs in Arabia Terra, Mars

Oehler, Dorothy Z.; Allen, Carlton C.; [2009]; 64 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: Other Sources

Based on new image data from the High Resolution Imaging Science Experiment (HiRISE) on Mars Reconnaissance Orbiter (MRO), a case can be made that several structures in Vernal Crater, Arabia Terra are ancient springs. This interpretation is based on comprehensive geomorphologic analysis coupled with assessment of multiple hypotheses. The structures identified extend across several kilometers and are exceptional, in that nothing with their detail and scale has been reported from Mars. The deposits are associated with an extensive fracture system which may have facilitated upward flow of warm fluids. Several additional spring-like features occur in Vernal Crater, and it is possible that these are part of a major province of spring activity. Since springs are environments where life could have evolved on Mars, where that life may have found refuge as the climate became colder and drier, and where signatures of that life may be preserved, Vernal Crater may be a site of major astrobiological importance.

Author

Mars Reconnaissance Orbiter; Craters; Geomorphology; Imaging Techniques; Exobiology; High Resolution

20090001315 NASA Johnson Space Center, Houston, TX, USA

In Situ Resource Utilization (ISRU) on the Moon: Moessbauer Spectroscopy as a Process Monitor for Oxygen Production

Morris, R.V.; Schroder, C.; Graff, T.G.; Sanders, G.B.; Lee, K.A.; Simon, T.M.; Larson, W.E.; Quinn, J.W.; Clark, L.D.; Caruso, J.J.; January 2009; 1 pp.; In English; Lunar Base Symposium, 12 - 13 May 2009, Kaiserlautern, Germany; Copyright; Avail.: Other Sources; Abstract Only

Essential consumables like oxygen must to be produced from materials on the lunar surface to enable a sustained, long-term presence of humans on the Moon. The Outpost Precursor for ISRU and Modular Architecture (OPTIMA) field test on Mauna Kea, Hawaii, facilitated by the Pacific International Space Center for Exploration Systems (PISCES) of the University of Hawaii at Hilo, was designed to test the implementation of three hardware concepts to extract oxygen from the lunar regolith: Precursor ISRU Lunar Oxygen Testbed (PILOT) developed by Lockheed Martin in Littleton, CO; Regolith & Environmental Science and Oxygen & Lunar Volatiles Extraction (RESOLVE) developed at the NASA Kennedy Space Center in Cape Canaveral, FL; and ROxygen developed at the NASA Johnson Space Center in Houston, TX. The three concepts differ in design, but all rely on the same general principle: hydrogen reduction of metal cations (primarily Fe2+) bonded to oxygen to metal (e.g., Fe0) with the production of water. The hydrogen source is residual hydrogen in the fuel tanks of lunar landers. Electrolysis of the water produces oxygen and hydrogen (which is recycled). We used the miniaturized M ssbauer spectrometer MIMOS II to quantify the yield of this process on the basis of the quantity of Fe0 produced. Iron M ssbauer spectroscopy identifies iron-bearing phases, determines iron oxidation states, and quantifies the distribution of iron between mineral phases and oxidation states. The oxygen yield can be calculated by quantitative measurements of the distribution of Fe among oxidation states in the regolith before and after hydrogen reduction. A M ssbauer spectrometer can also be used as a prospecting tool to select the optimum feedstock for the oxygen production plants (e.g., high total Fe content and easily reduced phases). As a demonstration, a MIMOS II backscatter spectrometer (SPESI, Germany) was mounted on the Cratos rover (NASA Glenn Research Center in Cleveland, OH), which is one of several rover concepts designed to excavate and transfer regolith to the stationary hydrogen reduction plants. Spaceflight versions of the MIMOS II are part of the instrument payloads of NASA s Mars Exploration Rovers and still operating five years after landing on the surface of the planet. MIMOS II was also selected for Phobos-Grunt, a Russian sample return mission to the martian moon Phobos scheduled to launch in 2009, and ESA s ExoMars rover, an exobiology mission scheduled to launch in 2013. An advanced version of the instrument is currently under development. A new detector system with a higher energy resolution will not only reduce the necessary measurement time considerably, but also allow the simultaneous acquisition of an X-ray fluorescence spectrum to determine the elemental composition of samples.

