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

Scientific and Technical Aerospace Reports

STAR

Volume 45 Number 18

September 17, 2007

WHAT'S INSIDE

NASA STI Program ... in Profile

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- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

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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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Mathematical and Computer Sciences

Physics

Social and Information Sciences

Space Sciences

General

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

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 45, NUMBER 18 SEPTEMBER 17, 2007

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.

20070025193 NASA Dryden Flight Research Center, Edwards, CA, USA
New Air-Launched Small Missile (ALSM) Flight Testbed for Hypersonic Systems
Bui, Trong T.; Lux, David P.; Stenger, Michael T.; Munson, Michael J.; Teate, George F.; August 2007; 22 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2007-214624; H-2634; Copyright; Avail.: CASI: A03, Hardcopy

The Phoenix Air-Launched Small Missile (ALSM) flight testbed was conceived and is proposed to help address the lack of quick-turnaround and cost-effective hypersonic flight research capabilities. The Phoenix ALSM testbed results from utilization of the USA Navy Phoenix AIM-54 (Hughes Aircraft Company, now Raytheon Company, Waltham, Massachusetts) long-range, guided air-to-air missile and the National Aeronautics and Space Administration (NASA) Dryden Flight Research Center (Edwards, California) F-15B (McDonnell Douglas, now the Boeing Company, Chicago, Illinois) testbed airplane. The retirement of the Phoenix AIM-54 missiles from fleet operation has presented an opportunity for converting this flight asset into a new flight testbed. This cost-effective new platform will fill the gap in the test and evaluation of hypersonic systems for flight Mach numbers ranging from 3 to 5. Preliminary studies indicate that the Phoenix missile is a highly capable platform; when launched from a high-performance airplane, the guided Phoenix missile can boost research payloads to low hypersonic Mach numbers, enabling flight research in the supersonic-to-hypersonic transitional flight envelope. Experience gained from developing and operating the Phoenix ALSM testbed will assist the development and operation of future higher-performance ALSM flight testbeds as well as responsive microsatellite-small-payload air-launched space boosters.
Author
Hypersonic Flight; Air Launching; Flight Envelopes; System Effectiveness; Air to Air Missiles

20070025529 Army Aviation and Missile Command, Redstone Arsenal, AL, USA
Dragless Flight Control System for Flying Objects
Lawless, D. E., Inventor; 13 Jan 05; 10 pp.; In English
Patent Info.: Filed Filed 13 Jan 05; US-Patent-Appl-SN-11-040 302
Report No.(s): PB2007-104170; No Copyright; Avail.: CASI: A02, Hardcopy

The Dragless Flight Control System for Flying Objects utilizes paired fins that are mounted to rotate in opposite directions. When no lift is desired during the object's flight, the fins are completely retracted into their housings that are recessed into the body of the object. This minimizes the drag. The fins are set to a maximum no-stall angle relative to the body axis of the flying object. To provide lift and other flight controls, such as roll and yaw, the fins are selectively exposed outside the exterior skin of the flying object by being rotated on their axes, the two fins in a pair always being rotated in opposite directions. Varying the amount of exposed area of the counter-rotating fins can generate lift effect that is proportional to the exposed area and similar to that produced by the current, permanently-extended standard rotational fins.
NTIS
Flight Control; Missiles; Control Systems Design

20070026133 National Advisory Committee for Aeronautics. Langley Aeronautical Lab., Langley Field, VA, USA
Compressibility Effects in Aeronautical Engineering
Stack, John; August 1941; 29 pp.; In English; Original contains black and white illustrations
Report No.(s): NACA-ACR-207; NACA-SR-207; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070026133

Compressible-flow research, while a relatively new field in aeronautics, is very old, dating back almost to the development

of the first firearm. Over the last hundred years, researches have been conducted in the ballistics field, but these results have been of practically no use in aeronautical engineering because the phenomena that have been studied have been the more or less steady supersonic condition of flow. Some work that has been done in connection with steam turbines, particularly nozzle studies, has been of value, In general, however, understanding of compressible-flow phenomena has been very incomplete and permitted no real basis for the solution of aeronautical engineering problems in which.the flow is likely to be unsteady because regions of both subsonic and supersonic speeds may occur. In the early phases of the development of the airplane, speeds were so low that the effects of compressibility could be justifiably ignored. During the last war and immediately after, however, propellers exhibited losses in efficiency as the tip speeds approached the speed of sound, and the first experiments of an aeronautical nature were therefore conducted with propellers. Results of these experiments indicated serious losses of efficiency, but aeronautical engineers were not seriously concerned at the time became it was generally possible. to design propellers with quite low tip. speeds. With the development of new engines having increased power and rotational speeds, however, the problems became of increasing importance.
Derived from text
Compressibility Effects; Aeronautical Engineering; Supersonic Flow; Tip Speed; Steady Flow; Propellers; Compressible Flow; Acoustic Velocity

20070026138 NASA Johnson Space Center, Houston, TX, USA
Low Velocity Airdrop Tests of an X-38 Backup Parachute Design
Stein, Jenny M.; Machin, Ricardo A.; Wolf, Dean F.; Hillebrandt, F. David; May 23, 2007; 9 pp.; In English; 18th AIAA Aerodynamic Decelerator Systems Technology Conference, 23-26 May 2005, Munich, Germany; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy

The NASA Johnson Space Center's X-38 program designed a new backup parachute system to recover the 25,000 lb X-38 prototype for the Crew Return Vehicle spacecraft. Due to weight and cost constraints, the main backup parachute design incorporated rapid and low cost fabrication techniques using off-the-shelf materials. Near the vent, the canopy was constructed of continuous ribbons, to provide more damage tolerance. The remainder of the canopy was a constructed with a continuous ringslot design. After cancellation of the X-38 program, the parachute design was resized, built, and drop tested for Natick Soldiers Center's Low Velocity Air Drop (LVAD) program to deliver cargo loads up to 22,000 lbs from altitudes as low as 500 feet above the ground. Drop tests results showed that the 500-foot LVAD parachute deployment conditions cause severe skirt inversion and inflation problems for large parachutes. The bag strip occurred at a high angle of attack, causing skirt inversion before the parachute could inflate. The addition of a short reefing line prevented the skirt inversion. Using a lower porosity in the vent area, than is normally used in large parachutes, improved inflation. The drop testing demonstrated that the parachute design could be refined to meet the requirements for the 500-foot LVAD mission.
Author
Drop Tests; X-38 Crew Return Vehicle; Parachutes; Loads (Forces); Fabrication; Airdrops

20070026249 NASA Johnson Space Center, Houston, TX, USA
An Overview of the Guided Parafoil System Derived from X-38 Experience
Stein, Jenny M.; Madsen, Chris M.; Strahan, Alan L.; May 23, 2005; 11 pp.; In English; 18th AIAA Aerodynamic Decelerator Systems Technology Conference, 23-25 May 2005, Munich, Germany; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070026249

The NASA Johnson Space Center built a 4200 sq ft parafoil for the U.S. Army Natick Soldier Center to demonstrate autonomous flight using a guided parafoil system to deliver 10,000 lbs of useable payload. The parafoil's design was based upon that developed during the X-38 program. The drop test payload consisted of a standard 20-foot Type V airdrop platform, a standard 12-foot weight tub, a 60 ft drogue parachute, a 4200 ft2 parafoil, an instrumentation system, and a Guidance, Navigation, and Control (GN&C) system. Instrumentation installed on the load was used to gather data to validate simulation models and preflight loads predictions and to perform post flight trajectory and performance reconstructions. The GN&C system, developed during NASA's X-38 program, consisted of a flight computer, modems for uplink commands and downlink data, a compass, laser altimeter, and two winches. The winches were used to steer the parafoil and to perform the dynamic flare maneuver for a soft landing. The laser was used to initiate the flare. The GN&C software was originally provided to NASA by the European Space Agency. NASA incorporated further software refinements based upon the X-38 flight test results. Three full-scale drop tests were conducted, with the third being performed during the Precision Airdrop Technology Conference and Demonstration (PATCAD) Conference at the U.S. Army Yuma Proving Ground (YPG) in November of 2003. For the PATCAD demonstration, the parafoil and GN&C software and hardware performed well, concluding with a good flare

and the smallest miss distance ever experienced in NASA's parafoil drop test program. This paper describes the 4200 sq ft parafoil system, simulation results, and the results of the drop tests.
Author
X-38 Crew Return Vehicle; Parafoils; Drop Tests; Payloads; Flight Tests; Flight Control; Guidance (Motion); Navigation; Data Simulation

02
AERODYNAMICS

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

20070025272 Combustion Research and Flow Technology, Inc., Pipersville, PA USA
Further Extension and Validation of a Parallel Unstructured Mesh Adaptation Package
Cavallo, Peter A; Grismer, Matthew J; Jan 2005; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-02-C-3215; NASA-NNS04AA08C
Report No.(s): AD-A464885; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A parallel tetrahedral mesh adaptation code is expanded to treat general, mixed-element unstructured meshes comprised of any combination of basic element types. Emphasis is placed on developing conforming mesh modification methods that are solver-independent. Specific developments include the implementation of a treatment for viscous, high aspect ratio near wall tetrahedra, and cell subdivision methods for prismatic, hexahedral, and pyramid cells. Rebalancing of the adapted grid, and particularly issues associated with processor assignment of parent/child cell sets, is addressed. Validations are performed for decomposed, mixed-element meshes using cell-vertex and cell-centered unstructured solvers. The resulting parallel adaptation package is a powerful, versatile tool for obtaining gridconverged, steady state results, and may readily be applied to other unstructured flow solvers.
DTIC
Flow; Unstructured Grids (Mathematics)

20070025345 Defence Science and Technology Organisation, Victoria, Australia
ImPressOne: A Pressure Display and Acquisition Program for the Low Speed Wind Tunnel at DSTO
Blandford, Adam; Nov 2005; 70 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465937; DSTO-GD-0486; No Copyright; Avail.: Defense Technical Information Center (DTIC)

DSTO operates a low speed wind tunnel within the Air Vehicles Division of DSTO Melbourne. Airspeeds up to approximately 100 m/s can be produced in the empty test section which is 2.7 m wide by 2.1 m high. Acquisition and display of pressure distribution data over a model under test in the wind tunnel is important to the project manager and test engineer so they can monitor the results in near real time as the test progresses. A software package called ImPressOne was developed for this purpose giving a graphical display of the pressure and the ability to acquire pressure sets and save the data to file. This document provides details of the software and its operation. It also provides information on programming and development considerations of the software.
DTIC
Low Speed; Low Speed Wind Tunnels; Pressure Distribution; Wind Tunnels

20070026134 National Advisory Committee for Aeronautics. Langley Aeronautical Lab., Langley Field, VA, USA
Wind-tunnel Tests of the NACA 45-125 Airfoil: A Thick Airfoil for High-Speed Airplanes
Delano, James B.; February 1940; 16 pp.; In English; Original contains black and white illustrations
Report No.(s): NACA-SR-138; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070026134

Investigations of the pressure distribution, the profile drag, and the location of transition for a 30-inch-chord 25-percent-thick N.A,C.A. 45-125 airfoil were made in the N.A.C.A 8-foot high-speed wind tunnel for the purpose of aiding in the development of a thick wing for high-speed airplanes. The tests were made at a lift coefficient of 0.1 for Reynolds Numbers from 1,750,000 to 8,690,000, corresponding to speeds from 80 to 440 miles per hour at 59 F. The effect on the profile drag of fixing the transition point was also investigated. The effect of compressibility on the rate of increase of pressure coefficients was found to be greater than that predicted by a simplified theoretical expression for thin wings. The results

indicated that, for a lift coefficient of 0.1, the critical speed of the N.A.C,A. 45-125 airfoil was about 460 miles per hour at 59 F,. The value of the profile-drag coefficient at a Reynolds Number of 4,500,000 was 0.0058, or about half as large as the value for the N.A,C,A. 0025 airfoil. The increase in the profile-drag coefficient for a given movement of the transition point was about three times as large as the corresponding increase for the N.A.C,A. 0012 airfoil. Transition determinations indicated that, for Reynolds Numbers up to ?,000,000, laminar boundary 1ayers were maintained over approximately 40 percent of the upper and the lower surfaces of the airfoil.
Derived from text
Aerodynamic Coefficients; Airfoils; Compressibility; Pressure Distribution; Transition Points; Wind Tunnel Tests; Aerodynamic Drag; Thin Wings; Critical Velocity

20070026160 Government Accountability Office, Washington, DC, USA
Aviation Security: Risk, Experience, and Customer Concerns Drive Changes to Airline Passenger Screening Procedures, but Evaluation and Documentation of Proposed Changes Could Be Improved
Apr. 2007; 77 pp.; In English
Report No.(s): PB2007-108415; GAO-07-634; No Copyright; Avail.: CASI: A05, Hardcopy

The Transportation Security Administration's (TSA) most visible layer of commercial aviation security is the screening of airline passengers at airport checkpoints, where travelers and their carry-on items are screened for explosives and other dangerous items by transportation security officers (TSO). Several revisions made to checkpoint screening procedures have been scrutinized and questioned by the traveling public and Congress in recent years. For this review, GAO evaluated (1) TSA's decisions to modify passenger screening procedures between April 2005 and December 2005 and in response to the alleged August 2006 liquid explosives terrorist plot, and (2) how TSA monitored TSO compliance with passenger screening procedures. To conduct this work, GAO reviewed TSA documents, interviewed TSA officials and aviation security experts, and visited 25 airports of varying sizes and locations.
NTIS
Airline Operations; Commercial Aircraft; Passengers; Risk; Security; Transportation

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.

20070025194 Swales Aerospace, Hampton, VA, USA
An Application of CICCT Accident Categories to Aviation Accidents in 1988-2004
Evans, Joni K.; July 2007; 90 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL07AA00B
Report No.(s): NASA/CR-2007-214888; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025194

Interventions or technologies developed to improve aviation safety often focus on specific causes or accident categories. Evaluation of the potential effectiveness of those interventions is dependent upon mapping the historical aviation accidents into those same accident categories. To that end, the USA civil aviation accidents occurring between 1988 and 2004 (n=26,117) were assigned accident categories based upon the taxonomy developed by the CAST/ICAO Common Taxonomy Team (CICTT). Results are presented separately for four main categories of flight rules: Part 121 (large commercial air carriers), Scheduled Part 135 (commuter airlines), Non-Scheduled Part 135 (on-demand air taxi) and Part 91 (general aviation). Injuries and aircraft damage are summarized by year and by accident category.
Author
Aircraft Accidents; Flight Safety; Civil Aviation; Aircraft Safety; Damage; Injuries; Commercial Aircraft

20070025206 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

The Private Pilot Practical Test: Survey Results From Designated Pilot Examiners and Newly Certificated Private Pilots

Hackworth, Carla A.; King, S. Janine; Cruz, Crystal; Thomas, Suzanne; Roberts, Carrie; Bates, Cristina; Moore, Roger; June 2007; 28 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): AM-B-06-HRR-521

Report No.(s): DOT/FAA/AM-07/17; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration (FAA) considers the reduction of general aviation (GA) accidents to be one of its highest priorities. Ensuring that pilot applicants receive complete and thorough practical examinations that are in full compliance with the appropriate practical test standards is one of the many safeguards in place to improve general aviation safety. Designated Pilot Examiners (DPEs), FAA aviation safety inspectors, and schools with examining authority operating under Title 14 of the Code of Federal Regulations (CFR) Part 141 serve as gatekeepers of aviation safety by ensuring that only pilot applicants that meet all of the regulatory certification requirements are issued pilot certificates. This study used two separate survey instruments to assess practical test examination practices nationally by soliciting feedback from DPEs and newly certificated GA pilots. The first instrument surveyed DPEs. We mailed 848 surveys to DPEs across the USA and screened returned surveys to include only those who had conducted at least one first-time private Pilot Airplane Single-Engine-Land (P-ASEL) practical test in the previous 12 months. Five hundred-forty respondents (64% response rate) met this criterion for inclusion in this paper. The final sample included experienced pilot examiners where over 64% indicated they had been an examiner for at least 11 years. Within the 12 months previous to completing the survey, pilot examiners conducted an average of 30 first-time private P-ASEL category and class rating tests, with 59% indicating that at least 81% of their first-time applicants passed. Nearly 99% of examiners reported using a written plan of action when conducting a practical test. The second instrument surveyed newly certificated GA pilots about their training and practical testing experiences. We mailed 4,216 surveys to pilots who were newly certificated on or after August 1, 2005 for the P-ASEL category and class rating. Returned surveys were screened to include only pilots who were rested by an examiner (includes ASIs, designated pilot examiners, and those tested by both a final phase check and examiner) and to include only those who had no previous private P-ASEL category and class rating practical test failures. This left 1,112 surveys (26% response rate) for reporting purposes. The average amount of time between the certification date and survey completion was less than three months (M=2.7 months; N=986). Source of training for pilots was split across pilot schools (Part 141 and non-Part 141: 43%), and independent flight instructors (57%). The majority of pilots were positive about the quality of flight instruction they received, with more than 80% giving high marks. When commenting upon their practical test experience, more than 95% reported that they were tested on stalls (power-on and power-off, spin awareness (82%), aeronautical decision-making (85%), and in-flight collision avoidance (82%).

Author

Aircraft Pilots; Aircraft Safety; Certification; Decision Making; Education; Feedback; Flight Safety; General Aviation Aircraft; Surveys

20070025335 Civil Aeromedical Inst., Oklahoma City, OK USA

Aircraft Accidents and Incidents Associated with Visual Disturbances from Bright Lights during Nighttime Flight Operations

Nakagawara, Van B; Montgomery, Ron W; Wood, Kathryn J; Nov 2006; 9 pp.; In English

Report No.(s): AD-A465917; DOT/FAA/AM-06/28; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Preservation of optimal night vision is important for pilots operating an aircraft at night. When the eyes are adapted to low-light levels, exposure to bright light can result in temporary visual impairment due to glare, flashblindness, and afterimages. The purpose of this study was to investigate operational problems experienced by civilian airmen exposed to bright light sources while performing nighttime aviation activities. The National Transportation Safety Board (NTSB) Aviation Accident and Incident Data System (January 1982 to February 2005) and the Federal Aviation Administration (FAA) Accident/Incident Data System (January 1978 to January 2005) were queried using terms associated with night vision problems. Accident and incident reports annotated with one or more of these terms were reviewed to determine whether vision difficulties resulting from exposure to bright lights contributed to the mishap. Results showed that vision problems resulting from exposure to bright lights at night were found to have contributed to 58 mishaps. Reports included 30 (NTSB) accidents and 28 (FAA/NTSB) incidents. The majority of accidents (57%) occurred during the approach and landing phase of flight. Incidents occurred most frequently while taxiing (54%) and during approach and landing (36%). The authors conclude that exposure to glare sources at night can affect an aviator's dark adaptation and has contributed to aviation accidents and incidents. The study of these events assists airport authorities in defining appropriate modification of existing airport lighting

systems and eliminating hazardous lighting near flight paths and surface movement areas (e.g., ramps, taxiways, runways). Preventive measures for avoiding similar glare conditions that impair vision and compromise the safety of aviation operations at night will be discussed.
DTIC
Aircraft Accidents; Brightness; Flight Operations; Light Sources; Luminaires; Night; Pilots; Visual Perception

20070025409 Air Force Research Lab., Wright-Patterson AFB, OH USA
IEIST Guardian Agent and Force Template Technologies Provide Warfighter Connectivity to the Global Information Grid
Satterthwaite, Charles P; Corman, David E; Martens, Eric J; Jun 2004; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465886; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Thirteen years after Desert Storm, conduct of Time Critical Target (TCT) operations remains one of the most difficult challenges facing US military forces. While a variety of DoD and DARPA programs are addressing technologies to locate and identify TCTs, finding the target candidate is only one part of the problem. Success will only occur when we shorten the entire 'kill chain', and operate within the enemy's maneuver timeline. The automated exchange and processing of battlefield information is critical to achieving viable decision timelines in this arena. The situation demands a secure, robust network backbone supporting automated decision aids designed to execute commander's guidance. Critical decision aids include the ability to monitor and exchange critical tactical information, to evaluate real-time intelligence and generate actionable Target Evidence Files and to re-assign en-route tactical and support assets to higher value tasks.
DTIC
Decision Support Systems; Military Operations; Templates

20070025530 NASA Johnson Space Center, Houston, TX, USA
Space Rescue
Muratore, John F.; [2007]; 22 pp.; In English; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025530

Space Rescue has been a topic of speculation for a wide community of people for decades. Astronauts, aerospace engineers, diplomats, medical and rescue professionals, inventors and science fiction writers have all speculated on this problem. Martin Caidin's 1964 novel Marooned dealt with the problems of rescuing a crew stranded in low earth orbit. Legend at the Johnson Space Center says that Caidin's portrayal of a Russian attempt to save the American crew played a pivotal role in convincing the Russians to join the real joint Apollo-Soyuz mission. Space Rescue has been a staple in science fiction television and movies portrayed in programs such as Star Trek, Stargate-SG1 and Space 1999 and movies such as Mission To Mars and Red Planet. As dramatic and as difficult as rescue appears in fictional accounts, in the real world it has even greater drama and greater difficulty. Space rescue is still in its infancy as a discipline and the purpose of this chapter is to describe the issues associated with space rescue and the work done so far in this field. For the purposes of this chapter, the term space rescue will refer to any system which allows for rescue or escape of personnel from situations which endanger human life in a spaceflight operation. This will span the period from crew ingress prior to flight through crew egress postlanding. For the purposes of this chapter, the term primary system will refer to the spacecraft system that a crew is either attempting to escape from or from which an attempt is being made to rescue the crew.
Derived from text
Rescue Operations; Aerospace Safety; Manned Space Flight; Escape Systems; Astronauts

20070025565 BBWI, Idaho Falls, ID, USA
Method and Apparatus for Detecting Concealed Weapons
Kotter, D. K., Inventor; Fluck, F. D., Inventor; 13 Feb 04; 20 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727
Patent Info.: Filed Filed 13 Feb 04; US-Patent-Appl-SN-10-778 790
Report No.(s): PB2007-104712; No Copyright; Avail.: CASI: A03, Hardcopy

Apparatus for classifying a ferromagnetic object within a sensing area may comprise a magnetic field sensor that produces magnetic field data. A signal processing system operatively associated with the magnetic field sensor comprises a neural network. The neural network compares the magnetic field data with magnetic field data produced by known ferromagnetic objects to make a probabilistic determination as to the classification of the ferromagnetic object within the sensing area. A user

interface operatively associated with the signal processing system produces a user-discernable output indicative of the probabilistic determination of the classification of the ferromagnetic object within a sensing area.
NTIS
Detection; Weapons; Ferromagnetic Materials; Metals

20070026158 Government Accountability Office, Washington, DC, USA
Military Base Closures: Management Strategy Needed to Mitigate Challenges and Improve Communication to Help Ensure Timely Implementation of Air National Guard Recommendations
May 2007; 55 pp.; In English
Report No.(s): PB2007-108416; GAO-07-641; No Copyright; Avail.: CASI: A04, Hardcopy

The 2005 Base Realignment and Closure (BRAC) recommendations affected 62 percent of the flying units in the Air National Guard (ANG) with 14 units losing their flying mission, and others converting from one type of aircraft to another, or increasing or decreasing assigned aircraft. To implement the recommendations, ANG must relocate hundreds of aircraft and retrain or recruit about 15,000 personnel by 2011. In this report, GAO addresses the status of efforts to implement the ANG BRAC actions. GAO's objectives were to determine (1) the process to provide replacement missions to units losing flying missions, (2) the progress and challenges in implementing the BRAC actions, and (3) changes to the cost and savings estimates. This report, prepared under the Comptroller General's authority to conduct evaluations on his own initiative, is one in a series of reports related to 2005 BRAC recommendations. GAO conducted its work at the Air Force, ANG headquarters, and in 11 states affected by BRAC 2005.
NTIS
Armed Forces (United States); Management Planning; Military Operations; Strategy

20070026265 Department of Transportation, Washington, DC, USA
Office of the Inspector General Audit Report. Accountability and Use of Airport Revenues. Queen City Municipal Airport. Federal Aviation Administration
Jan. 30, 1997; 17 pp.; In English
Report No.(s): PB2007-109969; R3-FA-7-002; No Copyright; Avail.: CASI: A03, Hardcopy

The objective of the audit was to determine the validity of allegations that the city of Allentown, Pennsylvania (Sponsor), diverted airport revenues. Specifically, airport users alleged the Sponsor (i) sold Queen City Municipal Airport (airport) land without proper credit to the Airport Fund, (ii) overcharged the Airport Fund for services, (iii) allowed commercial businesses to use airport land without paying rental fees, (iv) deposited the fixed-based operator's rental payments into the General Fund, and (v) used airport land and facilities for non-aviation purposes without paying rental fees. In reviewing the allegations, we also evaluated Federal Aviation Administration (FAA) monitoring of the Sponsor to ensure airport generated revenues were used for capital improvements and operating expenses of the airport.
NTIS
Airports; Revenue

20070026300 Department of Transportation, Washington, DC, USA
Office of the Inspector General Audit Report. Pilot Examiner Program. Federal Aviation Administration
Oct. 22, 1996; 27 pp.; In English
Report No.(s): PB2007-109968; R2-FA-7-001; No Copyright; Avail.: CASI: A03, Hardcopy

The objective of this survey was to determine the effectiveness of the Federal Aviation Administration's (FAA) procedures and controls over (i) training and designating pilot examiners, (ii) tracking pilot examiner performance, (iii) maintaining integrity of the pilot examiner's administration of pilot tests, and (iv) removal of unqualified pilot examiners.
NTIS
Personnel; Pilot Performance; Management

20070026301 Chicago Univ., IL, USA
Have International Transportation Costs Declined
Hummels, D.; Jul. 1999; 42 pp.; In English
Report No.(s): PB2007-109960; No Copyright; Avail.: CASI: A03, Hardcopy

While the precise causes of post-war trade growth are not well understood, declines in transport costs top the lists of usual suspects. However, there is remarkably little systematic evidence documenting the decline. This paper provides a detailed

accounting of the time-series pattern of shipping costs. Direct evidence from an eclectic mix of data shows that ocean freight rates have increased while air freight rates have declined rapidly. Indirect evidence suggests that the cost of overland transport has declined relative to ocean transport. For all modes, the freight costs associated with increased distance have declined. Data on the changing composition of trade are broadly consistent with these changes in relative prices.
NTIS
Costs; Transportation

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

20070026247 NASA Langley Research Center, Hampton, VA, USA
Small Aircraft RF Interference Path Loss Measurements
Nguyen, Truong X.; Koppen, Sandra V.; Ely, Jay J.; Szatkowski, George N.; Mielnik, John J.; Salud, Maria Theresa P.; August 2007; 121 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): FAA/NASA-DFTA03-96-X-90001; WBS 645846.02.07.07.05
Report No.(s): NASA/TP-2007-214891; L-19370; Copyright; Avail.: CASI: A06, Hardcopy

Interference to aircraft radio receivers is an increasing concern as more portable electronic devices are allowed onboard. Interference signals are attenuated as they propagate from inside the cabin to aircraft radio antennas mounted on the outside of the aircraft. The attenuation level is referred to as the interference path loss (IPL) value. Significant published IPL data exists for transport and regional category airplanes. This report fills a void by providing data for small business/corporate and general aviation aircraft. In this effort, IPL measurements are performed on ten small aircraft of different designs and manufacturers. Multiple radio systems are addressed. Along with the typical worst-case coupling values, statistical distributions are also reported that could lead to more meaningful interference risk assessment.
Author
General Aviation Aircraft; Radio Frequency Interference; Avionics; Aircraft Communication

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.

20070025274 Naval Research Lab., Washington, DC USA
Multiple Quantum Well Retromodulators for Low Power, Covert Infrared Data Links
Gilbreath, G C; Meehan, Timothy J; Walters, Robert J; Mozersky, Sharon; Ferraro, Mena; Messenger, Scott R; Rabinovich, William S; Jan 2001; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A464919; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we describe progress in the development of the Multiple Quantum Well retromodulator for compact, covert data transfer which is uniquely suited to unmanned vehicles. Device power draw is quite low and can be sun-powered with possible laser light augmentation in some strategies. Carrier wavelengths are in the infrared so interference is not an issue and shutter speeds can support up to 10 Mbps. Progress in demonstrating solar-powered burst communications for a UAV in flight will be presented. Alternative power schemes using photovoltaics will be presented to show how a low cost, low power communications terminal can be configured.
DTIC
Data Links; Infrared Radiation; Optical Communication; Quantum Wells

20070025285 Ohio State Univ., Columbus, OH USA

Output Feedback Control and Sensor Placement for a Hypersonic Vehicle Model (Preprint)

Jankovsky, Pete; Sigthorsson, David O; Serrani, Andrea; Yurkovich, Stephan; Bolender, Michael A; Doman, David B; Dec 2006; 25 pp.; In English

Contract(s)/Grant(s): F33615-01-2-3154

Report No.(s): AD-A465289; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper addresses issues related to output feedback control, including sensor placement, for a model of an air-breathing hypersonic vehicle. The model presents a number of control challenges, in particular because of strong couplings between the propulsive and aerodynamic forces. Because of the vehicle's low weight, slenderness, and length, the vehicle's flexibility has a large impact on stability and control of the vehicle. Two output feedback control methods are developed. One applies reconstruction of the flexible body system states, toward applications of state feedback control. The other uses a robust design that does not rely on an observer to ensure stabilization and performance throughout a given flight envelope. A rate gyroscope and an accelerometer have been modeled, incorporating the flexible effects, and strategies for sensor placement have been developed for the hypersonic vehicle model to enhance observability or to preserve certain system structures that are favorable for robust control design. Simulation results are provided to demonstrate the sensor placement strategies and output feedback control performances.

DTIC

Aerodynamic Forces; Detectors; Feedback Control; Flight Control; Hypersonic Vehicles

20070025472 Honeywell International, Inc., Morristown, NJ, USA

Flight Control Actuation System

Wingett, Paul T., Inventor; Gaines, Louie T., Inventor; Evans, Paul S., Inventor; Kern, I., Inventor; 16 Jun. 2005; 16 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NCC8-115

Patent Info.: Filed 22 Jun. 2004; US-Patent-Appl-10/874729; US 2005/0127241

Report No.(s): PB2007-102551; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070025472

A flight control actuation system comprises a controller, electromechanical actuator and a pneumatic actuator. During normal operation, only the electromechanical actuator is needed to operate a flight control surface. When the electromechanical actuator load level exceeds 40 amps positive, the controller activates the pneumatic actuator to offset electromechanical actuator loads to assist the manipulation of flight control surfaces. The assistance from the pneumatic load assist actuator enables the use of an electromechanical actuator that is smaller in size and mass, requires less power, needs less cooling processes, achieves high output forces and adapts to electrical current variations. The flight control actuation system is adapted for aircraft, spacecraft, missiles, and other flight vehicles, especially flight vehicles that are large in size and travel at high velocities.

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

Actuators; Flight Control; Aircraft Control; Control Systems Design

20070025531 Naval Air Warfare Center, Patuxent River, MD, USA

Helicopter Messenger Cable Illumination

Kolliopoulos, D., Inventor; 23 Apr 04; 6 pp.; In English

Patent Info.: Filed Filed 23 Apr 04; US-Patent-Appl-SN-10-834 154

Report No.(s): PB2007-104171; No Copyright; Avail.: CASI: A02, Hardcopy

An apparatus for illuminating the messenger cable of a helicopter includes a helicopter having a floor and including a RAST system; the RAST system comprising a messenger cable with a connector attached to one end for lowering to a landing deck of a ship, the RAST system further comprising a winch for raising and lowering the messenger cable, a housing attached to the floor of the helicopter through which the messenger cable is raised and lowered, a top of the housing including an opening through which the messenger cable passes, a sheave attached to the top of the housing and over which the messenger cable passes and a pulley attached to the housing and over which the messenger cable passes; a luminescent cover attached to a portion of the messenger cable adjacent the connector; a light mounted on the top of the housing for charging the luminescent cover; and a limit switch mounted on top of the housing for stopping upward motion of the messenger cable.

NTIS

Helicopters; Luminescence; Cables

20070026121 Department of Transportation, Washington, DC, USA
Office of the Inspector General Audit Report. Federal Air Marshal Program. Federal Aviation Administration
Apr. 17, 1997; 24 pp.; In English
Report No.(s): PB2007-109970; R9-FA-7-006; No Copyright; Avail.: CASI: A03, Hardcopy

The objective of the audit was to evaluate the effectiveness of Federal Aviation Administration's (FAA) Federal Air Marshal (FAM) Program in providing for in flight security requirements of high risk or special circumstance U.S. aircarrier flights.

NTIS
Security; Air Transportation

20070026140 NASA Dryden Flight Research Center, Edwards, CA, USA
Aeroelastic Model Structure Computation for Envelope Expansion
Kukreja, Sunil L.; July 2007; 17 pp.; In English; AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 23-26 April 2007, Honolulu, HI, USA; Original contains black and white illustrations
Report No.(s): NASA/TM-2007-214623; H-2736; AIAA Paper 2007-2317; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070026140

Structure detection is a procedure for selecting a subset of candidate terms, from a full model description, that best describes the observed output. This is a necessary procedure to compute an efficient system description which may afford greater insight into the functionality of the system or a simpler controller design. Structure computation as a tool for black-box modeling may be of critical importance in the development of robust, parsimonious models for the flight-test community. Moreover, this approach may lead to efficient strategies for rapid envelope expansion that may save significant development time and costs. In this study, a least absolute shrinkage and selection operator (LASSO) technique is investigated for computing efficient model descriptions of non-linear aeroelastic systems. The LASSO minimises the residual sum of squares with the addition of an l(Sub 1) penalty term on the parameter vector of the traditional l(sub 2) minimisation problem. Its use for structure detection is a natural extension of this constrained minimisation approach to pseudo-linear regression problems which produces some model parameters that are exactly zero and, therefore, yields a parsimonious system description. Applicability of this technique for model structure computation for the F/A-18 (McDonnell Douglas, now The Boeing Company, Chicago, Illinois) Active Aeroelastic Wing project using flight test data is shown for several flight conditions (Mach numbers) by identifying a parsimonious system description with a high percent fit for cross-validated data.

Author
Aircraft Models; Nonlinearity; Dynamic Models; Mathematical Models; Aircraft Design; Design Optimization; Aeroelasticity

20070026298 California Univ., Oakland, CA, USA
Solar Thermal Aircraft
Bennett, C. L., Inventor; 30 Apr 04; 22 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG48
Patent Info.: Filed Filed 30 Apr 04; US-Patent-Appl-SN-10-835-665
Report No.(s): PB2007-104035; No Copyright; Avail.: CASI: A03, Hardcopy

A solar thermal powered aircraft powered by heat energy from the sun. A heat engine, such as a Stirling engine, is carried by the aircraft body for producing power for a propulsion mechanism, such as a propeller. The heat engine has a thermal battery in thermal contact with it so that heat is supplied from the thermal battery. A solar concentrator, such as reflective parabolic trough, is movably connected to an optically transparent section of the aircraft body for receiving and concentrating solar energy from within the aircraft. Concentrated solar energy is collected by a heat collection and transport conduit, and heat transported to the thermal battery. A solar tracker includes a heliostat for determining optimal alignment with the sun, and a drive motor actuating the solar concentrator into optimal alignment with the sun based on a determination by the heliostat.

NTIS
Heat Engines; Solar Thermal Propulsion; Heliostats; Sun; Aircraft Engines

20070028417 NASA Dryden Flight Research Center, Edwards, CA, USA
Aerodynamic Effects of a 24-Foot, Multisegmented Telescoping Nose Boom on an F-15B Airplane
Cumming, Stephen B.; Smith, Mark S.; Frederick, Michael A.; August 20, 2007; 18 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 20 Aug. 2007, Hilton Head, SC, USA; Original contains color illustrations
Report No.(s): AIAA Paper-2007-6638; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070028417

An experimental multisegmented telescoping nose boom has been installed on an F-15B airplane to be tested in a flight

environment. The experimental nose boom is representative of one that could be used to tailor the sonic boom signature of an airplane such as a supersonic business jet. The nose boom consists of multiple sections and could be extended during flight to a length of 24 ft. The preliminary analyses indicated that the addition of the experimental nose boom could adversely affect vehicle flight characteristics and air data systems. Before the boom was added, a series of flights was flown to update the aerodynamic model and characterize the air data systems of the baseline airplane. The baseline results have been used in conjunction with estimates of the nose boom s influence to prepare for a series of research flights conducted with the nose boom installed. Data from these flights indicate that the presence of the experimental boom reduced the static pitch and yaw stability of the airplane. The boom also adversely affected the static-position error of the airplane but did not significantly affect angle-of-attack or angle-of-sideslip measurements. The research flight series has been successfully completed.
Author
F-15 Aircraft; Noses (Forebodies); Flight Tests; Sonic Booms; Folding Structures; Aerodynamic Characteristics

20070028418 NASA Dryden Flight Research Center, Edwards, CA, USA
Autonomous Airborne Refueling Demonstration: Phase I Flight-Test Results
Dibley, Ryan P.; Allen, Michael J.; Nabaa, Nassib; August 20, 2007; 19 pp.; In English; 2007 Atmospheric Flight Mechanics Conference and Exhibit/AIAA, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color illustrations
Report No.(s): AIAA Paper-2007-6639; Copyright; Avail.: CASI: A03, Hardcopy

The first phase of the Autonomous Airborne Refueling Demonstration (AARD) project was completed on August 30, 2006. The goal of this 15-month effort was to develop and flight-test a system to demonstrate an autonomous refueling engagement using the Navy style hose-and-drogue air-to-air refueling method. The prime contractor for this Defense Advanced Research Projects Agency (DARPA) sponsored program was Sierra Nevada Corporation (SNC), Sparks, Nevada. The responsible flight-test organization was the National Aeronautics and Space Administration (NASA) Dryden Flight Research Center (DFRC), Edwards, California, which also provided the F/A-18 receiver airplane (McDonnell Douglas, now The Boeing Company, Chicago, Illinois). The B-707-300 tanker airplane (The Boeing Company) was contracted through Omega Aerial Refueling Services, Inc., Alexandria, Virginia, and the optical tracking system was contracted through OCTEC Ltd., Bracknell, Berkshire, UK. Nine research flights were flown, testing the functionality and performance of the system in a stepwise manner, culminating in the plug attempts on the final flight. Relative position keeping was found to be very stable and accurate. The receiver aircraft was capable of following the tanker aircraft through turns while maintaining its relative position. During the last flight, six capture attempts were made, two of which were successful. The four misses demonstrated excellent characteristics, the receiver retreating from the drogue in a controlled, safe, and predictable manner that precluded contact between the drogue and the receiver aircraft. The position of the receiver aircraft when engaged and in position for refueling was found to be 5.5 to 8.5 ft low of the ideal position. The controller inputs to the F/A-18 were found to be extremely small.
Author
Air to Air Refueling; Autonomy; Flight Tests; F-18 Aircraft; Tanker Aircraft

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.

20070026136 NASA Dryden Flight Research Center, Edwards, CA, USA
Ikhana: A NASA UAS Supporting Long Duration Earth Science Missions
Cobleigh, B.; June 25, 2007; 4 pp.; In English; 32nd International Symposium on Remote Sensing of Environment, 25-29 June 2007, San Jose, Costa Rica; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070026136

The NASA Ikhana unmanned aerial vehicle (UAV) is a General Atomics Aeronautical Systems Inc. (San Diego, California) MQ-9 Predator-B modified to support the conduct of Earth science missions for the NASA Science Mission Directorate and, through partnerships, other government agencies and universities. It can carry over 2000 lb of experiment payloads in the avionics bay and external pods and is capable of mission durations in excess of 24 hours at altitudes above 40,000 ft. The aircraft is remotely piloted from a mobile ground control station (GCS) that is designed to be deployable by air, land, or sea. On-board support capabilities include an instrumentation system and an Airborne Research Test System

(ARTS). The Ikhana project will complete GCS development, science support systems integration, external pod integration and flight clearance, and operations crew training in early 2007. A large-area remote sensing mission is currently scheduled for Summer 2007.
Author
Avionics; Ground Based Control; Pilotless Aircraft; Remote Sensing; Global Positioning System

07
AIRCRAFT PROPULSION AND POWER

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

20070025223 NASA Glenn Research Center, Cleveland, OH, USA
Investigation of Current Methods to Identify Helicopter Gear Health
Dempsey, Paula J.; Lewicki, David G.; Le, Dy D.; July 2007; 22 pp.; In English; 2007 Aerospace Conference, 3-10 Mar. 2007, Big Sky, MT, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 877868.02.07.03.01.01
Report No.(s): NASA/TM-2007-214664; E-15799; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025223

This paper provides an overview of current vibration methods used to identify the health of helicopter transmission gears. The gears are critical to the transmission system that provides propulsion, lift and maneuvering of the helicopter. This paper reviews techniques used to process vibration data to calculate conditions indicators (CI's), guidelines used by the government aviation authorities in developing and certifying the Health and Usage Monitoring System (HUMS), condition and health indicators used in commercial HUMS, and different methods used to set thresholds to detect damage. Initial assessment of a method to set thresholds for vibration based condition indicators applied to flight and test rig data by evaluating differences in distributions between comparable transmissions are also discussed. Gear condition indicator FM4 values are compared on an OH58 helicopter during 14 maneuvers and an OH58 transmission test stand during crack propagation tests. Preliminary results show the distributions between healthy helicopter and rig data are comparable and distributions between healthy and damaged gears show significant differences.
Author
Systems Health Monitoring; Helicopter Propeller Drive; Transmissions (Machine Elements); Vibration; OH-58 Helicopter; General Overviews

20070025312 TDA Research, Inc., Wheat Ridge, CO USA
MEMS Technology for Jet Fuel Atomization
Nabity, James; Rooney, Sean; Sep 2, 2004; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-01-M-0036; N00014-01-C-0457
Report No.(s): AD-A465815; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this research was to develop a microelectromechanical system (MEMS) atomizer which could produce small (less than 50 micron) droplets in order to improve gas turbine flameholding and reduce emissions.
DTIC
Atomizing; Fuel Injection; Jet Engine Fuels; Microelectromechanical Systems

20070025571 McNees, Wallace and Nurick, Harrisburg, PA, USA; General Electric Co., Schenectady, NY, USA
Use of Biased Fabric to Improve Properties of SiC/SiC Ceramic Composites for Turbine Engine Components
Subramanian, S., Inventor; Steibel, J. D., Inventor; Carper, D. M., Inventor; Flandermeyer, B. K., Inventor; 23 Feb 04; 13 pp.; In English
Contract(s)/Grant(s): N00421-00-3-0536
Patent Info.: Filed Filed 23 Feb 04; US-Patent-Appl-SN-10-784 734
Report No.(s): PB2007-104724; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is a ceramic matrix composite turbine engine component, wherein the component has a direction of maximum tensile stress during normal engine operation. The component comprises a plurality of biased ceramic plies, wherein each biased ply comprises ceramic fiber tows, the tows being woven in a first warp direction and a second weft

direction, the second weft direction lying at a preselected angular orientation with respect to the first warp direction, wherein a greater number of tows are woven in the first warp direction than in the second weft direction, and wherein a number of tows in the second weft direction allows the biased plies to maintain their structural integrity when handled. The plurality of biased plies are laid up in a preselected arrangement to form the component, and a preselected number of the plurality of biased plies are oriented such that the orientation of the first warp direction of the preselected number of biased plies lie about in the direction of maximum tensile stress during normal engine operation. A coating is applied to the plurality of biased plies. The coating is selected from the group consisting of BN, SiC, and combinations thereof. A ceramic matrix material lies in interstitial regions between the tows of each biased ply and the interstitial region between the biased plies.
NTIS
Bias; Ceramic Matrix Composites; Engine Parts; Fabrics; Turbine Engines; Silicon Carbides

20070026148 Carlson, Gaskey and Olds, P.C., Birmingham, MI, USA
Air Assist Fuel Injector for a Combustor
Graves, C. B., Inventor; DeSalle, S. A., Inventor; 30 Apr 04; 12 pp.; In English
Contract(s)/Grant(s): N0019-02-C-3003
Patent Info.: Filed Filed 30 Apr 04; US-Patent-Appl-SN-10-837-305
Report No.(s): PB2007-104044; No Copyright; Avail.: CASI: A03, Hardcopy

A fuel injector system provides an air assist fuel nozzle which includes a fuel shroud and an air portion. Air passes around the fuel shroud to air jets in the air portion to provide a focused application of air directly onto a fuel spray from each of a multiple of main fuel jets to impart additional velocity to the fuel as it is flowing out of the fuel nozzle. The air jets increase the resulting fuel spray velocity to a level high enough to reach a prefilmer wall of a swirler even during snap deceleration conditions.
NTIS
Air Flow; Combustion Chambers; Fuel Injection

20070026150 Hopewell International, Inc., Morristown, NJ, USA
Multiple Electric Fuel Metering Systems for Gas Turbine Applications
Buchman, G., Inventor; Anson, B., Inventor; 29 Apr 04; 11 pp.; In English
Contract(s)/Grant(s): DAAE07-02-3-0002
Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-836-017
Report No.(s): PB2007-104043; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides a multiple manifold fuel metering system with a separate motor, pump, and shut-off/purge valve for each manifold. The present invention may be used for metering fuel to any engine, especially a gas turbine engine. The fuel metering system of the present invention has the capability of independently controlling fuel flow during transitions in engine operation or allowing fuel to flow simultaneously through all manifolds to prevent blowout, optimizing combustion temperature distributions, or minimizing combustion emissions. Brushless DC variable speed electric motors may be used to drive pumps with highly accurate speed control to accurately control fuel flow rate to each of a plurality of manifolds of a fuel metering system. With brushless DC motors, motor speed may be controlled within a revolution for smoothing fuel delivery to an engine.
NTIS
Flowmeters; Fuel Systems; Gas Turbines; Mechanical Engineering