Author

In Situ Resource Utilization; Consumables (Spacecraft); Oxygen Production; Planetary Surfaces; Space Exploration; Mars Exploration; Lunar Surface; Chemical Composition

20090001338 NASA Glenn Research Center, Cleveland, OH, USA

Exploring Venus

Landis, Geoffrey A.; January 17, 2008; 63 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 361426.07.03; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090001338

With a temperature higher than the inside of your oven and atmospheric pressure equal to that a kilometer under the ocean, the surface of Venus is one of the most hostile environments in the solar system, and Venus exploration presents a challenge to technology. This lecture presents mission trade-offs and discusses a proposed mission concept for rover and aircraft based exploration of the surface and atmosphere of Venus. Several approaches to the technology, electronics, mechanical parts, and power systems, are discussed.

Author

Venus Atmosphere; Venus (Planet); Solar System; Venus Surface; Space Exploration

20090001861 Atmospheric and Environmental Research, Inc., Lexington, MA, USA

Interpretation of the Near-IR Spectra of the Kuiper Belt Object

Eluszkiewicz, Janusz; Cady-Pereira, Karen; Brown, Michael E.; Stansberry, John A.; Journal of Geophysical Research - Planets; June 15, 2007; ISSN 0148-0227; Volume 112; 9 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNH04CC40C; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2007JE002892

Visible and near-IR observations of the Kuiper Belt Object (136472) 2005 FY(9) have indicated the presence of unusually

long (1 cm or more) optical path lengths in a layer of methane ice. Using microphysical and radiative transfer modeling, we show that even at the frigid temperatures in the outer reaches of the solar system, a slab of low porosity methane ice can indeed form by pressureless sintering of micron-sized grains, and it can qualitatively reproduce the salient features of the measured spectra. A good semiquantitative match with the near-IR spectra can be obtained with a realistic slab model, provided the spectra are scaled to a visible albedo of 0.6, at the low end of the values currently estimated from Spitzer thermal measurements. Consistent with previous modeling studies, matching spectra scaled to higher albedos requires the incorporation of strong backscattering effects. The albedo may become better constrained through an iterative application of the slab model to the analysis of the thermal measurements from Spitzer and the visible/near-IR reflectance spectra. The slab interpretation offers two falsifiable predictions (1) Absence of an opposition surge, which is commonly attributed to the fluffiness of the optical surface. This prediction is best testable with a spacecraft, as Earth-based observations at true opposition will not be possible until early next century. (2) Unlikelihood of the simultaneous occurrence of very long spectroscopic path lengths in both methane and nitrogen ice on the surface of any Kuiper Belt Object, as the more volatile nitrogen would hinder densification in methane ice.
Author
Kuiper Belt; Infrared Spectra; Dwarf Planets; Optical Paths; Near Infrared Radiation; Methane; Ice; Planetology

20090001901 NASA Marshall Space Flight Center, Huntsville, AL, USA; National Space Science and Technology Center, Huntsville, AL, USA
The Moon is a Planet Too: Lunar Science and Robotic Exploration
Cohen, Barbara; August 26, 2008; 2 pp.; In English; Challenger Center Annual Conference, 26-27 Aug. 2008, Wichita, KS, USA; Copyright; Avail.: Other Sources; Abstract Only

The first decades of the 21st century will be marked by major lunar science and exploration activities. The Moon is a witness to 4.5 billion years of solar system history, recording that history more completely and more clearly than any other planetary body. Lunar science encompasses early planetary evolution and differentiation, lava eruptions and fire fountains, impact scars throughout time, and billions of years of volatile input. I will cover the main outstanding issues in lunar science today and the most intriguing scientific opportunities made possible by renewed robotic and human lunar exploration. Barbara is a planetary scientist at NASA s Marshall Space Flight Center. She studies meteorites from the Moon, Mars and asteroids and has been to Antarctica twice to hunt for them. Barbara also works on the Mars Exploration Rovers Spirit and Opportunity and has an asteroid named after her. She is currently helping the Lunar Precursor Robotics Program on the Lunar Mapping and Modeling Project, a project tasked by the Exploration System Mission Directorate (ESMD) to develop maps and tools of the Moon to benefit the Constellation Program lunar planning. She is also supporting the Science Mission Directorate s (SMD) lunar flight projects line at Marshall as the co-chair of the Science Definition Team for NASA s next robotic landers, which will be nodes of the International Lunar Network, providing geophysical information about the Moon s interior structure and composition.
Author
Planetary Evolution; Lunar Exploration; Lunar Geology; Lunar Surface; Geophysics; Robotics; Project Planning