20070026152 Hopewell International, Inc., Morristown, NJ, USA
Uniform Effusion Cooling Method for a Can Combustion Chamber
Nguyen, L. D., Inventor; Kujala, S., Inventor; Walhhood, G., Inventor; Critchely, L., Inventor; Woodcock, G. O., Inventor; 28 Apr 04; 14 pp.; In English
Contract(s)/Grant(s): N00019-02-C-3002
Patent Info.: Filed Filed 28 Apr 04; US-Patent-Appl-SN-10-835-169
Report No.(s): PB2007-104042; No Copyright; Avail.: CASI: A03, Hardcopy

A dome for a combustion chamber may have a plurality of effusion holes therein to provide efficient cooling while preventing carbon formation on the dome and chamber walls of the combustion chamber. Conventional dome cooling designs, using dome louvers, for example, may become corroded and/or may allow for ingestion of carbon particles that may build up and eventually separate from the dome. Furthermore, the dome cooling design of the present invention allows for the use of

a lower profile dome as compared with conventional domes, thereby maximizing liner volume in the constrained combustion envelope while reducing combustor case weight. Additionally, the dome effusion cooling design of the present invention requires the use of less thermal barrier coating, as compared to conventional designs, in order to minimize thermal variation within the dome and between the dome and the combustor wall. A method for uniformly cooling a dome of a combustion chamber of an engine is also disclosed.
NTIS
Combustion Chambers; Cooling; Cans; Uniform Flow

20070026162 Swedish Defence Research Establishment, Linkoeping, Sweden
Multi Wavelength Laser Beam Propagation Close to a Down-Scaled Jet Engine Exhaust
Henriksson, M.; Gustafsson, O.; Sjoeqvist, L.; May 2006; 40 pp.; In English
Report No.(s): PB2007-106483; FOI-R-2002-SE; No Copyright; Avail.: CASI: A03, Hardcopy

Laser beam propagation in severe environments such as the turbulent flow near an aircraft needs to be studied to predict the performance of laser countermeasure systems. The jet engine plume may introduce severe perturbations on installed countermeasure systems such as directed infrared countermeasures (DIRCM). Experimental studies of laser beam propagation close to engine plumes provide knowledge and understanding for predicting and optimizing system performance. In this work multi wavelength laser beam propagation experiments were carried out close to a down-scaled jet engine exhaust. The experimental studied parameters included e.g. laser beam wander, intensity variations, temporal characteristics and phase distortions. In addition the experimental results were discussed in relations to applications such as DIRCM and active imaging. Ideas for improving modeling efforts of laser beam propagation in close vicinity of turbulent regions close to jet engine plume were considered.
NTIS
Exhaust Emission; Jet Engines; Laser Beams

20070026169 Armstrong Teasdale, LLP, Saint Louis, MO, USA
Methods and Apparatus for Assembling Gas Turbine Engines
Czachor, R. P., Inventor; 10 Feb 04; 7 pp.; In English
Contract(s)/Grant(s): DAAE07-00-C-N086
Patent Info.: Filed Filed 10 Feb 04; US-Patent-Appl-SN-10-775-859
Report No.(s): PB2007-104598; No Copyright; Avail.: CASI: A02, Hardcopy

A method for assembling a gas turbine engine includes coupling an outer structure within the gas turbine engine, wherein the outer structure includes a socket extending from a radially inner surface of the outer structure, and coupling an inner structure to the outer structure by inserting a radial pin through the inner structure and into the socket such that the inner structure is aligned axially, circumferentially, and with respect to an engine centerline axis extending through the gas turbine engine.
NTIS
Gas Turbine Engines; Engine Parts

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)*.

20070026241 NASA Langley Research Center, Hampton, VA, USA
Prospects for Nonlinear Laser Diagnostics in the Jet Noise Laboratory
Herring, Gregory C.; Hart, Roger C.; Fletcher, mark T.; Balla, R. Jeffrey; Henderson, Brenda S.; August 2007; 21 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 984754.02.07.07.21.33
Report No.(s): NASA/TM-2007-214893; L-19376; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070026241

Two experiments were conducted to test whether optical methods, which rely on laser beam coherence, would be viable for off-body flow measurement in high-density, compressible-flow wind tunnels. These tests measured the effects of large,

unsteady density gradients on laser diagnostics like laser-induced thermal acoustics (LITA). The first test was performed in the Low Speed Aeroacoustics Wind Tunnel (LSAWT) of NASA Langley Research Center's Jet Noise Laboratory (JNL). This flow facility consists of a dual-stream jet engine simulator (with electric heat and propane burners) exhausting into a simulated flight stream, reaching Mach numbers up to 0.32. A laser beam transited the LSAWT flow field and was imaged with a high-speed gated camera to measure beam steering and transverse mode distortion. A second, independent test was performed on a smaller laboratory jet (Mach number < 1.2 and mass flow rate < 0.1 kg/sec). In this test, time-averaged LITA velocimetry and thermometry were performed at the jet exit plane, where the effect of unsteady density gradients is observed on the LITA signal. Both experiments show that LITA (and other diagnostics relying on beam overlap or coherence) faces significant hurdles in the high-density, compressible, and turbulent flow environments similar to those of the JNL.
Author
Aeroacoustics; Laser Beams; Lasers; Wind Tunnels; Thermoacoustic Effects; Beam Steering

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*.

20070025217 Barrios Technology, Inc., Houston, TX, USA
International Space Station Execution Replanning Process: Trends and Implications
McCormick, Robet J.; September 18, 2007; 23 pp.; In English; AIAA Space 2007 Conference and Exposition, 18-20 Sep. 2007, Long Beach, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS9-20000; NNJ06VA01C; Copyright; Avail.: CASI: A03, Hardcopy

International Space Station is a joint venture. Because of this, ISS execution planning- planning within the week for the ISS requires coordination across multiple partner, and the associated processes and tools to allow this coordination to occur. These processes and tools are currently defined and are extensively used. This paper summarizes these processes, and documents the current data trends associated with these processes and tools, with a focus on the metrics provided from the ISS Planning Product Change Request (PPCR) tool. As NASA's Vision for Space Exploration and general Human spaceflight trends are implemented, the probability of joint venture long duration programs such as ISS, with varying levels of intergovernmental and/or corporate partnership, will increase. Therefore, the results of this PPCR analysis serve as current Lessons learned for the ISS and for further similar ventures.
Derived from text
International Space Station; Trends; Mission Planning; Manned Space Flight; NASA Space Programs

20070025468 Johns Hopkins Univ., Laurel, MD, USA
Time of Flight System on a Chip
Daschalidis, N. P., Inventor; 29 Sep. 2005; 12 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAGw-4547; NAGw-58516
Patent Info.: Filed 10 Apr. 2003; US-Patent-Appl-10/511069; US 2005/0211893
Report No.(s): PB2007-105312; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025468

A CMOS time-of-flight 'TOF' system-on-a-chip 'SoC' for precise time interval measurement with low power consumption and high counting rate has been developed. The analog and digital TOF chip may include two Constant Fraction Discriminators 'CFDs' and a Time-to-Digital Converter 'TDC'. The CFDs can interface to start and stop anodes through two preamplifiers and perform signal processing for time walk compensation. The TDC digitizes the time difference with reference to an off-chip precise external clock. One TOF output is an 11-bit digital word and a valid event trigger output indicating a valid event on the 11-bit output bus.
Author
Chips; Patent Applications; Systems-on-a-Chip

13
ASTRODYNAMICS

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

20070025471 Alston and Bird, LLP, Charlotte, NC, USA

Method, Apparatus and Computer Program Product for Safe Exit Maneuver from Dimensionally Extended Rotating Space Vehicle

Kinstler, Gary A., Inventor; 13 Oct. 2005; 14 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS8-01099

Patent Info.: Filed 16 Mar. 2004; US-Patent-Appl-10/802021; US 2005/0224661

Report No.(s): PB2007-105842; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070025471

There is provided methods, apparatus, and computer program products for implementing a KINSTLER maneuver for an exit vehicle that is departing from a rotating space vehicle such that the exit vehicle does not contact the space vehicle during departure. A composite spin axis of the space vehicle is determined, which defines a plurality of spin axis planes that contain the exit vehicle along the exit flight path. The spin rate of the rotating space vehicle is determined about the composite spin axis, and the exit vehicle is launched from the space vehicle, providing the exit vehicle with a departure velocity having a V(sub S) component. Lateral thrust is applied to provide a lateral acceleration, which provides a turn rate of the exit vehicle's V(sub S) component in the spin axis plane about the composite spin axis that is proportionate to the spin rate of the rotating space vehicle.

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

Computer Programs; Rotating Bodies; Stationkeeping; Maneuvers

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*.

20070025336 Air Force Weather Agency, Offutt AFB, NE USA

The Mesoscale Forecasting Process: Applying the Next Generation Mesoscale Forecast

Naegelin, Calvin C; McCrone, Paul J; Oct 5, 2006; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465918; AFWA/TN-06/001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The weather forecast effort has progressed a long way past its embryonic stage of the barotropic forecast. Both computer power and our knowledge of atmospheric processes have increased substantially over the years, allowing for the classification of many weather phenomena into scales, including the global/hemispheric scale, the synoptic scale, the mesoscale, and the microscale. These scales represent the cascade of energy that occurs in the atmosphere, with hemispheric features providing energy for the synoptic scale, synoptic features providing energy for the mesoscale, and so forth. Many observation and modeling tools exist to aid the forecaster along the way, including RAOB soundings, satellite imagery, wind profiler data, radar data, lightning data, and model data, and all are useful in mesoscale forecasting. When performing a mesoscale forecast, however, it is prudent to use a mesoscale model, such as the Air Force Weather Agency's (AFWA) Weather Research and Forecasting (WRF) model.

DTIC

Forecasting; Mesometeorology; Mesoscale Phenomena; Meteorological Parameters; Models; Weather Forecasting

20070028416 NASA Dryden Flight Research Center, Edwards, CA, USA

Crew Exploration Vehicle Launch Abort System Flight Test Overview

Williams-Hayes, Peggy S.; August 20, 2007; 13 pp.; In English; AIAA Guidance, Navigation and Control Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color illustrations

Report No.(s): AIAA Paper-2007-6596; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070028416

The Constellation program is an organization within NASA whose mission is to create the new generation of spacecraft that will replace the Space Shuttle after its planned retirement in 2010. In the event of a catastrophic failure on the launch pad or launch vehicle during ascent, the successful use of the launch abort system will allow crew members to escape harm. The

Flight Test Office is the organization within the Constellation project that will flight-test the launch abort system on the Orion crew exploration vehicle. The Flight Test Office has proposed six tests that will demonstrate the use of the launch abort system. These flight tests will be performed at the White Sands Missile Range in New Mexico and are similar in nature to the Apollo Little Joe II tests performed in the 1960s. An overview of the launch abort system flight tests for the Orion crew exploration vehicle is given. Details on the configuration of the first pad abort flight test are discussed. Sample flight trajectories for two of the six flight tests are shown.
Author
Crew Exploration Vehicle; Flight Tests; General Overviews; Aborted Missions; Launch Vehicles

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*.

20070025130 NASA Johnson Space Center, Houston, TX, USA
Integrated Simulation Design Challenges to Support TPS Repair Operations
Quiocho, Leslie J.; Crues, Edwin Z.; Huynh, An; Nguyen, Hung T.; MacLean, John; August 15, 2005; 2 pp.; In English; AIAA Guidance, Navigation, and Control Conference and Exhibit, 15-18 August 2007, San Francisco, CA, USA; Copyright; Avail.: CASI: A01, Hardcopy

During the Orbiter Repair Maneuver (ORM) operations planned for Return to Flight (RTF), the Shuttle Remote Manipulator System (SRMS) must grapple the International Space Station (ISS), undock the Orbiter, maneuver it through a long duration trajectory, and orient it to an EVA crewman poised at the end of the Space Station Remote Manipulator System (SSRMS) to facilitate the repair of the Thermal Protection System (TPS). Once repair has been completed and confirmed, then the SRMS proceeds back through the trajectory to dock the Orbiter to the Orbiter Docking System. In order to support analysis of the complex dynamic interactions of the integrated system formed by the Orbiter, ISS, SRMS, and SSRMS during the ORM, simulation tools used for previous 'nominal' mission support required substantial enhancements. These upgrades were necessary to provide analysts with the capabilities needed to study integrated system performance. This paper discusses the simulation design challenges encountered while developing simulation capabilities to mirror the ORM operations. The paper also describes the incremental build approach that was utilized, starting with the subsystem simulation elements and integration into increasing more complex simulations until the resulting ORM worksite dynamics simulation had been assembled. Furthermore, the paper presents an overall integrated simulation V&V methodology based upon a subsystem level testing, integrated comparisons, and phased checkout.
Derived from text
Computerized Simulation; Thermal Protection; Spacecraft Maintenance; Space Shuttles; Orbital Servicing; International Space Station

20070025184 NASA Johnson Space Center, Houston, TX, USA
SRMS Assisted Docking and Undocking for the Orbiter Repair Maneuver
Quiocho, Leslie J.; Briscoe, Timothy J.; Schliesing, John A.; Braman, Julia M.; August 15, 2005; 2 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 15-18 August 2005, San Francisco, CA, USA; Copyright; Avail.: CASI: A01, Hardcopy

As part of the Orbiter Repair Maneuver (ORM) planned for Return to Flight (RTF) operations, the Shuttle Remote Manipulator System (SRMS) must undock the Orbiter, maneuver it through a complex trajectory at extremely low rates, present it to an EVA crewman at the end of the Space Station Remote Manipulator System to perform the Thermal Protection System (TPS) repair, and then retrace back through the trajectory to dock the Orbiter with the Orbiter Docking System (ODs). The initial and final segments of this operation involve the interaction between the SRMS, ISS, Orbiter and ODs. This paper first provides an overview of the Monte-Carlo screening analysis for the installation (both nominal and contingency), including the variation of separation distance, misalignment conditions, SRMS joint/brake parameter characteristics, and PRCS jet combinations and corresponding thrust durations. The resulting 'optimum' solution is presented based on trade studies between predicted capture success and integrated system loads. This paper then discusses the upgrades to the APAS math

model associated with the new SRMS assisted undocking technique and reviews simulation results for various options investigated for either the active and passive separation of the ISS from the Orbiter.
Author
Mathematical Models; Space Station Mobile Servicing System; Spacecraft Docking; Space Maintenance; Thermal Protection

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*.

20070025135 NASA Johnson Space Center, Houston, TX, USA
Orion Cislunar Guidance and Navigation
D'Souza, Christopher; Crain, Timothy; Clark, Fred C.; August 20, 2007; 13 pp.; In English; AIAA Guidance Navigation and Control Conference, 20-23 August 2007, Hilton Head, SC, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Orion vehicle is being designed to provide nominal crew transport to the lunar transportation stack in low Earth orbit, crew abort prior during transit to the moon, and crew return to Earth once lunar orbit is achieved. Design of guidance and navigation algorithms to perform maneuvers in support of these functions is dependent on the support provided by navigation infrastructure, the performance of the onboard GN&C system, and the choice of trajectory maneuver methodology for outbound and return mission phases. This paper documents the preliminary integrated analyses performed by members of the Orion Orbit GN&C System team investigating the navigation update accuracy of a modern equivalent to the Apollo era ground tracking network and the expected onboard dispersion and navigation errors during a lunar mission using a linear covariance error analysis technique.
Author
Low Earth Orbits; Cislunar Space; Lunar Orbits; Spacecrews; Navigation; Error Analysis

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance; 39 Structural Mechanics*; and *16 Space Transportation and Safety*.

20070025133 NASA Johnson Space Center, Houston, TX, USA
Orion Entry, Descent, and Landing Performance and Mission Design
Broome, Joel M.; Johnson, Wyatt; August 20, 2007; 12 pp.; In English; AIAA Guidance, Navigation and Control Conference, 20-23 August 2007, Hilton Head, SC, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025133

The Orion Vehicle is the next spacecraft to take humans into space and will include missions to ISS as well as missions to the Moon. As part of that challenge, the vehicle will have to accommodate multiple mission design concepts, since return from Low Earth Orbit and return from the Moon can be quite different. Commonality between the different missions as it relates to vehicle systems, guidance capability, and operations concepts is the goal. Several unique mission design concepts include the specification of multiple land-based landing sites for a vehicle with closed-loop direct and skip entry guidance, followed by a parachute descent and landing attenuation system. This includes the ability of the vehicle to accurately target and land at a designated landing site, including site location aspects, landing site size, and landing opportunities assessments. Analyses associated with these mission design and flight performance challenges and constraints will be discussed as well as potential operational concepts to provide feasibility and/or mission commonality.
Author
Mission Planning; Low Earth Orbits; Landing Sites; Flight Characteristics; Design Analysis; Landing Aids; Feedback Control

20070025134 NASA Johnson Space Center, Houston, TX, USA

Orion Rendezvous, Proximity Operations, and Docking Design and Analysis

D'Souza, Christopher; Hanak, F. Chad; Spehar, Pete; Clark, Fred D.; Jackson, Mark; August 20, 2007; 13 pp.; In English; AIAA Guidance, Navigation and Control Conference, 20-23 August 2007, Hilton Head, SC, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Orion vehicle will be required to perform rendezvous, proximity operations, and docking with the International Space Station (ISS) and the Earth Departure Stage (EDS)/Lunar Landing Vehicle (LLV) stack in Low Earth Orbit (LEO) as well as with the Lunar Landing Vehicle in Low Lunar Orbit (LLO). The RPOD system, which consists of sensors, actuators, and software is being designed to be flexible and robust enough to perform RPOD with different vehicles in different environments. This paper will describe the design and the analysis which has been performed to date to allow the vehicle to perform its mission. Since the RPOD design touches on many areas such as sensors selection and placement, trajectory design, navigation performance, and effector performance, it is inherently a systems design problem. This paper will address each of these issues in order to demonstrate how the Orion RPOD has been designed to accommodate and meet all the requirements levied on the system.

Author

Spacecraft Docking; Orbital Rendezvous; Control Equipment; Actuators; Lunar Orbits; Systems Engineering; Low Earth Orbits; Design Analysis

20070025192 NASA Glenn Research Center, Cleveland, OH, USA

Apollo Seals: A Basis for the Crew Exploration Vehicle Seals

Finkbeiner, Joshua R.; Dunlap, Patrick H., Jr.; Steinetz, Bruce M.; Daniels, Christopher C.; [2007]; 31 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The National Aeronautics and Space Administration is currently designing the Crew Exploration Vehicle (CEV) as a replacement for the Space Shuttle for manned missions to the International Space Station, as a command module for returning astronauts to the moon, and as an earth reentry vehicle for the final leg of manned missions to the moon and Mars. The CEV resembles a scaled-up version of the heritage Apollo vehicle; however, the CEV seal requirements are different than those from Apollo because of its different mission requirements. A review is presented of some of the seals used on the Apollo spacecraft for the gap between the heat shield and backshell and for penetrations through the heat shield, docking hatches, windows, and the capsule pressure hull.

Author

Reentry Vehicles; Hulls (Structures); Command Modules; Space Shuttle Missions; Seals (Stoppers)

20070026093 Kyushu Univ., Fukuoka, Japan

Investigation and Comparison between New Satellite Impact Test Results and NASA Standard Breakup Model

Sakuraba, K.; Tsuruda, Y.; Hanada, T.; Liou, J.-C.; Akahoshi, Y.; September 23, 2007; 12 pp.; In English; 2007 Hypervelocity Impact Symposium, 23-27 Sep. 2007, Williamsburg, VA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper summarizes two new satellite impact tests conducted in order to investigate on the outcome of low- and hyper-velocity impacts on two identical target satellites. The first experiment was performed at a low velocity of 1.5 km/s using a 40-gram aluminum alloy sphere, whereas the second experiment was performed at a hyper-velocity of 4.4 km/s using a 4-gram aluminum alloy sphere by two-stage light gas gun in Kyushu Institute of Technology. To date, approximately 1,500 fragments from each impact test have been collected for detailed analysis. Each piece was analyzed based on the method used in the NASA Standard Breakup Model 2000 revision. The detailed analysis will conclude: 1) the similarity in mass distribution of fragments between low and hyper-velocity impacts encourages the development of a general-purpose distribution model applicable for a wide impact velocity range, and 2) the difference in area-to-mass ratio distribution between the impact experiments and the NASA standard breakup model suggests to describe the area-to-mass ratio by a bi-normal distribution.

Author

Analogies; Impact Tests; Impact Velocity; Space Debris; Satellites; Impact Tolerances; Impact Damage; Spacecraft Breakup

20070026181 NASA Johnson Space Center, Houston, TX, USA

Orion GN and C Overview and Architecture

Hu, Howard; Straube, Tim; August 20, 2007; 12 pp.; In English; AIAA Guidance, Navigation and Control Conference, 20-23 August 2007, Hilton Head, SC, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070026181

The Crew Exploration Vehicle, named Orion, is a critical element in the Constellation Program to develop the

transportation system needed to send humans back to the moon and then beyond. Lockheed Martin is the prime contractor for the Orion spacecraft, which is managed by the Johnson Space Center. The Orion GN&C sub-system is being jointly developed by NASA and Lockheed Martin through a mode team approach. The GN&C is a critical element of the Orion mission to carry astronauts to low earth orbit to service the International Space Station and then on later flights to transfer and return a crew of four to the moon. The Orion GN&C system must perform monitoring and abort functions during ascent, rendezvous and docking in both low earth and lunar orbits, perform uncrewed lunar loiter operations, perform trans earth injection and atmospheric entry and landing. The Orion also must be integrated with the Ares I Crew Launch Vehicle, the Earth Departure Stage of the Ares V and the Lunar Surface Access Module. This paper provides an overview of the Orion GN&C system. The functional capabilities of the Orion GN&C will be provided in the context of Constellation architecture, the key GN&C requirements will be summarized, the GN&C architecture will be presented, the development schedule and plans will summarized and finally conclusions will be presented.

Author

Guidance (Motion); Navigation; Crew Exploration Vehicle; General Overviews; Systems Engineering

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*.

20070025189 NASA Glenn Research Center, Cleveland, OH, USA; Analex Corp., Cleveland, OH, USA

Sensor Selection and Optimization for Health Assessment of Aerospace Systems

Maul, William A.; Kopasakis, George; Santi, Louis M.; Sowers, Thomas S.; Chicatelli, Amy; July 16, 2007; 23 pp.; In English; Infotech\@Aerospace 2007 Conferenceand Exhibit, 7-10 May 2007, Rohnert Park, CA, USA; Original contains color illustrations

Report No.(s): NASA/TM-2007-214822; AIAA Paper-2007-2849; E-15992; Copyright; Avail.: CASI: A03, Hardcopy

Aerospace systems are developed similarly to other large-scale systems through a series of reviews, where designs are modified as system requirements are refined. For space-based systems few are built and placed into service. These research vehicles have limited historical experience to draw from and formidable reliability and safety requirements, due to the remote and severe environment of space. Aeronautical systems have similar reliability and safety requirements, and while these systems may have historical information to access, commercial and military systems require longevity under a range of operational conditions and applied loads. Historically, the design of aerospace systems, particularly the selection of sensors, is based on the requirements for control and performance rather than on health assessment needs. Furthermore, the safety and reliability requirements are met through sensor suite augmentation in an ad hoc, heuristic manner, rather than any systematic approach. A review of the current sensor selection practice within and outside of the aerospace community was conducted and a sensor selection architecture is proposed that will provide a justifiable, dependable sensor suite to address system health assessment requirements.

Author

Aerospace Systems; Information Systems; Research Vehicles; Sensors; Heuristic Methods; Reliability; Safety

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*.

20070025433 Environmental Protection Agency, Washington, DC, USA

New Powertrain Technologies and Their Projected Costs. Interim Report

Oct. 2005; 81 pp.; In English

Report No.(s): PB2007-109504; EPA-420-R-05-012; No Copyright; Avail.: CASI: A05, Hardcopy

This interim report projects the cost effectiveness, from a consumer perspective, of four technology strategies capable of improving new personal vehicle fuel economy over the next decade: packages of individual gasoline vehicle technologies,

advanced diesel engines, gasoline electric hybrids, and diesel electric hybrids. These economic projections are based on a future high-volume scenario where economies-of-scale for these technologies are similar to those for conventional vehicles today. They do not account for the higher manufacturer and consumer costs during a transition period. Based on EPAs review of the technical literature, all of these technology packages are projected to increase personal vehicle retail cost, ranging from around $1000 for a gasoline vehicle package in a midsize car to about $6000 for a diesel electric hybrid in a large SUV. But, by increasing vehicle fuel economy by 20% to 70%, these technologies will also reduce vehicle operating costs (primarily fuel expenditures). This report projects the consumer payback period, i.e., how many years it takes for a consumer to recoup in discounted operating savings an amount equal to the higher initial cost of the vehicle. Based on a set of common economic assumptions, these technologies are projected to pay back to consumers in 2 to 11 years. Since all of these technologies pay back in less than the projected 14-year life of a vehicle, they would all provide net savings over a typical vehicle lifetime. These discounted lifetime savings range from $300 for one of the midsize car scenarios to over $4000 for some of the large SUV scenarios. In all cases, the payback period is shorter and the lifetime savings are greater when the advanced technologies are used in a large SUV rather than in a midsize car.
NTIS
Technology Utilization; Economy; Clean Fuels; Automobiles; Operating Costs; Cost Reduction

20070025434 Environmental Protection Agency, Washington, DC, USA
New Powertrain Technologies and Their Projected Costs Executive Summary
Oct. 2005; 7 pp.; In English
Report No.(s): PB2007-109511; EPA-420-S-05-013; No Copyright; Avail.: CASI: A02, Hardcopy

This interim report projects the cost effectiveness, from a consumer perspective, of four technology strategies capable of improving new personal vehicle fuel economy over the next decade: packages of individual gasoline vehicle technologies, advanced diesel engines, gasoline electric hybrids, and diesel electric hybrids. These economic projections are based on a future high-volume scenario where economies-of-scale for these technologies are similar to those for conventional vehicles today. They do not account for the higher manufacturer and consumer costs during a transition period. Based on EPAs review of the technical literature, all of these technology packages are projected to increase personal vehicle retail cost, ranging from around $1000 for a gasoline vehicle package in a midsize car to about $6000 for a diesel electric hybrid in a large SUV. But, by increasing vehicle fuel economy by 20% to 70%, these technologies will also reduce vehicle operating costs (primarily fuel expenditures). This report projects the consumer payback period, i.e., how many years it takes for a consumer to recoup in discounted operating savings an amount equal to the higher initial cost of the vehicle. Based on a set of common economic assumptions, these technologies are projected to pay back to consumers in 2 to 11 years. Since all of these technologies pay back in less than the projected 14-year life of a vehicle, they would all provide net savings over a typical vehicle lifetime. These discounted lifetime savings range from $300 for one of the midsize car scenarios to over $4000 for some of the large SUV scenarios. In all cases, the payback period is shorter and the lifetime savings are greater when the advanced technologies are used in a large SUV rather than in a midsize car.
NTIS
Costs; Technologies; Clean Fuels; Economy

20070026735 Engineering Research and Consulting, Inc., Houston, TX, USA
An Analysis of the Orbital Distribution of Solid Rocket Motor Slag
Horstman, Matthew F.; Mulrooney, Mark; August 24, 2007; 7 pp.; In English; 2007 International Astronautical Congress, 24-28 Sep. 2007, Hyderabad, India; Original contains color illustrations
Report No.(s): IAC-07-6.2.03; Copyright; Avail.: CASI: A02, Hardcopy

The contribution made by orbiting solid rocket motors (SRMs) to the orbital debris environment is both potentially significant and insufficiently studied. A combination of rocket motor design and the mechanisms of the combustion process can lead to the emission of sufficiently large and numerous by-products to warrant assessment of their contribution to the orbital debris environment. These particles are formed during SRM tail-off, or the termination of burn, by the rapid expansion, dissemination, and solidification of the molten Al2O3 slag pool accumulated during the main burn phase of SRMs utilizing immersion-type nozzles. Though the usage of SRMs is low compared to the usage of liquid fueled motors, the propensity of SRMs to generate particles in the 100 m and larger size regime has caused concern regarding their contributing to the debris environment. Particle sizes as large as 1 cm have been witnessed in ground tests conducted under vacuum conditions and comparable sizes have been estimated via ground-based telescopic and in-situ observations of sub-orbital SRM tail-off events. Using sub-orbital and post recovery observations, a simplistic number-size-velocity distribution of slag from on-orbit SRM firings was postulated. In this paper we have developed more elaborate distributions and emission scenarios and modeled the

resultant orbital population and its time evolution by incorporating a historical database of SRM launches, propellant masses, and likely location and time of particulate deposition. From this analysis a more comprehensive understanding has been obtained of the role of SRM ejecta in the orbital debris environment, indicating that SRM slag is a significant component of the current and future population.
Author
Slags; Solid Propellant Rocket Engines; Space Debris; Rocket Engine Design; Aluminum Oxides

23
CHEMISTRY AND MATERIALS (GENERAL)

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

20070025183 NASA Johnson Space Center, Houston, TX, USA
Validation of NHB 8060.1C, Test 18 Arc Tracking, September 30, 1991
Linley, Larry; [2005]; 1 pp.; In English
Report No.(s): WSTF-TR-651-001; No Copyright; Avail.: Other Sources; Abstract Only

A test project was conducted to validate Test 18 of NASA Handbook (NHB) 8060.1C and, if necessary, identify and recommend improvements in the procedures or criteria of the test. The NHB 8060.1C, Test 18 test system was modified to produce better discrimination of test results. Changes, and their effects on test results, in the graphite immersion-depth, test timing sequence, and atmospheric conditions were investigated for the wire-insulation constructions tested. Based on the test results, the graphite immersion-depths (between 0.8 mm and 1.6 mm), the timing sequence, and the change in the test conditions from ambient to three environments common in manned spaceflight did not significantly affect test results. The criteria used in Test 18 of NHB 8060.1C was found to be appropriate for qualifying arc-tracking and arc-propagation characteristics of wire-insulation materials, Using the Test 18 criteria, Kapton and ETFE were considered inappropriate for use, while PTFE was considered appropriate. Recommendations from this test project for Test 18 of NHB 8060.1C include changing the experimental setup and configurational tests and performing qualification testing in air rather than in the three environments common in manned spaceflight.
Author
Insulation; Performance Tests; Wire

20070025294 Universal Technology Corp., Dayton, OH USA
Finite Element Analysis of Multilayered and Functionally Gradient Tribological Coatings With Measured Material Properties (Preprint)
Kang, Young S; Sharma, Shashi K; Sanders, Jeffrey H; Voevodin, Andrey A; Nov 2006; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-03-D-5801; Proj-4349
Report No.(s): AD-A465552; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Proper design of functionally gradient (FG) coatings requires a thorough understanding of layer architecture, chemistry and mechanical properties. An elastic-plastic model has been developed to study the stress distribution in multilayered FG coatings using finite element method to achieve optimum design architecture for high wear resistance and low friction. Ti1-xCx (0<x<1) gradient coatings with diamond like carbon (DLC) coating on 440C stainless steel substrate were assumed as a series of perfectly bonded layers with unique material properties and layer thickness. In order to model the elastic-plastic behavior of these coatings accurately, nano-indentation experiments using a nano-indenter were performed to measure material properties of each Ti1-xCx gradient coating block. Using measured material properties, the numerical elastic-plastic model was used to examine the threshold of plasticity and plastic deformation zone inside the multilayered coatings and substrate and at the multilayered interfaces.
DTIC
Coatings; Elastic Properties; Finite Element Method; Gradients; Mechanical Properties; Tribology

20070025474 Cleveland State Univ., Cleveland, OH, USA
Slightly Conductive Transparent Films for Space Applications: Manufacturability and Durability
Uppala, N.; Griffin, J.; Vemulapalli, J.; Hambourger, P. D.; 47th Annual Technical Conference Proceedings; April 24, 2001; ISSN 0737-5921, pp. 199-203; In English; 47th Annual Technical Conference, 24-29 Apr. 2004, Dallas, TX, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-740; NCC3-1023; NCC3-1033; NCC3-1065; Copyright; Avail.: Other Sources

Highly transparent, slightly conductive films of co-deposited indium tin oxide (ITO) and MgF, have possible applications for environmental protection of exterior surfaces of spacecraft. Reliable preparation of films with the desired sheet resistivity (approximately 10(exp 8) ohms/square) is difficult because the electrical properties of ITO-MgF, are highly dependent on film composition. We have investigated the use of plasma emission monitoring to improve the reproducibility of films prepared by RF magnetron sputtering. While considerable improvement was observed, it appears that some in-situ electrical or optical characterization will be needed for reliable production coating with ITO-MgF,. We have also done further evaluation of a possibly undesirable photoconductive effect previously observed in these films.
Author
Coating; Magnetron Sputtering; Tin Oxides; Spacecraft Construction Materials; Indium Compounds; Magnesium Fluorides; Electrical Resistivity

20070025558 Morrison and Foerster LLP, San Francisco, CA, USA; California Univ., Oakland, CA, USA
Adhesive Microstructure and Method of Forming Same
Fearing, R. S., Inventor; Setti, M., Inventor; 14 Mar 05; 19 pp.; In English
Contract(s)/Grant(s): N66001-01-C-8072
Patent Info.: Filed Filed 14 Mar 05; US-Patent-Appl-SN-11-080 037
Report No.(s): PB2007-104700; No Copyright; Avail.: CASI: A03, Hardcopy

A fabricated microstructure comprising at least one protrusion capable of providing an adhesive force at a surface of between about 60 and 2,000 nano-Newtons. A stalk supports the protrusion at an oblique angle relative to a supporting surface. The microstructure can adhere to different surfaces.
NTIS
Adhesives; Microstructure; Fabrication

20070025564 Texas Univ. System, Austin, TX, USA
Step and Flash Imprint Lithography
Wilson, C. G., Inventor; Colburn, M. E., Inventor; 22 Feb 05; 7 pp.; In English
Contract(s)/Grant(s): MDA-972-97-3-0007
Patent Info.: Filed Filed 22 Feb 05; US-Patent-Appl-SN-11-062 420
Report No.(s): PB2007-104174; No Copyright; Avail.: CASI: A02, Hardcopy

A method of forming a relief image in a structure comprising a substrate and a transfer layer formed thereon comprises covering the transfer layer with a polymerizable fluid composition, and then contacting the polymerizable fluid composition with a mold having a relief structure formed therein such that the polymerizable fluid composition fills the relief structure in the mold. The polymerizable fluid composition is subjected to conditions to polymerize polymerizable fluid composition and form a solidified polymeric material therefrom on the transfer layer. The mold is then separated from the solid polymeric material such that a replica of the relief structure in the mold is formed in the solidified polymeric material; and the transfer layer and the solidified polymeric material are subjected to an environment to selectively etch the transfer layer relative to the solidified polymeric material such that a relief image is formed in the transfer layer.
NTIS
Lithography; Patent Applications; Polymerization

20070025569 McLeod and Moyne, P.C., Okemos, MI, USA; Michigan State Univ., East Lansing, MI, USA
Process for the Catalytic Synthesis of Biaryls and Polymers from Aryl Compounds
Smith, M. R., Inventor; Maleczka, R. E., Inventor; 14 Mar 05; 20 pp.; In English
Contract(s)/Grant(s): NSF-CHE-9817230; NIH-RO1GM63188-01
Patent Info.: Filed Filed 14 Mar 05; US-Patent-Appl-SN-11-079 672
Report No.(s): PB2007-104718; No Copyright; Avail.: CASI: A03, Hardcopy

A process for producing organic substituted aromatic or heteroaromatic compounds including biaryl and biheteroaryl

compounds in a two-step reaction. In the first step, the aromatic or heteroaromatic compound is borylated in a reaction comprising a borane or diborane reagent (any boron reagent where the boron reagent contains a B--H, B--B or B--Si bond) and an iridium or rhodium catalytic complex. In the second step, a metal catalyst catalyzes the formation of the organic substituted aromatic or heteroaromatic compound from the borylated compound and an electrophile such as an aryl or organic halide, triflate (OSO(sub 2)CF(sub 3)), or nonaflate (OSO(sub 2)C(sub 4)F(sub 9)). The steps in the process can be performed in a single reaction vessel or in separate reaction vessels. The present invention also provides a process for synthesis of complex polyphenylenes starting from halogenated aromatic compounds.
NTIS
Hydrocarbons; Synthesis (Chemistry); Polymers

20070026079 Army Soldier and Biological Chemical Command, Natick, MA, USA
Methods for Polymerization of Electronic and Photonic Polymers
Bruno, F., Inventor; Samuelson, L. A., Inventor; Nagarajan, R., Inventor; Kumar, J., Inventor; 2 May 05; 25 pp.; In English
Patent Info.: Filed Filed 2 May 05; US-Patent-Appl-SN-11-120 031
Report No.(s): PB2007-104825; No Copyright; Avail.: CASI: A03, Hardcopy

A method for polymerizing electronic and photonic polymers, wherein an aromatic monomer is combined with a hematin catalyst derivatized with at least one non-proteinaceous amphipathic group, and a peroxide initiator, and employing a template, wherein the aromatic monomer aligns along the template and polymerizes to form a complex comprising the polymerized monomer and the template.
NTIS
Patent Applications; Polymerization

20070026080 Groff (Gardner), PC, Marietta, GA, USA
Biocidal Siloxane Coating Material Containing N-Halogenated Amine and Amide Functional Groups
Worley, S. D., Inventor; Chen, Y., Inventor; Liang, J., Inventor; Wu, R., Inventor; Barnes, K., Inventor; 17 Nov 04; 11 pp.; In English
Contract(s)/Grant(s): F08637-02-C-7020
Patent Info.: Filed Filed 17 Nov 04; US-Patent-Appl-SN-10-991 358
Report No.(s): PB2007-104759; No Copyright; Avail.: CASI: A03, Hardcopy

N-halamine compounds which contain hindered amine and amide functional groups. Compounds include 1 wherein X, X(feet), and X(inches) independently are H, Cl, or Br, wherein no more than two of X, X(feet), and X(inches) are H and 2 wherein R, R(feet), and R(inches) are independently alkyl groups containing 1 to 4 carbon atoms or hydrogen, and X and X(feet) are independently H, Cl, or Br. Compositions comprising the compounds are also described. The compounds and/or compositions can be used, for example, for the purpose of constructing biocidal coatings and materials. The biocidal activity can inactivate pathogenic microorganisms such as bacteria, fungi, and yeasts, as well as, virus particles, which can cause infectious diseases, and those microorganisms which cause noxious odors and unpleasant coloring, such as mildew.
NTIS
Amides; Amines; Coating; Pesticides; Siloxanes

20070026155 Lawrence Livermore National Lab., Livermore, CA USA
Dynamic Dislocation Mechanisms for the Anomalous Slip in a Single-Crystal BCC Metal Oriented for 'Single Slip'
Hsiung, L.; Jan. 12, 2007; 27 pp.; In English
Report No.(s): DE2007-900046; UCRL-TR-227296; No Copyright; Avail.: Department of Energy Information Bridge

The mysterious anomalous-slip phenomenon observed in bcc metals has been revisited and studied by conducting careful TEM examinations of the dislocation structures formed in the (2(bar) 9 20)-oriented Mo single crystals compressed at room temperature to an axial strain of 0.6% at a strain rate of 1 s (sup -1).
NTIS
Body Centered Cubic Lattices; Crystals; Metals; Molybdenum; Single Crystals

20070026163 Kentucky Univ., Lexington, KY USA
Coatings, Sealants and Fillers to Address Bridge Concrete Deterioration and Aesthetics. Phase One
Palle, S.; Hopwood, T.; Jun. 2006; 36 pp.; In English
Report No.(s): PB2007-106478; KTC06-36/SPR 291-04-1F; No Copyright; Avail.: National Technical Information Service (NTIS)

This study addresses experimental evaluation and testing of concrete coatings for maintenance purposes on structural

(steel reinforced) concrete. The test methods employed are intended to identify coatings and sealers for eventual incorporation into a qualified products list for structural concrete coatings. Some of the methods/procedures used in this study will be used in the future to evaluate additional coatings and sealers. Developmental work focused on identifying relevant coatings systems and laboratory tests. The objectives of experimental project monitoring were to: (1) identify existing viable concrete coatings along with their properties/characteristics/surface preparation requirements and determine effective acceptance/evaluation tests for those coatings; (2) provide a compendium of concrete coatings/properties/tests for consideration by KYTC; (3) evaluate laboratory tests of promising concrete coatings and develop new test procedures if existing ones prove unacceptable for KYTC purposes; (4) use those tests to evaluate KYTC-approved coatings; (5) conduct field tests of candidate coatings on existing structures; and (6) provide KYTC with a range of effective concrete bridge coatings and guidelines for selecting them to provide the best benefits to bridges. This report provides a summary of the coatings systems tested and the overall results/findings of the research study.
NTIS
Bridges (Structures); Concretes; Deterioration; Fillers; Sealers

20070026176 National Center for Asphalt Technology, Auburn, AL, USA
Aggregate Toughness/Abrasion Resistance and Durability/Soundness Tests Related to Asphalt Concrete Performance in Pavements
Wu, Y.; Parker, F.; Kandhal, K.; Mar. 1998; 26 pp.; In English
Report No.(s): PB2007-109979; NCAT-98-4; No Copyright; Avail.: CASI: A03, Hardcopy

Numerous tests have been developed to empirically characterize aggregate without, necessarily, a strong relationship with the performance of the final products incorporating these aggregates. This seems to be particularly true for aggregate toughness and abrasion resistance and durability and soundness. The purpose of this research was to identify and evaluate toughness/abrasion resistance and durability/soundness tests for characterizing aggregate used in asphalt concrete and to determine those test methods that best correlate with field performance. Based on a review of literature and specifications, laboratory tests for characterizing aggregate toughness/abrasion resistance and durability/soundness were selected. Sixteen aggregate sources with poor to good performance histories were identified for evaluation with the selected suite of tests. Performance histories of pavements containing these aggregates in asphalt concrete layers were established through personal contacts with state transportation agencies and performance evaluation questionnaires. Aggregate properties from laboratory tests were correlated with field performance. The Micro-Deval and magnesium sulfate soundness tests provide the best correlations with field performance of asphalt concrete, and are recommended for characterizing aggregate toughness/abrasion resistance and durability/soundness.
NTIS
Abrasion Resistance; Aggregates; Asphalt; Concretes; Pavements

20070026177 National Center for Asphalt Technology, Auburn, AL, USA
Density of Asphalt Concrete-How Much is Needed
Brown, E. R.; Jan. 1990; 24 pp.; In English
Report No.(s): PB2007-109975; NCAT-90-3; No Copyright; Avail.: CASI: A03, Hardcopy

Density is one of the most important parameters in construction of asphalt mixtures. A mixture that is properly designed and compacted will contain enough air voids to prevent rutting due to plastic flow but low enough air voids to prevent permeability of air and water. Since density of an asphalt mixture varies throughout its life the voids must be low enough initially to prevent permeability of air and water and high enough after a few years of traffic to prevent plastic flow. There are three primary methods of specifying density: percent of control strip, percent of laboratory density, and percent of theoretical maximum density. All three methods can be used to obtain satisfactory compaction if used correctly. The initial in-place air voids must be below approximately eight percent and the final in-place air voids must be above approximately three percent. The initial in-place air voids are determined by comparing bulk density to theoretical maximum density (TMD) and the final inplace air voids are estimated by comparing bulk density of laboratory compacted sampler to the TMD. The two methods that have been used to measure bulk density of asphalt mixture are physical measurements of cores and nuclear gage. The nuclear gage is fast and non-destructive but is not as accurate as the core method.
NTIS
Asphalt; Concretes

20070026187 Greer, Burns and Crain, Chicago, IL, USA; Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Apparatus and Method for Determining a Thickness of a Deposited Material
Mackin, T. J., Inventor; Sager, C. R., Inventor; 6 May 04; 24 pp.; In English
Contract(s)/Grant(s): NSF-02-17469
Patent Info.: Filed Filed 6 May 04; US-Patent-Appl-SN-10-839 967
Report No.(s): PB2007-104007; No Copyright; Avail.: CASI: A03, Hardcopy

Method and apparatus for determining a thickness of a deposited material. Energy is passed through the deposited material, wherein some of the energy is transmitted. The transmitted energy is received, and the received energy is used to determine a thickness of the deposited material.

NTIS
Patent Applications; Thickness

20070026199 Fish and Richardson, P.C., Minneapolis, MN, USA
Adhesion of a Metal Layer to a Substrate and Related Structures
Watkins, J. J., Inventor; Zong, Y., Inventor; 13 Apr 05; 22 pp.; In English
Contract(s)/Grant(s): NSF-CTS-9734177; NSF-CTS-0245002
Patent Info.: Filed Filed 13 Apr 05; US-Patent-Appl-SN-11-104-743
Report No.(s): PB2007-104194; No Copyright; Avail.: CASI: A03, Hardcopy

Methods and resulting structures are described in which a metal layer is adhered to a surface of a substrate. The methods involve applying a sacrificial acidic organic layer to the surface of the substrate prior to depositing the metal layer onto the substrate. During deposition of the metal layer, the sacrificial acidic organic layer is substantially consumed, thereby leaving behind a metal/substrate interface that has excellent adhesion properties.

NTIS
Adhesion; Substrates; Metals; Layers

20070026201 Williams (Hovey), LLP, Kansas City, MO, USA
Microsystem Enclosure and Method of Hermetic Sealing
Morgenstern, H., Inventor; Kautz, D., Inventor; Blaszek, R. J., Inventor; 6 Feb 04; 6 pp.; In English
Contract(s)/Grant(s): DE-AC04-01AL66850
Patent Info.: Filed Filed 6 Feb 04; US-Patent-Appl-SN-10-774-926
Report No.(s): PB2007-104594; No Copyright; Avail.: CASI: A02, Hardcopy

A microsystem enclosure for hermetically sealing and thereby protecting a microsystem located on a substrate from the potentially damaging effects of exposure to moisture, dust, and other external environmental or operating conditions. The enclosure broadly comprises a single-piece hermetic cover structure and a single solder preform. The preform facilitates sealing the cover to the substrate in high-temperature, single-step process so as to create a hermetic cavity wherein the microsystem resides.