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20090001889 NASA Marshall Space Flight Center, Huntsville, AL, USA
Sunspot Group Decay
Hathaway, David H.; Choudhary, Debi Prasad; [2008]; 12 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

We examine daily records of sunspot group areas (measured in millionths of a solar hemisphere or microHem) for the last 130 years to determine the rate of decay of sunspot group areas. We exclude observations of groups when they are more than 60deg in longitude from the central meridian and only include data when at least three days of observations are available following the date of maximum area for a group’s disk passage. This leaves data for over 18,000 measurements of sunspot group decay.We find that the decay rate increases linearly from 28 microHem/day to about 140microHem/day for groups with areas increasing from 35microHem to 1000microHem. The decay rate tends to level o for groups with areas larger than 1000microHem. This behavior is very similar to the increase in the number of sunspots per group as the area of the group increases. Calculating the decay rate per individual sunspot gives a decay rate of about 3.65microHem/day with little

dependence upon the area of the group. This suggests that sunspots decay by a Fickian diffusion process with a diffusion coefficient of about 10sq km/s. Although the 18,000 decay rate measurements are lognormally distributed, this can be attributed to the lognormal distribution of sunspot group areas and the linear relationship between area and decay rate for the vast majority of groups. We find weak evidence for variations in decay rates from one solar cycle to another and for different phases of each sunspot cycle. However, the strongest evidence for variations is with latitude and the variations with cycle and phase of each cycle can be attributed to this variation. High latitude spots tend to decay faster than low latitude spots.
Author
Sunspots; Diffusion Coefficient; Decay Rates; Solar Cycles; Diffusion

20090001918 NASA Marshall Space Flight Center, Huntsville, AL, USA
On the Period-Amplitude and Amplitude-Period Relationships
Wilson, Robert M.; Hathaway, David H.; November 2008; 24 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TP-2008-215580; M-1245; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090001918

Examined are Period-Amplitude and Amplitude-Period relationships based on the cyclic behavior of the 12-month moving averages of monthly mean sunspot numbers for cycles 0.23, both in terms of Fisher's exact tests for 2x2 contingency tables and linear regression analyses. Concerning the Period-Amplitude relationship (same cycle), because cycle 23's maximum amplitude is known to be 120.8, the inferred regressions (90-percent prediction intervals) suggest that its period will be 131 +/- 24 months (using all cycles) or 131 +/- 18 months (ignoring cycles 2 and 4, which have the extremes of period, 108 and 164 months, respectively). Because cycle 23 has already persisted for 142 months (May 1996 through February 2008), based on the latter prediction, it should end before September 2008. Concerning the Amplitude-Period relationship (following cycle maximum amplitude versus preceding cycle period), because cycle 23's period is known to be at least 142 months, the inferred regressions (90-percent prediction intervals) suggest that cycle 24's maximum amplitude will be about less than or equal to 96.1 +/- 55.0 (using all cycle pairs) or less than or equal to 91.0 +/- 36.7 (ignoring statistical outlier cycle pairs). Hence, cycle 24's maximum amplitude is expected to be less than 151, perhaps even less than 128, unless cycle pair 23/24 proves to be a statistical outlier.
Author
Sun; Sunspot Cycle; Regression Analysis

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*.

20090001229 NASA Langley Research Center, Hampton, VA, USA
Cross Sections From Scalar Field Theory
Norbury, John W.; Dick, Frank; Norman, Ryan B.; Nasto, Rachel; December 2008; 55 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TP-2008-215555; L-19558; Copyright; Avail.: CASI: A04, Hardcopy

A one pion exchange scalar model is used to calculate differential and total cross sections for pion production through nucleon- nucleon collisions. The collisions involve intermediate delta particle production and decay to nucleons and a pion. The model provides the basic theoretical framework for scalar field theory and can be applied to particle production processes where the effects of spin can be neglected.
Author
Scalars; Scattering Cross Sections; Nucleons; Pions

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