NTIS
Enclosure; Hermetic Seals; Sealing

20070026233 California Univ., Berkeley, CA, USA
Nanostructured Friction Enhancement Using Fabricated Microstructure
Majidi, C., Inventor; Groff, R., Inventor; Fearing, R. S., Inventor; 16 Nov 05; 11 pp.; In English
Contract(s)/Grant(s): NMA 501-03-1-2017; NSF-EEC-0304 730
Patent Info.: Filed Filed 16 Nov 05; US-Patent-Appl-SN-11-281-768
Report No.(s): PB2007-101762; No Copyright; Avail.: CASI: A03, Hardcopy

Described herein are fabricated microstructures to adhere in shear to a contact surface. A fabricated microstructure comprises a substrate and a plurality of nano-fibers attached to the substrate. The nano-fibers have an elasticity modulus E, an interfacial energy per unit length of contact w, a length L, a radius R, and are oriented at an angle theta(sub o) relative to the substrate. The length L of the nano-fibers is greater than 0.627 theta(sub o)R(sup 2)(E/w)(sup 1/2) with theta(sub o) in radians. Also described herein is a method of forming a fabricated microstructure to adhere in shear to a contact surface and a method of adhering in shear a fabricated microstructure to a contact surface.

NTIS
Augmentation; Fabrication; Friction; Microstructure; Patent Applications

20070026234 Bechtel BWXT Idaho, LLC, Idaho Falls, ID, USA
Method and Apparatus for Two Dimensional Surface Property Analysis Based on Boundary Measurement
Richardson, J. G., Inventor; 19 Apr 04; 11 pp.; In English
Contract(s)/Grant(s): DE-AC07-991D13727
Patent Info.: Filed Filed 19 Apr 04; US-Patent-Appl-SN-10-828-633
Report No.(s): PB2007-104215; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus and method for determining properties of a conductive film is disclosed. A plurality of probe locations selected around a periphery of the conductive film define a plurality of measurement lines between each probe location and all other probe locations. Electrical resistance may be measured along each of the measurement lines. A lumped parameter model may be developed based on the measured values of electrical resistance. The lumped parameter model may be used to estimate resistivity at one or more selected locations encompassed by the plurality of probe locations. The resistivity may be extrapolated to other physical properties if the conductive film includes a correlation between resistivity and the other physical properties. A profile of the conductive film may be developed by determining resistivity at a plurality of locations. The conductive film may be applied to a structure such that resistivity may be estimated and profiled for the structure's surface.
NTIS
Boundaries; Dimensional Analysis; Surface Properties

20070026235 Yale Univ., New Haven, CT, USA
Ribosome Structure and Protein Synthesis Inhibitors
Steitz, T. A., Inventor; Moore, P. B., Inventor; Ban, N., Inventor; Nissen, P., Inventor; Hansen, J., Inventor; 9 Aug 04; 93 pp.; In English
Contract(s)/Grant(s): NIH-GM22778; NIH-GM54216
Patent Info.: Filed Filed 9 Aug 04; US-Patent-Appl-SN-10-914-680
Report No.(s): PB2007-104213; No Copyright; Avail.: CASI: A05, Hardcopy

The invention provides methods for producing high resolution crystals of ribosomes and ribosomal subunits as well as crystals produced by such methods. The invention also provides high resolution structures of ribosomal subunits either alone or in combination with protein synthesis inhibitors. The invention provides methods for identifying ribosome-related ligands and methods for designing ligands with specific ribosome-binding properties as well as ligands that may act as protein synthesis inhibitors. Thus, the methods and compositions of the invention may be used to produce ligands that are designed to specifically kill or inhibit the growth of any target organism.
NTIS
Inhibitors; Protein Synthesis; Ribosomes

20070026277 North Carolina State Univ., Raleigh, NC, USA; Michigan State Univ., East Lansing, MI, USA
Self-Assembled Silica Nano-Composite Polymer Electrolytes: Synthesis, Rheology & Electrochemistry
Khan, S. A.; Fedkiw, P. S.; Baker, G. L.; January 2006; 13 pp.; In English
Report No.(s): DE2007-897873; No Copyright; Avail.: National Technical Information Service (NTIS)

The ultimate objectives of this research are to understand the principles underpinning nano-composite polymer electrolytes (CPEs) and facilitate development of novel CPEs that are low-cost, have high conductivities, large Li+ transference numbers, improved electrolyte-electrode interfacial stability, yield long cycle life, exhibit mechanical stability and are easily processable. Our approach is to use nanoparticulate silica fillers to formulate novel composite electrolytes consisting of surface-modified fumed silica nano-particles in polyethylene oxides (PEO) in the presence of lithium salts. We intend to design single-ion conducting silica nanoparticles which provide CPEs with high Li+ transference numbers. We also will develop low-Mw (molecular weight), high-Mw and crosslinked PEO electrolytes with tunable properties in terms of conductivity, transference number, interfacial stability, processability and mechanical strength.
NTIS
Electrochemistry; Electrolytes; Nanocomposites; Rheology; Silicon Dioxide

20070026295 Texas A&M Univ., College Station, TX USA; Texas A&M Univ., College Station, TX USA
Using Surface Energy Measurements to Select Materials for Asphalt Pavement
Little, D. N.; Bhasin, A.; Dec. 2006; 196 pp.; In English
Report No.(s): PB2007-109701; Copyright; Avail.: National Technical Information Service (NTIS)

Surface free energy, or simply surface energy, of asphalt binders and aggregates is an important material property that

influences the performance of asphalt mixes. Principles of thermodynamics can be used to quantify the propensity of asphalt binders to debond from aggregate surfaces in the presence of water based on their surface energy components. This probably is directly related to the moisture sensitivity of asphalt mixes. Principles of fracture mechanics can be combined with the work of cohesion and adhesion derived from surface energy components of the asphalt binder and aggregates and other material properties of asphalt mastics to model crack growth behavior. These models can be used to predict the fatigue and healing characteristics of asphalt mixes. In order to use surface energy measurements to select materials for better performing asphalt pavements, it is imperative that simple, accurate, and reliable test methods be used to measure the surface energy components of asphalt binders and aggregates, and the link between surface energy and performance of mixes must be established and validated. In this study various candidate test methods to measure the surface energy components of these materials were selected based on an exhaustive literature review.
NTIS
Asphalt; Materials Selection; Pavements; Surface Energy

20070026307 National Inst. of Justice, Washington, DC, USA
Evaluation of Pepper Spray
Edwards, S. M.; Granfield, J.; Onnen, J.; Feb. 1997; 8 pp.; In English
Report No.(s): PB2007-109766; NCJ-162358; No Copyright; Avail.: CASI: A02, Hardcopy

The implementation process and field test results of a project to evaluate the effectiveness of pepper spray in police confrontations with humans and animals. A research team from the International Association of Chiefs of Police analyzed Baltimore County Police Department policies, implementation training, and use of pepper spray from July 1993 to March 1994-whether OC spray can effectively incapacitate humans including those who are intoxicated, drugged, or mentally disturbed in confrontations with the police.-whether OC spray can reduce the number of assaults against police attempting to subdue or arrest hostile/aggressive subjects.- whether OC use helps to reduce injuries to both officers and suspects in encounters between the two. -whether police use-of-force or brutality complaints are lodged less frequently due to use of OC. -whether OC is effective in neutralizing attacking or threatening dogs.
NTIS
Peppers; Sprayers; Education

20070026312 Brookhaven National Lab., Upton, NY USA
Aluminum Hydride, AlH3, as a Hydrogen Storage Compound
Graetz, J.; Reilly, J.; Sandrock, G.; Johnson, J.; Zhou, W. M.; Nov. 2006; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-899889; BNL-77336-2006; No Copyright; Avail.: Department of Energy Information Bridge

Aluminum hydride is a covalent, binary hydride that has been known for more than 60 years and is an attractive medium for on-board automotive hydrogen storage, since it contains 10.1 % by wt. hydrogen with a density of 1.48 g/ml.
NTIS
Aluminum Hydrides; Hydrogen; Hydrogen Compounds

24
COMPOSITE MATERIALS

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

20070025225 NASA Glenn Research Center, Cleveland, OH, USA
Probabilistic Simulation for Nanocomposite Characterization
Chamis, Christos C.; Coroneos, Rula M.; July 2007; 22 pp.; In English; 48th Structures, Structural Dynamics, and Materials (SDM) Conference, 23-26 Apr. 2007, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.15.03
Report No.(s): NASA/TM-2007-214847; AIAA Paper-2007-1969; E-16063; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025225

A unique probabilistic theory is described to predict the properties of nanocomposites. The simulation is based on composite micromechanics with progressive substructuring down to a nanoscale slice of a nanofiber where all the governing equations are formulated. These equations have been programmed in a computer code. That computer code is used to simulate

uniaxial strengths properties of a mononanofiber laminate. The results are presented graphically and discussed with respect to their practical significance. These results show smooth distributions.
Author
Characterization; Nanocomposites; Simulation; Probability Theory; Micromechanics

20070025557 M Cubed Technologies, Inc., Newark, DE, USA
Nanotube-Containing Composite Bodies and Methods for Making Same
Karandikar, P. G., Inventor; 26 Apr 04; 16 pp.; In English
Contract(s)/Grant(s): N00014-02-1-0960
Patent Info.: Filed Filed 26 Apr 04; US-Patent-Appl-SN-10-832 823
Report No.(s): PB2007-104699; No Copyright; Avail.: CASI: A03, Hardcopy

A composite material featuring carbon nanotubes reinforcing a matrix featuring metal or silicon carbide, or both. Such composites can be produced using a molten silicon metal infiltration technique, for example, a siliconizing or a reaction-bonding process. Here, the carbon nanotubes are prevented from chemically reacting with the silicon infiltrant by an interfacial coating disposed between the carbon nanotubes and the infiltrant. Preferably, the coating is free carbon or a carbonaceous precursor material added during preform processing, or after. The reaction-bonding system is designed such that the molten infiltrant of silicon metal or silicon alloy reacts with at least some of the interfacial carbon layer to form in-situ silicon carbide, and that the formed SiC is sufficiently dense that it effectively seals off the underlying carbon nanotube from exposure to additional molten infiltrant. A reaction-bonded composite body containing even a small percentage of carbon nanotubes possessed a significant increase in electrical conductivity as compared to a reaction-bonded composite not containing such nanotubes, reflecting the high electrical conductivity of the nanotubes.
NTIS
Carbon Nanotubes; Composite Materials; Composite Structures; Nanotubes

20070025559 Naval Surface Warfare Center, Annapolis, MD, USA
Enhanced Performace Reactive Composite Projectiles
Nechitallo, N. V., Inventor; 10 Feb 04; 7 pp.; In English
Patent Info.: Filed Filed 10 Feb 04; US-Patent-Appl-SN-10-779 555
Report No.(s): PB2007-104702; No Copyright; Avail.: CASI: A02, Hardcopy

A reactive composite projectile includes a reactive composite material in a solid shape and an encasement material applied to and surrounding the solid shape for exerting compressive forces thereon. Additionally or alternatively, an elongate structure can be positioned in the solid shape. The elongate structure is made from a material having a mass density that is approximately 2 to 10 times the mass density of the reactive composite material.
NTIS
Projectiles; Reactivity; Composite Materials

20070026203 California Univ., Oakland, CA, USA
Nanocomposites of Silicon Nitride, Silicon Carbide, and Boron Nitride
Wan, J., Inventor; Mukherjee, A. K., Inventor; Gasch, M. J., Inventor; 6 Mar 04; 5 pp.; In English
Contract(s)/Grant(s): ONR-N00014-00-1-0186
Patent Info.: Filed Filed 6 Mar 04; US-Patent-Appl-SN-10-773-758
Report No.(s): PB2007-104593; No Copyright; Avail.: CASI: A01, Hardcopy

Densified composites of silicon nitride, silicon carbide, and boron nitride that exhibit high creep resistance are obtained by sintering a mixture of amorphous powders of silicon nitride, silicon carbide, and boron nitride in the presence of an electric field under high pressure. The grain size in the resulting composite is less than 100 nanometers for all components of the composite, and the composite exhibits high creep resistance.
NTIS
Boron Nitrides; Composite Materials; Nanocomposites; Silicon Carbides; Silicon Nitrides

20070026205 Raytheon Co., El Segundo, CA, USA
System and Method for Vacuum Bag Fabrication
Clambrone, D. F., Inventor; Johnson, K. E., Inventor; Ahmad, H., Inventor; 30 Nov 04; 8 pp.; In English
Contract(s)/Grant(s): F33657-91-C-0006

Patent Info.: Filed Filed 30 Nov 04; US-Patent-Appl-SN-11-000-356
Report No.(s): PB2007-104592; No Copyright; Avail.: CASI: A02, Hardcopy

A system and method for vacuum bag assembly fabrication via the vacuum bag method which reduces the amount of trapped air. The inventive system includes a chamber adapted to contain a vacuum bag and first and second evacuating mechanisms. The first evacuating mechanism serves to evacuate the bag and vent to atmosphere. The second evacuating mechanism serves to evacuate and vent the chamber to atmosphere. Thus, generally, the inventive method includes the steps of placing a vacuum bag lay up in an air tight chamber; and evacuating the vacuum bag lay up and the air tight chamber at the same time. In practice, the assembly would consist of at least two components and a heat curable composition. The components can be parts to be bonded together or layers of cloth to be made into a laminate. In this case, the heat curable composition would be a catalyzed adhesive or resin.
NTIS
Composite Materials; Fabrication; Vacuum; Bags

20070026348 NASA Glenn Research Center, Cleveland, OH, USA
Oxidation Through Coating Cracks of SiC-Protected Carbon/Carbon
Jacobson, Nathan S.; Roth, Don J.; Rauser, Richard W.; Curry, Donald M.; [2007]; 21 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

The oxidation of SiC-protected carbon/carbon through machined slots and naturally occurring craze cracks in the SiC was studied. The slot and crack geometries were characterized, and the subsurface oxidation of the carbon/carbon substrate at temperatures of 1000 to 1300 C in air was assessed using weight change, x-ray computed tomography, and optical microscopy of sections. Rate constants were derived from these measurements and compared with a two-step diffusion control model of carbon oxidation. Oxidation kinetic measurements on both the specimens with machined slots and with naturally occurring craze cracks showed good agreement with the model.
Author
Carbon-Carbon Composites; Coating; Oxidation; Surface Cracks

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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*.

20070025296 Naval Surface Warfare Center, Indian Head, MD USA
Experimental and Computational Studies of Molecular and Lattice Symmetries of Energetic Materials at High Pressure
Peiris, Suhithi; Jan 2002; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465556; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Overall research objectives were: to study energetic materials of interest to the Navy/DoD at the high-pressure and high-temperature of detonation; to study the initiation mechanism of detonation; to learn the phase, lattice, and molecular symmetry, and measure theoretical maximum density (TMD) of a material at high pressure and temperature just before initiation; to understand exactly what chemical bonds are most energetic and why, at the pressure and temperature of detonation; to model the global kinetics and reaction mechanism of energetic materials during detonative reactions.
DTIC
Detonation; Explosives; High Pressure; Molecules; Symmetry

20070025316 Innovative Scientific Solutions, Inc., Dayton, OH USA
Research on Nitride Thin Films, Advanced Plasma Diagnostics, and Charged-Particle Processes
Lanter, William C; Guo, Wei; Jiao, Charles Q; Ingram, David C; Jul 2006; 130 pp.; In English
Contract(s)/Grant(s): F33615-00-C-2055; Proj-2301
Report No.(s): AD-A465823; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This program has three sub-tasks: 1) Nitride Thin-Film Coatings, 2) Advanced Plasma Diagnostics, and 3) Studies of Charged-Particle Processes. The focus of Task 1 has been to develop amorphous carbon-nitride films utilizing controlled plasma-generated ions to increase the nitrogen concentration within the film. It is anticipated that development of films with

higher concentrations of nitrogen will lead to properties similar to those theoretically calculated for crystalline β-C3N4. Successful development of this film will facilitate the creation of a smooth, extremely hard, thermally stable amorphous film. Applications can include hard-coating protection, solid lubricants, reduced friction and wear coatings, thermal heat spreaders, and high-temperature dielectrics. In Task 2 advanced diagnostics of plasmas with various operating conditions have been performed to gain a better understanding of the generated plasma fields. Task 3 has utilized Fourier Transform Mass Spectrometry (FTMS) to investigate gas-phase reactions of charged particles. Ion chemistries have been studied in selected compounds of great interest in areas including plasma processing and combustion. Cross sections of electron-impact ionization of these compounds have been measured and the kinetics of the reactions between the ions and their parent molecules examined.
DTIC
Carbon Nitrides; Charged Particles; Nitrides; Nitrogen Compounds; Plasma Diagnostics; Thin Films

20070025317 North Carolina Univ., Chapel Hill, NC USA
Nanoscale Study of Conduction Through Carbon Nanotube Networks
Stadermann, M; Papadakis, S J; Falvo, M R; Novak, J; Snow, E; Fu, Q; Liu, J; Fridman, Y; Boland, J J; Superfine, R; Jan 2004; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465825; No Copyright; Avail.: Defense Technical Information Center (DTIC)
We present local conductance measurements of carbon nanotube networks with nanometer scale resolution and show that there are discrete drops in conductance that correspond to junctions of metallic nanotubes and semiconducting nanotubes. The anomalies of these networks compared to thin films are shown, and a new method of discerning between semiconducting and metallic single-wall carbon nanotubes is demonstrated.
DTIC
Carbon Nanotubes; Chains; Nanotubes; Polymers; Walls

20070025420 Brookhaven National Lab., Upton, NY USA
Environmental Molecular Sciences Institute Support for the Center for Environmental Molecular Sciences. (Supplement to the Annual Report for FY06)
Dodge, C.; Fitts, J.; Francis, A. J.; Fuhrmann, M.; Gillow, J.; Nov. 2006; 7 pp.; In English
Report No.(s): DE2007-896304; ERSD-102371-2006; No Copyright; Avail.: National Technical Information Service (NTIS)
This project is investigating the chemical processes that govern actinide sequestration in grout materials with the goal of determining the long-term behavior of grouts used to stabilize actinides in source-terms such as high level waste tank heals. Two grouts contained portland cement, blast furnace slag and fly ash, with one formulation containing zeolite and the other fluorapatite. Earlier experimental work was conducted with funds from DOE/West Valley. CEMS funding allowed further exploration of grout behavior, beyond the scope of the original work which consisted of both batch and flow-through column experiments. The primary focus was the late stage behavior of actinides in the grout system when it is expected to be open to the atmosphere and groundwater, resulting in decreases of pH and interactions of U (and other elements) with dissolved carbonate.
NTIS
Radioactive Wastes; Grout; Chemical Reactions; Actinide Series

20070025421 Pacific Northwest National Lab., Richland, WA, USA
Rhenium Uptake, as Analogue for Tc-99 by Steel Corrosion Products
Krupka, K. M.; Brown, C. F.; Schaef, H. T.; Heald, S. M.; Valenta, M. M.; Apr. 30, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-AC06-76RL01830
Report No.(s): DE2007-895172; No Copyright; Avail.: National Technical Information Service (NTIS)
Static batch experiments were used to examine the sorption of dissolved perrhenate (Re(VII)), as a surrogate for pertechnetate (Tc(VII)), on corrosion products of A-516 carbon steel coupons contacted with synthetic groundwater or dilute water. After 109 days of contact time, the concentration of dissolved Re(VII) in the synthetic groundwater matrix decreased by approximately 26%; the dilute water matrix experienced a 99% decrease in dissolved Re(VII) over the same time period. Bulk XRD results for the corroded steel coupons showed that the corrosion products consisted primarily of maghemite, lepidocrocite, and goethite. Analyses of the coupons by SEM/EDS indicated that Re was present with the morphologically complex assemblages of Fe oxide/hydroxide corrosion products for samples spiked with the highest dissolved Re(VII)

concentration (1.0 mmol/L) used for these experiments. Analyses of corroded steel coupons contacted with solutions containing 1.0 mmol/L Re(VII) by synchrotron-based methods confirmed the presence of Re sorbed with the corrosion product on the steel coupons. Analyses showed that the Re sorbed on these corroded coupons was in the +7 oxidation state, suggesting that the Re(VII) uptake mechanism did not involve reduction of Re to a lower oxidation state, such as +4. The results of our studies using Re(VII) as an analogue for Tc(VII)-99 suggest that Tc(VII)-99 would also be sorbed with steel corrosion products and that the inventory of Tc(VII)-99 released from breached waste packages would be lower than what is now conservatively estimated.
NTIS
Analogs; Corrosion; Radioactive Isotopes; Radioactive Wastes; Rhenium; Steels; Technetium Isotopes; Waste Management; Carbon Steels

20070025426 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Thermodynamic Properties of 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide
Archer, D. G.; Nov. 2006; 28 pp.; In English
Report No.(s): PB2007-107295; NISTIR-6645; No Copyright; Avail.: CASI: A03, Hardcopy

Measurements of the heat capacity and the enthalpy changes of transitions of 1- hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide were requested as part of a project initiated by the International Union of Pure and Applied Chemistry (IUPAC). The measurements were performed with differential scanning calorimetry from 150 K to 345 K. These measurements led to the heat capacity of the crystal phases; the enthalpy change for transition between two crystal phases; the heat capacity of a glass, the supercooled liquid, and the stable liquid; the fusion temperatures of two crystal phases; and the enthalpy change for fusion of the stable crystal phase. Measurements at higher temperatures also probed thermal stability of the material. The calibration of the differential scanning calorimeter is described in detail.
NTIS
Enthalpy; Hexyl Compounds; Specific Heat; Thermodynamic Properties; Imides

20070025473 Barnes and Thornburg, Indianapolis, IN, USA
Variable Temperature Test Cell and Associated Method
Karlinsey, Robert L., Jr., Inventor; Carini, John P., Inventor; 16 Jun. 2005; 9 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG3-2588; NSF DMF-98-70246
Patent Info.: Filed 11 Dec. 2003; US-Patent-Appl-10/733673; US 2005/0127931
Report No.(s): PB2007-102558; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025473

A test cell for testing the electrochemical properties of a solid-state test specimen is herein disclosed. The test cell includes a heating element operable to increase the temperature of the test specimen to a desired temperature. A method of testing the electrochemical properties of a solid-state specimen is also disclosed.
Author
Solid State; Electrochemistry; Materials Tests; Performance Tests

20070025510 Analytic Power Corp., Santa Fe, Mexico
Electrochemical Hydrogen Compressor
MacKenzie, B. S.; Bloomfield, D. P.; May 01, 2006; 35 pp.; In English
Contract(s)/Grant(s): DE-FG02-05ER84220
Report No.(s): DE2007-883089; No Copyright; Avail.: National Technical Information Service (NTIS)

The research performed will lead to a commercial electrochemical hydrogen compressor. While our research did not completely investigate Molybdenum as a hydrogen anode or cathode, it did show that etched 316 stainless steel is inadequate for an EHC. It also showed that molybdenum bipolar plates, photochemical etching processes, and Gortex Teflon seals are too costly for a commercial EHC. The use of carbon paper in combination with a perforated thin metal electrode demonstrated adequate anode support strength, but is suspect in promoting galvanic corrosion. The nature of the corrosion mechanisms are not well understood, but locally high potentials within the unit cell package are probably involved. The program produced a design with an extraordinary high cell pitch, and a very low part count. This is one of the promising aspects of the redesigned EHC. The development and successful demonstration of the hydraulic cathode is also important. The problem of corrosion resistant metal bipolar plates is vital to the development of an inexpensive, commercial PEM fuel cell. Our research suggests

that there is more to the corrosion process in fuel cells and electrochemical compressors than simple, steady state, galvanic stability. It is an important area for scientific investigation.
NTIS
Compressors; Hydrogen; Turbocompressors; Electrochemistry

20070025515 Fluor Daniel Hanford, Inc., Richland, WA, USA
Assessing Chemical Hazards at the Plutonium Finishing Plant for Planning Future Decontamination and Decommissioning
Hopkins, A. M.; Klos, D. B.; Minette, M. J.; Chaboneau, S. L.; Teal, J. A.; Jan. 01, 2007; 17 pp.; In English
Report No.(s): DE2007-899763; HNF-31067-FP-REV-0; No Copyright; Avail.: Department of Energy Information Bridge

This paper documents the fiscal year (FY) 2006 assessment to evaluate potential chemical and radiological hazards associated with vessels and piping in the former plutonium process areas at Hanford's Plutonium Finishing Plant (PFP). Evaluations by PFP engineers as design authorities for specific systems and other subject-matter experts were conducted to identify the chemical hazards associated with transitioning the process areas for the long-term layup of PFP before its eventual final decontamination and decommissioning (D&D). D&D activities in the main process facilities were suspended in September 2005 for a period of between 5 and 10 years. A previous assessment conducted in FY 2003 found that certain activities to mitigate chemical hazards could be deferred safely until the D&D of PFP, which had been scheduled to result in a slab-on-grade condition by 2009. As a result of necessary planning changes, however, D&D activities at PFP will be delayed until after the 2009 time frame. Given the extended project and plant life, it was determined that a review of the plant chemical hazards should be conductd. This review to determine the extended life impact of chemicals is called the Plutoniu Finishing Plant Chemical Hazards Assessment, FY 2006. This FY 2006 assessment addresses potential chemical and radiological hazard areas identified by facility personnel and subject-matter experts who reevaluated all the chemical systems (items) from the FY 2003 assessment. This paper provides the results of the FY 2006 chemical hazards assessment and describes the methodology used to assign a hazard ranking to the items reviewed.
NTIS
Decommissioning; Decontamination; Hazards; Plutonium; Waste Management

20070025516 CH2M/Hill Hanford Group, Inc., Richland, WA, USA
Inhibition of Stress Corrosion Cracking of Carbon Steel Storage Tanks at Hanford
Brossia, C. S.; Beavers, J. A.; Brongers, M. P. H.; Edgemon, G. L.; Frankel, G. S.; Jan. 31, 2007; 19 pp.; In English
Contract(s)/Grant(s): DE-AC27-99RL14047
Report No.(s): DE2007-899766; CH2M-32542-FP REV 0; No Copyright; Avail.: Department of Energy Information Bridge

The Hanford tank reservation contains approximately 50 million gallons of liquid legacy radioactive waste from cold war weapons production, which is stored in 177 underground storage tanks. Current plans call for eventual vitrification processing and ultimate disposal of the resulting waste glass logs at the Yucca Mountain Repository. The double shelled carbon steel storage tanks presently used for storage will continue in option until the vitrification plant construction is finalized and waste processing operations completed.
NTIS
Carbon Steels; Storage Tanks; Stress Corrosion Cracking

20070025517 CH2M/Hill Hanford Group, Inc., Richland, WA, USA
Anodic Polarization Behavior of Carbon Steel in Hanford Nuclear Wastes
Gui, F.; Brossia, C. S.; Edgemon, G. L.; Beavers, J. A.; Mendz, C.; Jan. 31, 2007; 20 pp.; In English
Contract(s)/Grant(s): DE-AC27-99RL14047
Report No.(s): DE2007-899767; CH2M-32543-FP REV 0; No Copyright; Avail.: Department of Energy Information Bridge

The effect of the important chemical constituents in the Hanford nuclear waste simulant on the anodic behavior of carbon steel was studied. Specifically, the effect of pH, nitrite concentration, nitrite/nitrate concentration ratios, total organic carbon and the chloride concentration on the open circuit potential, pitting potential and repassivation potential was evaluated. It was found that pH adjusting, although capable of returning the tank chemistry back to specification, did not significantly reduce the corrosivity of the stimulant compared to the present condition. Nitrite was found to be a potent inhibitor for carbon steel. A critical concentration of approximately 1.2M appeared to be beneficial to increase the difference of repassivation potential

and open circuit potential considerably and thus prevent pitting corrosion from occurring. No further benefit was gained when increasing nitrite concentration to a higher level. The organic compounds were found to be weak inhibitors in the absence of nitrite and the change of chloride from 0.05M to 0.2M did not alter the anodic behavior dramatically.
NTIS
Carbon Steels; Polarization (Charge Separation); Radioactive Wastes

20070025518 Fluor Daniel Hanford, Inc., Richland, WA, USA
Integration of the 241Z Building Decontamination and Decommissioning Under CERCLA with RCRA Closure at the Plutonium Finishing Plant
Mattlin, E. M.; Charboneau, S. L.; Johnston, G. A.; Hopkins, A. M.; Bloom, R. W.; Feb. 01, 2007; 12 pp.; In English
Contract(s)/Grant(s): DE-AC06-96RL13200
Report No.(s): DE2007-899798; HNF-32810-FP REV 0; No Copyright; Avail.: Department of Energy Information Bridge
The 241-2 treatment and storage tanks, a hazardous waste Treatment, Storage and Disposal (TSD) unit permitted pursuant to the Resource Conservation and Recovery Act of I976 (RCRA) and Washington State Hazardous Waste Management Act, RCW 70.105, , have been deactivated and are being actively decommissioned under the provisions of the Hanford Federal Facilitv Agreement and Consent Order (HFFACO) (Ref. 1), RCRA and Comprehensive Environmental Response, Compensation, and Liability Act of 2980 (CERCLA) 42 U.S.C. 9601 et seq. The 241 -Z TSD unit managed non-listed radioactive contaminated waste water, containing trace RCRA characteristic constituents.
NTIS
Decommissioning; Decontamination; Liquid Wastes; Plutonium

20070025537 Stanford Linear Accelerator Center, Stanford, CA, USA
Chrysocolla Redefined as Spertiniite
Farges, F.; Benzerara, K.; Brown, G. E.; Nov. 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-896405; SLAC-PUB-12232; No Copyright; Avail.: National Technical Information Service (NTIS)
XAFS and (mu)-XAFS spectra were collected at the Cu K-edge for seven chrysocolla samples (Peru, USA, and Congo). The results suggest that the local structure around Cu is similar to that in Cu(OH)(sub 2) (spertiniite). Cu-L(sub 3) STXM imaging and spectroscopy confirm that the chrysocolla samples examined here consist of mesoscopic Cu(II)-rich domains surrounded by Si-rich domains (in agreement with results from infra-red spectroscopy). Hence, we suggest that chrysocolla, which is generally considered to be orthorhombic with composition (Cu,Al)(sub 2)H(sub 2)Si(sub 2)O(sub 5)(OH)(sub 4) (center-dot) nH(sub 2)O, is in actually a mesoscopic assemblage composed dominantly of spertiniite (Cu(OH)(sub 2)), water and amorphous silica (SiO(sub 2)).
NTIS
Copper Compounds; Hydroxides; Fine Structure; Spectra

20070025561 Dority and Manning, Greenville, SC, USA; Clemson Univ., SC USA
Carbon Nanotube Bases Resonant Circuit Sensor
Rao, A. M., Inventor; Chopra, S., Inventor; 24 Feb 04; 21 pp.; In English
Contract(s)/Grant(s): NSF 01-32573; NIRT DMI-0210559
Patent Info.: Filed Filed 24 Feb 04; US-Patent-Appl-SN-10-785 421
Report No.(s): PB2007-104704; No Copyright; Avail.: CASI: A03, Hardcopy
Disclosed are resonant gas sensors and methods for forming and using the disclosed sensors. The sensors include a resonator including a layer comprising adsorptive nanostructures, for example carbon nanotubes, activated carbon fibers, or adsorptive nanowires. The dielectric of the resonator is in electrical communication with the layer comprising adsorptive nanostructures such that the effective resonant frequency of the resonator depends on both the dielectric constant of the dielectric as well as the dielectric constant of the adsorptive layer. In some embodiments, the nanostructures can be degassed. The sensors can detect the presence of polar gases, non-polar gases, organic vapors, and mixtures of materials with both high sensitivity and high selectivity.
NTIS
Carbon Nanotubes; Circuits; Gas Detectors; Sensors

20070026077 Lawrence Livermore National Lab., Livermore, CA USA

Methods to Calculate Corrosion Rates for Alloy 22 from Polarization Resistance Experiments

Wong, L. L.; Martin, S. I.; Rebak, R. B.; Apr. 03, 2006; 12 pp.; In English

Report No.(s): DE2007-895416; UCRL-PROC-220344; No Copyright; Avail.: Department of Energy Information Bridge

The general corrosion rate may be measured using immersion tests or electrochemical tests. Electrochemical tests are fast and can be used for a rapid screening of environmental effects such as temperature and electrolyte composition. Electrochemical tests are described in ASTM standards G 59 and G 102. The basis of these tests is to calculate the resistance to polarization (Rp) in a voltage vs. current plot and to convert these values to corrosion rates using Faraday's law. Commercial software can calculate the corrosion rate based on inputs from the operator. This paper discusses three ways of calculating the corrosion rate (Methods 1, 2, and 3) based on a fixed set of acquired data of voltage vs. current. It is concluded that the way the corrosion rate is calculated does not greatly impact the absolute value of the corrosion rate. Variations in the acquired data (current, potential) from one experiment to another seem more important than the manner in which data is fitted with the Rp slope.

NTIS

Corrosion; Corrosion Resistance; Nickel Alloys; Polarization

20070026159 Mueting, Raasch and Gebhardt, P.A., Minneapolis, MN, USA

Structured Material for the Production of Hydrogen

Flickinger, M. C., Inventor; Harwood, C. S., Inventor; Rey, F., Inventor; 9 Aug 04; 29 pp.; In English

Contract(s)/Grant(s): DE-FG02-01ER63143; DE-FG02-95ER20184

Patent Info.: Filed Filed 9 Aug 04; US-Patent-Appl-SN-10-951-934

Report No.(s): PB2007-104605; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides composite biological devices that include biological material as an integral component thereof. The devices can be used for producing hydrogen gas, for example.

NTIS

Hydrogen; Hydrogen Production

20070026171 Arizona Univ., Tucson, AZ, USA

Materials, Methods, and Uses for Photochemical Generation of Acids and/or Radical Species

Marder, S., Inventor; Perry, J., Inventor; Zhou, W., Inventor; Kuebler, S. M., Inventor; Cammack, J. K., Inventor; 1 Apr 02; 72 pp.; In English

Contract(s)/Grant(s): NSF-CHE9408701; ONR-N00014-95-1-1319

Patent Info.: Filed Filed 1 Apr 02; US-Patent-Appl-SN-10-474-365

Report No.(s): PB2007-104597; No Copyright; Avail.: CASI: A04, Hardcopy

The present invention provides compounds and compositions, which include: at least one chromophore having strong simultaneous two-photon or multi-photon absorptivity; at least one acid- or radical-generator in close proximity to the chromophore; such that the single- or multi-photon excitation of the chromophore results in the generation of an acid and/or redical that is capable of activating chemistry; and such that compositions of matter based on the componds and compositions of the invention can be photo-patterned by one- or multiphoton excitation.

NTIS

Photochemical Reactions; Radicals; Acids; Chromophores

20070026248 NASA Ames Research Center, Moffett Field, CA, USA

Uptake and Dissolution of Gaseous Ethanol in Sulfuric Acid

Michelsen, Rebecca R.; Staton, Sarah J. R.; Iraci, Laura T.; The Journal of Physical Chemistry A; April 05, 2006; Volume 110, No. 21, pp. 6711-6717; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNA04CC01A; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1021/jp056234s

The solubility of gas-phase ethanol (ethyl alcohol, CH3CH2OH, EtOH) in aqueous sulfuric acid solutions was measured in a Knudsen cell reactor over ranges of temperature (209-237 K) and acid composition (39-76 wt % H2SO4). Ethanol is very

soluble under these conditions: effective Henry's law coefficients, H*, range from 4 x 10(exp 4) M/atm in the 227 K, 39 wt % acid to greater than 10(exp 7) M/atm in the 76 wt % acid. In 76 wt % sulfuric acid, ethanol solubility exceeds that which can be precisely determined using the Knudsen cell technique but falls in the range of 10(exp 7)-10(exp 10) M/atm. The equilibrium concentration of ethanol in upper tropospheric/lower stratospheric (UT/LS) sulfate particles is calculated from these measurements and compared to other small oxygenated organic compounds. Even if ethanol is a minor component in the gas phase, it may be a major constituent of the organic fraction in the particle phase. No evidence for the formation of ethyl hydrogen sulfate was found under our experimental conditions. While the protonation of ethanol does augment solubility at higher acidity, the primary reason H* increases with acidity is an increase in the solubility of molecular (i.e., neutral) ethanol.
Author
Ethyl Alcohol; Sulfuric Acid; Ethyl Compounds; Knudsen Gages; Aqueous Solutions; Troposphere; Organic Compounds

20070026272 Sandia National Labs., Albuquerque, NM USA
Electroforming of Bi(1-x)Sb(x) Nanowires for High-Efficiency Micro-Thermoelectric Cooling Devices on a Chip. Final LDRD Report
Siegal, M. P.; Overmyer, D. L.; Yelton, W. G.; Webb, E. B.; Nov. 2006; 23 pp.; In English
Report No.(s): DE2007-899368; SAND2006-6940; No Copyright; Avail.: Department of Energy Information Bridge

Active cooling of electronic systems for space-based and terrestrial National Security missions has demanded use of Stirling, reverse-Brayton, closed Joule-Thompson, pulse tube and more elaborate refrigeration cycles. Such cryocoolers are large systems that are expensive, demand large powers, often contain moving parts and are difficult to integrate with electronic systems. On-chip, solid-state, active cooling would greatly enhance the capabilities of future systems by reducing the size, cost and inefficiencies compared to existing solutions. We proposed to develop the technology for a thermoelectric cooler capable of reaching 77K by replacing bulk thermoelectric materials with arrays of Bi1-xSbx nanowires. Furthermore, the Sandia-developed technique we will use to produce the oriented nanowires occurs at room temperature and can be applied directly to a silicon substrate. Key obstacles include (1) optimizing the Bi1-xSbx alloy composition for thermoelectric properties; (2) increasing wire aspect ratios to 3000:1; and (3) increasing the array density to = 109wires/cm2. The primary objective of this LDRD was to fabricate and test the thermoelectric properties of arrays of Bi1-xSbx nanowires. With this proof-of-concept data under our belts we are positioned to engage National Security systems customers to invest in the integration of on-chip thermoelectric coolers for future missions.
NTIS
Chips; Cooling; Electroforming; Nanotechnology; Nanowires; Thermoelectric Cooling; Thermoelectricity

20070026305 North Carolina State Univ., Raleigh, NC, USA
Evaluation of MMFX Steel for NCDOT Concrete Bridges
Rizkalla, S.; Zia, P.; Seliem, H.; Lucier, G.; Dec. 2005; 130 pp.; In English
Report No.(s): PB2007-109846; No Copyright; Avail.: National Technical Information Service (NTIS)

The new commercially available Micro-Composite Multi-Structural Formable (MMFX) steel is a high strength and highly corrosion-resistant steel. Use of MMFX steel could lead to potential savings due to its unique characteristics. Many state transportation departments have begun to use MMFX steel as a direct replacement for conventional Grade 60 steel. However, the higher strength and lack of well-defined yield point of MMFX steel alter the structural behavior of bridge decks reinforced with MMFX steel bars. Therefore, three concrete bridge decks with a span-to-depth ratio of 12.5 were tested up to failure using concentrated loads intended to simulate the effects of truck wheel loadings. The first and second bridge decks were reinforced with the same amount of MMFX and conventional Grade 60 steel, respectively. The third bridge deck was reinforced with MMFX steel reduced by 33 percent in an attempt to utilize its high strength characteristics. The results of the experimental program and the analytical modeling demonstrated that bridge decks reinforced with 33 percent less MMFX steel developed the same ultimate load-carrying capacity and deflection at service load as those reinforced with Grade 60 steel.
NTIS
Concrete Structures; Concretes; Corrosion Resistance; Steels

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METALS AND METALLIC MATERIALS

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

20070025232 Lawrence Livermore National Lab., Livermore, CA USA
Anodic Behavior of Alloy 22 in High Nitrate Brines at Temperatures Higher than 100 degree C
Llevbare, G. O.; Etien, R. A.; Estill, J. C.; Hust, G. A.; Yilmaz, A.; Mar. 31, 2006; 12 pp.; In English
Report No.(s): DE2007-895423; UCRL-PROC-220305; No Copyright; Avail.: National Technical Information Service (NTIS)

Alloy 22 (N06022) may be susceptible to crevice corrosion in chloride solutions. Nitrate acts as an inhibitor to crevice corrosion. Several papers have been published regarding the effect of nitrate on the corrosion resistance of Alloy 22 at temperatures 100 degrees C and lower. However, very little is known about the behavior of this alloy in highly concentrated brines at temperatures above 100 degrees C. In the current work, electrochemical tests have been carried out to explore the anodic behavior of Alloy 22 in high chloride high nitrate electrolytes at temperatures as high as 160 degrees C at ambient atmospheres. Even though Alloy 22 may adopt corrosion potentials in the order of +0.5 V (in the saturated silver chloride scale), it does not suffer crevice corrosion if there is high nitrate in the solution. That is, the inhibitive effect of nitrate on crevice corrosion is active for temperatures higher than 100 degrees C.
NTIS
Anodes; Brines; High Temperature; Nickel Alloys; Nitrates; Corrosion Resistance

20070025235 Lawrence Livermore National Lab., Livermore, CA USA
Bulk Properties of Iron Isotopes
Algin, E.; Schiller, A.; Voinov, A.; Agvannluvsan, U.; Belgya, T.; Jul. 31, 2006; 18 pp.; In English
Report No.(s): DE2007-895427; UCRL-PROC-223278; No Copyright; Avail.: Department of Energy Information Bridge

Determination of nuclear level densities (NLDs) and radiation strength functions (RSFs) has been of great importance, in particular, in reaction modeling calculations. The experimental data on NLDs for many nuclei are obtained from the analysis of low-lying discrete levels and neutron resonance data. This information on NLDs covers a rather narrow excitation energy range. Therefore, other methods are necessary to determine the NLD in a wider ranges of excitation energies.
NTIS
Iron Isotopes; Radiation; Gamma Rays

20070025298 Naval Surface Warfare Center, Bethesda, MD USA
Modeling High Carbon and High Nickel Steel: Effect of Heat Treatment Time
Rao, A S; Jan 2005; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465559; NSWCCD-61-TR-2005/05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In order to understand the effect of heat treatment on the mechanical properties such as the yield strength (5 (02%)), ultimate stress (Su), deformation (d (%)), reduction in area of cross section (RA(%)) and Charpy v-notch test (CVN) values, a neural network analysis approach was undertaken to analyze the data obtained on 10% nickel steel. Initially the neural network was trained using the experimental data collected from 121 data sets from 10 different steel samples that were heat treated at temperatures in the range 950 - 1,050 degrees F, and for up to 1200 minutes. There was insufficient data to run the neural network analysis using the neural mode of analysis. The network analysis was made using the genetic mode over a very small heat treatment range (up to 600 min). The predicted values were then added as additional input to retrain the neural network. By repeating the above procedure three times, final neural network analysis was carried out to predict the properties of steel as a function of heat treatment time (1200 min.). There was not enough data on the CVN values to perform any mode of neural network analysis. The final predictions on the mechanical properties results conclude that the heat treatment at a given temperature (in the range 950 - 1050 degrees F) for up to 300 minutes has some effect on the 5 (02%), Su, d (%), and RA(%) values. However, prolonged heat treatment above 300 minutes and up to 1200 minutes has no significant effect.
DTIC
Carbon; Heat Treatment; Nickel; Nickel Steels; Temperature Effects

20070025535 Lockheed Martin Corp., Schenectady, NY, USA; Union Coll., Schenectady, NY, USA
SCC Initiation in Alloy 600 Heat Affect Zones Exposed to High Temperature Water
Richey, E.; Morton, D. S.; Etien, R. A.; Young, G. A.; Bucinell, R. B.; Nov. 03, 2006; 23 pp.; In English
Report No.(s): DE2007-896371; LM-06K125; No Copyright; Avail.: National Technical Information Service (NTIS)

Studies have shown that grain boundary chromium carbides improve the stress corrosion cracking (SCC) resistance of nickel based alloys exposed to high temperature, high purity water. However, thermal cycles from welding can significantly alter the microstructure of the base material near the fusion line. In particular, the heat of welding can solutionize grain boundary carbides and produce locally high residual stresses and strains, reducing the SCC resistance of the Alloy 600 type material in the heat affected zone (HAZ). Testing has shown that the SCC growth rate in Alloy 600 heat affected zone samples can be (approx.) 30x faster than observed in the Alloy 600 base material under identical testing conditions due to fewer intergranular chromium rich carbides and increased plastic strain in the HAZ. Stress corrosion crack initiation tests were conducted on Alloy 600 HAZ samples at 360 C in hydrogenated, deaerated water to determine if these microstructural differences significantly affect the SCC initiation resistance of Alloy 600 heat affected zones compared to the Alloy 600 base material. Alloy 600 to EN82H to Alloy 600 heat-affected-zone (HAZ) specimens where fabricated from an Alloy 600 to Alloy 600 narrow groove weld with EN82H filler metal. The approximate middle third of the specimen gauge region was EN82H such that each specimen had two HAZ regions. Tests were conducted with in-situ monitored smooth tensile specimens under a constant load, and a direct current electric potential drop was used for in-situ detection of SCC.
NTIS
Chromium Carbides; Inconel (Trademark); Stress Corrosion Cracking; Water; Heat Resistant Alloys

20070025562 National Inst. of Standards and Technology, Gaithersburg, MD USA
Study of Metal Truss Plate Connectors when Exposed to Fire
Harman, K. A.; Lawson, J. R.; Jan. 2007; 20 pp.; In English
Report No.(s): PB2007-109663; NISTIR-7393; No Copyright; Avail.: National Technical Information Service (NTIS)

The popularity of lightweight, metal plate connected wood truss construction is increasing due to cost effectiveness, versatility, and ease of construction. This type of construction brings many concerns to the firefighting community, since structural collapse has caused numerous injuries and fatalities in the fire service. In an attempt to determine the performance of metal plate wood truss connections during fire exposures, NIST conducted a series of twelve instrumented tests exposing one side of the test specimen to the thermal exposure. Load carrying ability of the metal plate truss connections was not measured during these tests. The tests were purely an attempt to study the heat transfer between the metal plate and the wood. Results from these tests suggest that the metal plates help to protect the wood beneath the plates. However, additional work is required to produce more detailed information.
NTIS
Connectors; Fires; Flammability; Metal Plates; Structural Members; Trusses; Wooden Structures

20070026107 Oak Ridge National Lab., TN USA
Cracking and Corrosion of Composite Tubes in Black Liquor Recovery Boiler Primary Air Ports
Keiser, J. R.; Singbeil, D. L.; Sarma, G. B.; Kish, J. R.; Yuan, J.; Oct. 2006; 179 pp.; In English
Report No.(s): DE2007-899758; ORNL/TM-2006/112; No Copyright; Avail.: National Technical Information Service (NTIS)

Black liquor recovery boilers are an essential part of kraft mills. Their design and operating procedures have changed over time with the goal of providing improved boiler performance. These performance improvements are frequently associated with an increase in heat flux and/or operating temperature with a subsequent increase in the demand on structural materials associated with operation at higher temperatures and/or in more corrosive environments. Improvements in structural materials have therefore been required. In most cases the alternate materials have provided acceptable solutions. However, in some cases the alternate materials have solved the original problem but introduced new issues. This report addresses the performance of materials in the tubes forming primary air port openings and, particularly, the problems associated with use of stainless steel clad carbon steel tubes and the solutions that have been identified.
NTIS
Boilers; Composite Structures; Corrosion; Pipes (Tubes)

20070026119 Budapest Univ. of Technology and Economics, Budapest, Hungary

Effect of Aging Time and Boron Addition on the Properties of 9-12% CR Power Plant Steels-Outcomes from Different Experimental Investigations

Artinger, I.; Elarbi, Y.; May 2006; 83 pp.; In English

Report No.(s): PB2007-110267; Copyright; Avail.: National Technical Information Service (NTIS)

The relation between the aging time and the mechanical properties of the investigated steels was demonstrated graphically as a result of an experimental work in this paper. The effect of trace boron in steels, especially the influence of boron on microstructure and properties of 9-12% Cr steels were also summarized. Three alloys with and without boron of 9% Cr steels were prepared. The specimens prepared for testing were aged at 20C and 650C for time range of 3000 to 10000 hrs. Concerning the effect of boron addition to the 9-12% Cr steels, some results of recent investigation studies by other researcherswere alsomentioned in this paper formore information about the role of this alloying element in improving of high alloyed chromium steels.

NTIS

Boron; Chromium Steels; Stainless Steels; Steels; Time Dependence

20070026126 Lawrence Livermore National Lab., Livermore, CA USA

Analysis of Density Changes in Plutonium Observed from Accelerated Aging Using Pu-238 Enrichment

Chung, B. W.; Saw, C. K.; Thompson, S. R.; Quick, T. M.; Woods, C. H.; Jul. 24, 2006; 14 pp.; In English

Report No.(s): DE2007-900066; UCERL-CONF-223081; No Copyright; Avail.: Department of Energy Information Bridge

We present dimensional and density changes in an aging plutonium alloy enriched with 7.3 at. % of 238Pu and reference alloys of various ages. After 45 equivalent years of aging, the enriched alloys at 35DGC have swelled in volume by 0.14 to 0.16% and now exhibit a near linear volume increase, without void swelling. Based on X-ray diffraction measurements, the lattice expansion by self-irradiation appears to be the primary cause for dimensional changes during the initial 2-3 years of aging. Following the initial transient, the density change is primarily cause by a constant helium in-growth rate as a result of alpha-particle decay.

NTIS

Accelerated Life Tests; Aging (Materials); Enrichment; Plutonium; Plutonium 238

20070026127 Lawrence Livermore National Lab., Livermore, CA USA

Synchrotron Based Observations of Sigma Phase Formation and Dissolution in Duplex Stainless Steel

Elmer, J.; Palmer, T.; Specht, E.; Aug. 23, 2006; 20 pp.; In English

Report No.(s): DE2007-900063; UCRL-CONF-223928; No Copyright; Avail.: National Technical Information Service (NTIS)

The formation and growth of sigma (s) phase in 2205 duplex stainless steel was observed and measured in real time using synchrotron radiation during isothermal heat treating at temperatures between 700 deg C and 850 deg C. Synchrotron experiments were performed on this material at the Advanced Photon Source (APS) while isothermally holding the samples for times of up to 10 hr. During the isothermal hold, sigma formed in quantities up to 22% as the ferrite transformed to a mixture of sigma and austenite phases. In addition, sigma formed at 850 deg C was heated to 100 deg C to observe its dissolution. The amounts of sigma that formed, and the dissolution temperature of sigma were compared to the results predicted by Thermocalc, showing differences between the calculated and measured values. The synchrotron data was further modeled using a modified Johnson-Mehl-Avrami analysis to determine kinetic parameters for sigma formation. The initial JMA exponent, n, at low fractions of sigma was found to be approximately 7.0, however, towards the end of the transformation, n decreased to values of approximately 0.75. Because of the variable value of n, it was not possible to determine reliable values for the activation energy and pre-exponential terms for the JMA equation. During cooling to room temperature, the high temperature austenite partially transformed to ferrite, substantially increasing the ferrite content while the sigma phase kept its high temperature value.

NTIS

Austenitic Stainless Steels; Dissolving; Duplexers; Synchrotron Radiation; Synchrotrons

20070026245 NASA Glenn Research Center, Cleveland, OH, USA

Comparison of GRCop-84 to Other Cu Alloys with High Thermal Conductivities

deGroh, Henry C., III; Ellis, David L.; Loewenthal, William S.; [2007]; 24 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 644423.06.31.04.01.03.22; Copyright; Avail.: CASI: A03, Hardcopy

The mechanical properties of six highly conductive copper alloys, GRCop-84, AMZIRC, GlidCop Al-15, Cu-1Cr-0.1Zr,

Cu-0.9Cr, and NARloy-Z were compared. Tests were done on as-received hard drawn material, and after a heat treatment designed to simulate a brazing operation at 935 C. In the as-received condition AMZIRC, GlidCop Al-15, Cu- 1Cr-0.1Zr and Cu-0.9Cr had excellent strengths at temperatures below 500 C. However, the brazing heat treatment substantially decreased the mechanical properties of AMZIRC, Cu-1Cr-0.1Zr, Cu-0.9Cr, and NARloy-Z. The properties of GlidCop Al-15 and GRCop-84 were not significantly affected by the heat treatment. Thus there appear to be advantages to GRCop-84 over AMZIRC, Cu-1Cr-0.1Zr, Cu-0.9Cr, and NARloy-Z if use or processing temperatures greater than 500 C are expected. Ductility was lowest in GlidCop Al-15 and Cu-0.9Cr; reduction in area was particularly low in GlidCop Al-15 above 500 C, and as- received Cu-0.9Cr was brittle between 500 and 650 C. Tensile creep tests were done at 500 and 650 C; the creep properties of GRCop-84 were superior to those of brazed AMZIRC, Cu-1Cr- 0.1Zr, Cu-0.9Cr, and NARloy-Z. In the brazed condition, GRCop-84 was superior to the other alloys due to its greater strength and creep resistance (compared to AMZIRC, Cu-1Cr-0.1Zr, Cu-0.9Cr, and NARloy-Z) and ductility (compared to GlidCop Al-15).
Author
Conductivity; Copper Alloys; Mechanical Properties; Thermodynamic Properties

20070026284 Lawrence Livermore National Lab., Livermore, CA USA
Application of Neutron-Absorbing Structural-Amorphous Metal (SAM) Coatings for Spent Nuclear Fuel (SNF) Container to Enhance Criticality Safety Control
Choi, J. S.; Jan. 12, 2007; 46 pp.; In English
Report No.(s): DE2007-900045; UCRL-TR-227250; No Copyright; Avail.: Department of Energy Information Bridge
This report describes the analysis and modeling approaches used in the evaluation for criticality-control applications of the neutron-absorbingst ructural-amorphous metal (SAM) coatings. The applications of boron-containing high-performance corrosion-resistant material (HPCRM) amorphous metal as the neutron-absorbing coatings to the metallic support structure can enhance criticality safety controls for spent nuclear fuel in baskets inside storage containers, transportation casks,and disposal containers. The use of these advanced iron-based, corrosion-resistant materials to prevent nuclear criticality in transportation, aging, and disposal containers would be extremely beneficial to the nuclear waste management programs.
NTIS
Amorphous Materials; Corrosion Resistance; Metal Coatings; Metals; Neutrons; Nuclear Fuels; Safety; Spent Fuels

20070026350 Michigan Univ., Ann Arbor, MI, USA
Highly Preheated Combustion Air System with/without Oxygen Enrichment for Metal Processing Furnaces
Atreya, A.; January 2006; 35 pp.; In English
Contract(s)/Grant(s): DE-FC36-02ID14348
Report No.(s): DE2007-899515; No Copyright; Avail.: National Technical Information Service (NTIS)
This work develops and demonstrates a laboratory-scale high temperature natural gas furnace that can operate with/without oxygen enrichment to significantly improve energy efficiency and reduce emissions. The laboratory-scale is 5ft in diameter & 8ft tall. This furnace was constructed and tested. This report demonstrates the efficiency and pollutant prevention capabilities of this test furnace. The project also developed optical detection technology to control the furnace output.
NTIS
Combustion; Enrichment; Furnaces; Natural Gas; Oxygen

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*.

20070025337 Defence Science and Technology Organisation, Victoria, Australia
Progress Report on Activities in Support of Composite Repair Engineering Development Program Tasks AF, AH and AI
Rider, A N; Parslow, D; Nov 2006; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465919; DSTO-TR-1932; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Research has been undertaken to support the Royal Australian Air Force's commitments to the F/A-18 Composite Repair Engineering Development Program (CREDP). This report details work that has examined the effectiveness of surface treatments for adhesive bonding to aluminium, titanium and stainless steel (Tasks AF and AH) and the benefit of resin injection

repairs to damaged composite laminates to restore fatigue strength (Task Al). The studies showed that bonding to high modulus metals using current and new generation surface treatment processes does not appear to be as effective as on alumimium alloys. Resin injection repairs to damaged composite laminates shows some measurable improvements over unrepaired laminates when tested in compression-compression fatigue.
DTIC
Adhesive Bonding; Product Development

20070025469 Cristie, Parker and Hale, LLP, Pasadena, CA, USA
Perfluoroalkanesulfornic Acides and Perfluoroalkanesulfonimides as Electrode Additives for Fuel Cells
Narayanan, Sekharipuram, R., Inventor; Smart, Marshall C., Inventor; Surampudi, Subbarao, Inventor; Surya-Prakash, G. K., Inventor; Wang, Qun-jie, Inventor; Olah, George A., Inventor; 29 Sep. 2005; 17 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS7-1407
Patent Info.: Filed 1 Oct. 2004; US-Patent-Appl-10/956835; US 2005/0214629
Report No.(s): PB2007-105814; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025469

Coating materials for coating the electrodes of a fuel cell are disclosed. In one embodiment, the coating materials comprise perfluoroalkanesulfonic acids having the general formula F(sub 3)C--(CF(sub 2))(sub n)--SO(sub 3)H, wherein n ranges from 8 to 17. In another embodiment, the coating materials comprise perfluoroalkanesulfonimides having the general formula C(sub n)F(sub 2n+1)SO(sub 2)NHO(sub 2)SF(sub 2m+1)C(sub m), wherein the sum of m and n ranges from 8 to 17. These long chain sulfonic acids and imides impart improved electrode performance and decrease polarization.
Official Gazette of the U.S. Patent and Trademark Office
Additives; Electrodes; Fuel Cells; Methyl Alcohol; Coatings

20070025570 Foley and Lardner, LLP, Washington, DC, USA; Northwestern Univ., Evanston, IL, USA
Methods Utilizing Scanning Probe Microscope Tips and Products Therefor or Produced Thereby
Mirkin, C. A., Inventor; Piner, R., Inventor; Hong, S., Inventor; 10 Sep 04; 55 pp.; In English
Contract(s)/Grant(s): F49620-96-1-055
Patent Info.: Filed Filed 10 Sep 04; US-Patent-Appl-SN-10-937 877
Report No.(s): PB2007-104661; No Copyright; Avail.: CASI: A04, Hardcopy

The invention provides a lithographic method referred to as 'dip pen' nanolithography (DPN). DPN utilizes a scanning probe microscope (SPM) tip (e.g., an atomic force microscope (AFM) tip) as a 'pen,' a solid-state substrate (e.g., gold) as 'paper,' and molecules with a chemical affinity for the solid-state substrate as 'ink.' Capillary transport of molecules from the SPM tip to thee solid substrate is used in DPN to directly write patterns consisting of a relatively small collection of molecules in submicrometer dimensions, making DPN useful in the fabrication of a variety of microscale and nanoscale devices. The invention also provides substrates patterned by DPN, including submircometer combinatorial arrays, and kits, devices and software for performing DPN. The invention further provides a method of performing AFM imaging in air. The method comprises coating an AFM tip with a hydrophobic compound, the hydrophobic compound being selected so that AFM imaging perfromed using the coated AFM tip is improved compared to AFM imaging preformed using an uncoated AFM tip. Finally, the invention provides AFM tips coated with the hydrophobic compounds.
NTIS
Lithography; Nanofabrication; Nanotechnology; Scanners; Substrates

20070025574 Drinker Biddle and Reath, LLP, Philadelphia, PA, USA
Block Co-Polymer Worm Micelles and Methods of Use Therefor
Discher, D. E., Inventor; Dalhaimer, P., Inventor; 6 Aug 04; 29 pp.; In English
Contract(s)/Grant(s): NIH-R21; NSF-MRSEC
Patent Info.: Filed Filed 6 Aug 04; US-Patent-Appl-SN-10-913 660
Report No.(s): PB2007-104669; No Copyright; Avail.: CASI: A03, Hardcopy

Provided are worm-like micelles, capable of encapsulating at least one encapsulant, wherein each worm-like micelle comprises one or more wholly synthetic, polymeric, super-amphiphilic molecules that self assemble in aqueous solution, without organic solvent or post assembly polymerization; and wherein at least one of said super-amphiphilic molecules is a hydrophilic block copolymer, the weight fraction (w) of which, relative to total copolymer molecular weight, directs assembly

of the amphiphilic molecules into the worm-like micelle of up to one or more microns in length, and determines its stability, flexibility and convective responsiveness. Also provide are methods of preparing and methods of using the worm-like micelles, particularly when loaded with one or more encapsulants. The loaded worm-like micelles of the present invention are particularly suited for the stable and controlled transport, delivery and storage of materials, either in vivo or in vitro.
NTIS
Micelles; Aqueous Solutions; Block Copolymers; Self Assembly; Agglomeration; Assembling; Copolymerization

20070026195 Boggs (Patton), Denver, CO, USA; California Univ., Berkeley, CA, USA
Nanocomposite Ceramics of Oxide and No-Oxide Phases and Methods for Producing Same
Raj, R., Inventor; Saha, A., Inventor; Shah, S., Inventor; 28 Apr 03; 12 pp.; In English
Patent Info.: Filed Filed 28 Apr 03; US-Patent-Appl-SN-10-511 464
Report No.(s): PB2007-104010; No Copyright; Avail.: CASI: A03, Hardcopy

A composite of nanoscale oxide ceramic phases is dispersed in a non-oxide ceramic matrix material. The non-oxide ceramic phase may be silicon-carbon-nitrogen-based, and imparts resistance to mechanical degradation, resistance to chemical degradation, and resistance to oxidation at temperatures up to 1800 degrees C. The nanodispersed oxide phase is selected according to desired functional properties, including coefficient of thermal expansion, rheology, ferromagnetic and superparamagnetic properties, superdielectric properties, and superpiezolectric and electrostrictive properties. A method is provided for making a nanocomposite ceramic fiber having a nanodispersion of zirconia in a silicon-carbon-nitrogen ceramic phase. A method is provided for making a soft ferromagnetic ceramic having a nanodispersion of ferrite in a zirconia in a silicon-carbon-nitrogen ceramic phase.
NTIS
Ceramics; Nanocomposites; Zirconium Oxides; Ferromagnetic Materials

20070026229 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA; California Univ., Oakland, CA, USA
Nanocrystalline Ceramic Materials Reinforced with Single-Wall Carbon Nanotubes
Zhan, G., Inventor; Mukherjee, A. K., Inventor; Kuntz, J. D., Inventor; Wan, J., Inventor; 13 Dec 04; 7 pp.; In English
Contract(s)/Grant(s): DAAD-19-00-1-0185
Patent Info.: Filed Filed 13 Dec 04; US-Patent-Appl-SN-11-011-207
Report No.(s): PB2007-103976; No Copyright; Avail.: CASI: A02, Hardcopy

Composites of ceramic materials, notably alumina or metal oxides in general, with single-wall carbon nanotubes are consolidated by electric field-assisted sintering to achieve a fully dense material that has an unusually high fracture toughness compared to the ceramic alone, and also when compared to composites that contain multi-wall rather than single-wall carbon nanotubes, and when compared to composites that are sintered by methods that do not include exposure to an electric field.
NTIS
Carbon Nanotubes; Ceramics; Composite Materials; Patent Applications; Walls

20070026236 Savannah River National Lab., Aiken, SC, USA; Pacific Northwest National Lab., Richland, WA, USA
Glass Selection Strategy: Development of US and KRI Test Matrices
Aloy, A.; Vienna, J. D.; Fox, K. M.; Sep. 2006; 34 pp.; In English
Report No.(s): DE2007-899687; WSRC-STI-2006-00205; No Copyright; Avail.: National Technical Information Service (NTIS)

High-level radioactive wastes are stored as liquids in underground storage tanks at the Department of Energys (DOE) Savannah River Site (SRS) and Hanford Reservation. These wastes are to be prepared for permanent disposition in a geologic repository by vitrification with glass forming additives (e.g., frit), creating a waste form with long-term durability. Wastes at SRS are being vitrified in the Defense Waste Processing Facility (DWPF). Vitrification of the wastes stored at Hanford is planned for the Waste Treatment and Immobilization Plant (WTP) when completed. Some of the wastes at SRS, and particularly those at Hanford, contain high concentrations of aluminum, chromium and sulfate. These elements make it more difficult to produce a waste glass with a high waste loading (WL) without crystallization occurring in the glass (either within the melter or upon cooling of the glass), potentially exceeding the solubility limit of critical components, having negative

impacts on durability, and/or resulting in the formation of a sulfate salt layer on the molten glass surface. Although the overall scope of the task is focused on all three critical, chemical components, the current work will primarily address the potential for crystallization (e.g., nepheline and/or spinel) in high level waste (HLW) glasses. Recent work at the Savannah River National Laboratory (SRNL) and by other groups has shown that nepheline (NaAlSiO4), which is likely to crystallize in high-alumina glasses, has a detrimental effect on the durability of the glass.
NTIS
Glass; Radioactive Wastes; Test Facilities

20070026238 William J. Hughes Technical Center, Atlantic City, NJ, USA; SRA International, Inc., Egg Harbor Twp., NJ, USA
Thermal Analysis of Polymer Flammability
Lyon, R. E.; Filipczak, R.; Walters, R. N.; Crowley, S.; Stoliarov, S. I.; Apr. 2007; 44 pp.; In English
Report No.(s): PB2007-109829; No Copyright; Avail.: CASI: A03, Hardcopy

A thermal analysis method is presented that uses controlled heating of polymer samples and complete combustion of the evolved gases to separately reproduce the condensed and gas phase processes of flaming combustion in a single laboratory test. Oxygen consumption calorimetry applied to the combustion gas stream gives the heat release rate history of the sample as a function of its temperature. The maximum rate of heat release and the temperature at which it occurs are polymer characteristics related to fire performance and flame resistance.
NTIS
Flammability; Thermal Analysis; Polymers; Heating

20070026243 NASA Glenn Research Center, Cleveland, OH, USA
An Elongated Tetrakaidecahedron Model for Open-Celled Foams
Sullivan, Roy M.; Ghosn, Louis J.; Lerch, Bradley A.; July 17, 2007; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 524238.08.02.03.04
Report No.(s): NASA/TM-2007-214931; E-16169; Copyright; Avail.: CASI: A03, Hardcopy

A micro-mechanics model for non-isotropic, open-celled foams is developed using an elongated tetrakaidecahedron (Kelvin model) as the repeating unit cell. The micro-mechanics model employs an elongated Kelvin model geometry which is more general than that employed by previous authors. Assuming the cell edges possess axial and bending rigidity, the mechanics of deformation of the elongated tetrakaidecahedron lead to a set of equations for the Young's modulus, Poisson's ratio and strength of the foam in the principal material directions. These equations are written as a function of the cell edge lengths and cross-section properties, the inclination angle and the strength and stiffness of the solid material. The model is applied to predict the strength and stiffness of several polymeric foams. Good agreement is observed between the model results and the experimental measurements.
Author
Foams; Mechanical Properties; Polymer Physics; Mathematical Models

20070026299 Colburn (Cantor), LLP, Bloomfield, CT, USA
Shape Memory Main-Chain Smectic-C Elastomers
Mather, P. T., Inventor; Rousseau, I. A., Inventor; Qin, H., Inventor; 31 Mar 05; 32 pp.; In English
Contract(s)/Grant(s): NSF-CTS-00093880
Patent Info.: Filed Filed 31 Mar 05; US-Patent-Appl-SN-11-096-021
Report No.(s): PB2007-104033; No Copyright; Avail.: CASI: A03, Hardcopy

Shape memory main-chain smectic-C elastomers are described. The elastomers are prepared by hydrosilylation of a reaction mixture including a liquid crystalline diene, a crosslinking agent, and a bis(silyl hydride) compound. The elastomers exhibit shape-memory properties and spontaneously reversible shape changes. They are useful for fabrication of shape memory articles including, for example, implantable medical devices, contact lenses, reversible embossing media, and Fresnel lenses.
NTIS
Elastomers; Liquid Crystals; Shape Memory Alloys; Shapes; Fabrication

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*.

20070025136 NASA Glenn Research Center, Cleveland, OH, USA
Energy Storage: Batteries and Fuel Cells for Exploration
Manzo, Michelle A.; Miller, Thomas B.; Hoberecht, Mark A.; Baumann, Eric D.; July 2007; 18 pp.; In English; 45th Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2007, Reno, NV, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 038957.04.01.03.03.05
Report No.(s): NASA/TM-2007-214837; AIAA Paper-2007-0541; E-16051; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025136

NASA's Vision for Exploration requires safe, human-rated, energy storage technologies with high energy density, high specific energy and the ability to perform in a variety of unique environments. The Exploration Technology Development Program is currently supporting the development of battery and fuel cell systems that address these critical technology areas. Specific technology efforts that advance these systems and optimize their operation in various space environments are addressed in this overview of the Energy Storage Technology Development Project. These technologies will support a new generation of more affordable, more reliable, and more effective space systems.
Author
Aerospace Systems; Electric Batteries; Energy Storage; Space Exploration; Technology Utilization; Regenerative Fuel Cells

20070025229 Lawrence Livermore National Lab., Livermore, CA USA
Versatile Synthesis of 1 3 5-Triamino-2 4 6 -Trinitrobenzene (TATB)
Mitchell, A. R.; Pagoria, P. F.; Schmidt, R. D.; Coburn, M. D.; Lee, G. S.; Apr. 10, 2006; 14 pp.; In English
Report No.(s): DE2007-895417; UCRL-PROC-220479; No Copyright; Avail.: Department of Energy Information Bridge

A safe and versatile synthesis of high-purity 1,3,5-triamino- 2,4,6-trinitrobenzene (TATB) based on vicarious nucleophilic substitution (VNS) chemistry has now been achieved. The starting material can be selected from a variety of inexpensive nitroarenes obtained from commercial suppliers (4-nitroaniline, picric acid) or U.S. stockpiles (ammonium picrate, TNT). The use of picric acid and ammonium picrate (Explosive D) is preferred as both compounds are directly converted to picramide in the presence of ammonium salts (diammonium hydrogen phosphate, ammonium carbamate) in sulfolane at elevated temperature. The picramide resulting from this process is directly converted to TATB using an optimized VNS reaction employing inexpensive hydroxylamine as the nucleophilic aminating reagent. A crucial element in our synthesis is a novel and efficient purification of TATB.
NTIS
Explosives; TATB; Synthesis (Chemistry)

20070026244 NASA Glenn Research Center, Cleveland, OH, USA
A Step Towards CO2-Neutral Aviation
Brankovic, Andreja; Ryder, Robert C.; Hendricks, Robert C.; Huber, Marcia L.; September 17, 2007; 11 pp.; In English; 2007 SAE AeroTech Congress and Exhibition; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.16.03
Report No.(s): SAE-07ATC-214; Copyright; Avail.: Other Sources

An approximation method for evaluation of the caloric equations used in combustion chemistry simulations is described. The method is applied to generate the equations of specific heat, static enthalpy, and Gibb's free energy for fuel mixtures of interest to gas turbine engine manufacturers. Liquid-phase fuel properties are also derived. The fuels include JP-8, synthetic fuel, and two fuel blends consisting of a mixture of JP-8 and synthetic fuel. The complete set of fuel property equations for both phases are implemented into a computational fluid dynamics (CFD) flow solver database, and multi-phase, reacting flow simulations of a well-tested liquid-fueled combustor are performed. The simulations are a first step in understanding combustion system performance and operational issues when using alternate fuels, at practical engine operating conditions.
Author
Carbon Dioxide; Combustion Chemistry; Computational Fluid Dynamics; Gas Turbine Engines; JP-8 Jet Fuel; Specific Heat; Synthetic Fuels

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

20070026246 NASA Glenn Research Center, Cleveland, OH, USA

Pyrolysis of Large Black Liquor Droplets

Bartkus, Tadas P.; T'ien, James S.; Dietrich, Daniel L.; Wessel, Richard A.; July 18, 2007; 20 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 567524.04.02.03; Copyright; Avail.: CASI: A03, Hardcopy

This paper presents the results of experiments involving the pyrolysis of large black liquor droplets in the NASA KC-135 reduced gravity aircraft. The reduced gravity environment facilitated the study of droplets up to 9 mm in diameter extending the results of previous studies to droplet sizes that are similar to those encountered in recovery boilers. Single black liquor droplets were rapidly inserted into a 923 K oven. The primary independent variables were the initial droplet diameter (0.5 mm to 9 mm), the black liquor solids content (66.12% - 72.9% by mass), and the ambient oxygen mole fraction (0.0 - 0.21). Video records of the experiments provided size and shape of the droplets as a function of time. The results show that the particle diameter at the end of the drying stage (D(sub DRY)) increases linearly with the initial particle diameter (D(sub O)). The results further show that the ratio of the maximum swollen diameter (D(sub MAX)) to D(sub O) decreases with increasing D(sub O) for droplets with D(sub O) less than 4 mm. This ratio was independent of D(sub O) for droplets with D(sub O) greater than 4 mm. The particle is most spherical at the end of drying, and least spherical at maximum swollen size, regardless of initial sphericity and droplet size.

Author

Drop Size; Drops (Liquids); Microgravity; Pyrolysis

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*.

20070025210 Tuskegee Univ., AL, USA

Using a Low Cost Flight Simulation Environment for Interdisciplinary Education

Khan, M. Javed; Rossi, Marcia; ALi, Syed F.; June 2004; 9 pp.; In English; ASEE Annual Conference and Exposition, June 2004, Salt Lake City, UT, USA

Contract(s)/Grant(s): NAG4-226; Copyright; Avail.: Other Sources

A multi-disciplinary and inter-disciplinary education is increasingly being emphasized for engineering undergraduates. However, often the focus is on interaction between engineering disciplines. This paper discusses the experience at Tuskegee University in providing interdisciplinary research experiences for undergraduate students in both Aerospace Engineering and Psychology through the utilization of a low cost flight simulation environment. The environment, which is pc-based, runs a low-cost of-the-shelf software and is configured for multiple out-of-the-window views and a synthetic heads down display with joystick, rudder and throttle controls. While the environment is being utilized to investigate and evaluate various strategies for training novice pilots, students were involved to provide them with experience in conducting such interdisciplinary research. On the global inter-disciplinary level these experiences included developing experimental designs and research protocols, consideration of human participant ethical issues, and planning and executing the research studies. During the planning phase students were apprised of the limitations of the software in its basic form and the enhancements desired to investigate human factors issues. A number of enhancements to the flight environment were then undertaken, from creating Excel macros for determining the performance of the 'pilots', to interacting with the software to provide various audio/video cues based on the experimental protocol. These enhancements involved understanding the flight model and performance, stability & control issues. Throughout this process, discussions of data analysis included a focus from a human factors perspective as well as an engineering point of view.

Author

Aerospace Engineering; Education; Flight Simulation; Flight Training; Educational Resources; Training Devices

20070025419 Wisconsin Univ., Madison, WI, USA; California Univ., Berkeley, CA USA; Argonne National Lab., IL USA; Tennessee Univ., Knoxville, TN, USA

User-Friendly End Station at the ALS for Nanostructure CharacterizationReport

Himpsel, F. J.; Alivisatos, P.; Calcott, T.; Carlisle, J.; Denlinger, J. D.; Jul. 05, 2006; 8 pp.; In English

Contract(s)/Grant(s): DE-FG02-01ER459197

Report No.(s): DE2007-896224; No Copyright; Avail.: National Technical Information Service (NTIS)

This is a construction project for an end station at the ALS, which is optimized for measuring NEXAFS of nanostructures with fluorescence detection. Compared to the usual electron yield detection, fluorescence is able to probe buried structures and is sensitive to dilute species, such as nanostructures supported on a substrate.

NTIS

Characterization; Nanostructure (Characteristics); Radiation Sources; Synchrotron Radiation; Fluorescence

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20070025224 NASA Glenn Research Center, Cleveland, OH, USA

Path Loss Prediction Over the Lunar Surface Utilizing a Modified Longley-Rice Irregular Terrain Model

Foore, Larry; Ida, Nathan; July 2007; 12 pp.; In English; Wireless for Space Workshop, 22 Jan. 2007, Colorado Springs, CO, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 141141.02.05.03

Report No.(s): NASA/TM-2007-214825; E-16017; Copyright; Avail.: CASI: A03, Hardcopy

This study introduces the use of a modified Longley-Rice irregular terrain model and digital elevation data representative of an analogue lunar site for the prediction of RF path loss over the lunar surface. The results are validated by theoretical models and past Apollo studies. The model is used to approximate the path loss deviation from theoretical attenuation over a reflecting sphere. Analysis of the simulation results provides statistics on the fade depths for frequencies of interest, and correspondingly a method for determining the maximum range of communications for various coverage confidence intervals. Communication system engineers and mission planners are provided a link margin and path loss policy for communication frequencies of interest.

Author

Radio Frequencies; Wave Propagation; Terrain; Multipath Transmission; Mathematical Models; Digital Data; Lunar Surface

20070025271 Naval War Coll., Newport, RI USA

FOUR-STAR TRIGGER PULLERS: The Trend for, and Consequences of, Centralized Execution

Jamison, Glenn R; Feb 14, 2005; 23 pp.; In English

Report No.(s): AD-A464222; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Modern technology has conferred upon the U.S. military's strategic-level commanders an unprecedented capacity to scrutinize and personally control events at the tactical level from halfway around the globe. Notwithstanding military tradition and joint service doctrine aligned with the principles of centralized direction and decentralized execution, there is a surreptitious move underway towards a more highly centralized control structure. The consequences of greater centralized control are the sacrifice of the military's speed advantage and the disruption of operational tempo for the forces in the field. A return to doctrinal command and control orientation is necessary if the U.S. military is to maintain the lead and realize the promises of defense transformation.

DTIC

Actuators; Command and Control; Decision Making; Military Operations

20070025278 Naval Research Lab., Washington, DC USA

Performance of Cat's Eye Modulating Retro-Reflectors for Free-Space Optical Communications

Rabinovich, W S; Goetz, P G; Mahon, R; Swingen, L; Murphy, J; Gilbreath, G C; Binari, S; Waluschka, E; Jan 2004; 12 pp.; In English

Report No.(s): AD-A464979; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Modulating retro-reflectors (MRR) couple passive optical retro-reflectors with electro-optic modulators to allow

free-space optical communication with a laser and pointing/acquisition/tracking system required on only one end of the link. In operation a conventional free space optical communications terminal, the interrogator, is used on one end of the link to illuminate the MRR on the other end of the link with a cw beam. The MRR imposes a modulation on the interrogating beam and passively retro-reflects it back to the interrogator. These types of systems are attractive for asymmetric communication links for which one end of the link cannot afford the weight, power or expense of a conventional free-space optical communication terminal. Recently, MRR using multiple quantum well (MQW) modulators have been demonstrated using a large area MQW placed in front of the aperture of a corner-cube. For the MQW MRR, the maximum modulation can range into the gigahertz, limited only by the RC time constant of the device. This limitation, however, is a serious one. The optical aperture of an MRR cannot be too small or the amount of light retro-reflected will be insufficient to close the link. For typical corner-cube MQW MRR devices the modulator has a diameter between 0.5-1 cm and maximum modulation rates less than 10 Mbps. In this paper we describe a new kind of MQW MRR that uses a cat's eye retro-reflector with the MQW in the focal plane of the cat's eye. This system decouples the size of the modulator from the size of the optical aperture and allows much higher data rates. A 10 Mbps free space link over a range of 1 km is demonstrated. In addition a laboratory demonstration of a 70 Mbps MQW focal plane is described.
DTIC
Cats; Eye (Anatomy); Free-Space Optical Communication; Modulation; Optical Communication; Reflectors

20070025309 Army War Coll., Carlisle Barracks, PA USA
Network Centric Warfare Case Study: U.S. V Corps and 3rd Infantry Division (Mechanized) During Operation Iraqi Freedom Combat Operations (Mar-Apr 2003). Volume 2: Command, Control, Communications and Computer Architectures
Cogan, Kevin J; De Lucio, Ray; Jan 2003; 143 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465747; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study is designed to further the examination of the tenets of Network Centric Warfare (NCW), which hypothesizes that a robustly networked force improves information sharing, collaboration, quality of information, and shared situational awareness resulting in significantly increased mission effectiveness. This volume is the second of a three volume set produced by the USA Army War College in conjunction with the Office of Force Transformation, Office of the Secretary of Defense. This volume is meant to provide the military reader with three insights: (1) to provide a historical view of the advances in technology that ultimately enabled a computer communications network; (2) to encapsulate the Army command, control, communications, and computer (C4) architecture for V Corps and 3 ID during the two specific time frames referred to as pre-OIF and OIF-1; (3) to examine future communications programs that are underway for the next generation of C4 architecture with respect to the ability of the DoD acquisition process to keep pace with the rapid advances in technology.
DTIC
Architecture (Computers); Combat; Command and Control; Communication Networks; Warfare

20070025320 Space and Naval Warfare Systems Command, San Diego, CA USA
Knowledge Engineering for Command and Control Transformation at USA European Command (USEUCOM)
Pester-DeWan, Joanne; Moore, Ronald A; Morrison, Jeffrey G; Jun 2004; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465833; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DOD) is seeking to transform the way it executes mission objectives to better take advantage of capabilities provided by modern technologies, as well as the best business practices currently being used in both DOD and industry. USA European Command (EUCOM) is taking a leadership role in this transformation. EUCOM is moving from a command organization focused on oversight and facilitation of communication and coordination among subordinate operational units to a Standing Joint Force Headquarters (SJFHQ) concept of operations focused on more direct command and control (C2) of forces and increased speed and flexibility of command, as well as more efficient use of limited staff manpower. Senior leaders at EUCOM recognize that a successful transformation is dependent on the effective and efficient management of information and knowledge. Accordingly, EUCOM leadership has devoted considerable effort towards optimizing facilities, tools and technologies. They are now focusing on assessing and improving their business processes. Towards this end, the authors were invited to conduct an independent, unbiased evaluation of their current information and knowledge management practices, identify strengths and weaknesses, and develop recommendations for improvement regarding information and knowledge management policies, practices, procedures, and their supporting technologies.
DTIC
Command and Control; Expert Systems; Information Management; Knowledge Representation; United States

20070025327 Naval Postgraduate School, Monterey, CA USA

Inducing Adaptation in Organizations: Concept and Experiment Design

Entin, Elliot E; Weil, Shawn A; Kleinman, David L; Hutchins, Susan G; Hocevar, Susan P; Kemple, William G; Serfaty, Daniel; Jun 2004; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-99-C-0255

Report No.(s): AD-A465867; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Mission performance is likely to be high when organizational structures are 'congruent' with the mission and degraded when organizational structures are 'incongruent' with the mission. All else being equal, it is to an organization's advantage to monitor the fit between its structure and mission, and to alter its structure when a misfit is identified. The authors afforded teams the opportunity to adapt their organizational structure to changes in the mission. In the forced case, teams had to allocate new assets to deal with a SCUD threat entering theater. In another situation, the team could adapt their organizational structure to a mission that had grown incongruent with that structure. The authors' primary interest was this adaptation process. Results indicate that the teams did adapt; frequently, they made many small changes to adjust workload and to compensate for weak team members. Less frequently, they made major changes in response to changing mission and task requirements. Teams appeared reluctant to make the larger changes necessary to realign organizational structure and mission. This reluctance stems in part from their concern with the cost of change and in part from a difficultly in understanding organizational structures and the ramifications of changes made to the structures. Enhanced training and model-driven decision aids may help to ameliorate these problems. Seventeen briefing charts summarize the presentation.

DTIC

Command and Control; Decision Making; Experiment Design

20070025350 TRADOC Analysis Command, White Sands Missile Range, NM USA

Proposing C4ISR Architecture Methodology for Homeland Security

Farah-Stapleton, Monica F; Dimarogonas, James; Eaton, Rodney; Deason, Paul J; Jun 2004; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465948; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This presentation presents how a network architecture methodology developed for the Army's Future Force could be applied to the requirements of Civil Support, Homeland Security/Homeland Defense (CS HLS/HLD). This architecture application design will demonstrate how to link the sensors, command and control, and communications systems of local, state, regional, national and DoD elements. The architecture definitions and specifications of the inter- and intra-agency links would be usable in real-world operations as well as enabling the representation of CS HLS/HLD scenarios within large scale stochastic simulations (e.g., the Combined Arms and Support Task Force Evaluation Model (CASTFOREM)). Representation in detailed stochastic simulation allows the evaluation of the impact of proposed hardware or software before acquisition or fielding. This methodology can also be used to develop operational and contingency plans by evaluating different options for possible real world events.

DTIC

Command and Control; Computers; Security

20070025354 Rite-Solutions, Middleton, RI USA

Integrating Effects-Based and Attrition-Based Modeling

DeGregorio, Edward A; Janssen, Raymond A; Wagenhals, Lee W; Messier, Richard H; Jun 2004; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465967; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The concept of Effects-Based Operations (EBO), enabled by Network-Centric Warfare (NCW), is developing rapidly as diplomats and war planners move to confront global threats in the new millennium. Modeling the NCW EBO process attempts to codify the belief structure and reasoning of adversaries and their cause-effect relationships with US and coalition actions, including mitigating undesired effects. A systematic EBO approach requires modeling, simulation, and evaluation tools to quantify the expected effects for different Courses of Action (COA). The problem with realizing a systematic approach is that typically the tools used at the strategic level are different than the tools used at or close to the tactical and operational level. This paper proposes a new method for bridging the quantitative measures provided by these toolsets. The paper describes an end-to-end process for developing the higher-level effects-based model, selecting and interfacing the attrition-based models with the EBO model, and performing evaluations using the combination of the different-level models. This illustration shows

where the interfacing can be done between the models as well as how additional events or effects can be added to quantify performance parameters at the interface boundary.
DTIC
Command and Control; Communication Networks; Interprocessor Communication; Mathematical Models; Warfare

20070025355 Army Research Lab., Fort Monmouth, NJ USA
Maintaining the Information Flow: Signal Corps Manpower and Personnel Requirements for the Battlefield
Anderson, B W; Garfinkel, Gerald S; Jun 2004; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465971; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Army transformation depends heavily upon superior Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) to provide a force multiplier. C4ISR requirements also bring electronic systems and technologies to the battlefield in quantities never before used by the Army. In order to function and serve the soldiers, these systems require support personnel predominantly from the unit's Signal Company. To determine if identified signal manpower levels would adequately support a C4ISR function for the new Stryker Brigade Combat Team (SBCT), an assessment of signal support was conducted. The assessment methodologies were (1) a comparison of the Stryker signal personnel with signal personnel of current units, (2) a comparison of electronic equipment per repairer levels in the SBCT and current units, (3) an analysis of the C4ISR maintenance backlog during an operational exercise, and (4) an analysis of signal personnel questionnaires. Results indicated that the signal personnel assigned to the SBCT may not be sufficient. Manpower for some of the Military Occupational Specialties (MOSs) needs to be increased, specifically the information systems personnel (MOS 74B) and various electronics repair personnel. If the C4ISR is not sufficiently maintained, it will degrade and not provide the expected force multiplier needed by the warfighter.
DTIC
Command and Control; Communication Networks; Computer Networks; Information Retrieval; Information Systems; Manpower; Personnel

20070025358 Space and Naval Warfare Systems Center, San Diego, CA USA
From Legacy C2 Systems Toward Mission-Centered Design: Tomahawk Missile Weapon Control System
Kellmeyer, David; Osga, Glenn; Jun 2004; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465980; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Through a sequence of research studies the User-Centered Design work group at the Space & Naval Warfare Systems Center San Diego (SSC-SD) has identified a set of design principles captured in a Mission-Centered Design (MCD) approach to developing Human Computer Interfaces (HCIs). This approach has been applied to emerging designs for the next generation land-attack Tactical Tomahawk Weapon Control System (TTWCS). A Task Manager display was implemented as a key HCI design feature to address cognitive requirements for supervisory control by providing an explicit mission process representation. The representation is used to convey mission process, status, and guide attention across simultaneous tasks. The interface supports the cognitive function of mission process situation awareness as well as providing an efficient mechanism to navigate to existing TTWCS interfaces. A recent study indicates a potential reduction in both cognitive and motor workload with Task Management assistance. An operational scenario-based laboratory evaluation of a future TTWCS HCI design with Task Management and decision support aids required a single operator vice the traditional four operators to perform simultaneous planning, execution, and missile control tasks. The improved HCI design produced high performance levels with minimal workload even with only 6 hours of difference training.
DTIC
Command and Control; Cruise Missiles; Missile Control; Tomahawk Missiles; Weapon Systems

20070025365 Space and Naval Warfare Systems Center, San Diego, CA USA
Binding Technologies to Concepts: Unleashing the Power of the Information Age
Thomas, Violette H; Gilman, Michael; McKearney, Terry; Jun 2004; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465998; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Commander of a Combatant Command or a Joint Task Force is responsible for an extensive range of missions and activities that span the spectrum from traditional force projection and war fighting responsibilities to non-traditional activities such as Nation Building, Peace Keeping, and Diplomacy. The Combatant Commander has cognizance of hundreds of simultaneous, ongoing activities within the Command. These can include Crisis Operations, Deliberate Planning, Theater Security Coordination, Political/Diplomatic actions, Exercises and Training, Budgeting and Command House Keeping, to

name a few. Whereby existing C2 system constructs are optimized for the staff, today's Decision Maker requires a broader Decision Focused perspective. CINC21 is an Advanced Concept Technology Demonstration sponsored at Headquarters, U.S. Pacific Command. This paper highlights the contributions of CINC21 to Command and Control, and details the journey of ideas to innovation. Building from operational concepts articulated in Joint Doctrine, pioneering software concepts provide a sufficiently broad set of functionality from which the power of information emerges. The Decision Focused Command and Control (DFC2) is the realization of concept and technology, and is the showcase product of CINC21. DFC2 provides the Decision Focused framework required by the Combatant and Joint Task Force Commander. This paper will provide an overview of DFC2 as it applies to Joint Operations, and characterize key elements of the technical architecture. The discussion will explore fundamental issues from the perspective of the operational user, capture the reality of a paradigm shift, and expose the challenges of reinventing business processes supported by a robust knowledge-centric framework.
DTIC
Command and Control; Decision Making; Management Planning

20070025366 Space and Naval Warfare Systems Command, Charleston, SC USA
An Abstract Process and Metrics Model for Evaluating Unified Command and Control: A Scenario and Technology Agnostic Approach
Lenahan, Jack; Jun 2004; 134 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465999; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this research is to define a domain neutral, process centric framework and the derivative metrics required to assess process re-engineering effectiveness and capabilities based procurement. The paper focuses on process formalisms, process performance metrics, and in particular emphasizes process effectiveness gains through improved process adaptability. After completing a thorough reading of the document, the reader should be able to define a process, score the process components, identify gaps in the process, redesign and optimize the process, and make capability based process improvement procurement recommendations based upon the process metrics scores. The abstract metrics in this paper can also be mapped to measurable quantities for Agile C2 and Network Centric Warfare metrics classes. The author believes that he has satisfied the primary goal of this paper which was to describe the methodology and the metrics necessary to assess any set of processes. The assessment score metrics derived from using the approach in this paper can then be used to properly defend the procurement of a process enhancing capability.
DTIC
Command and Control; Measurement

20070025410 Human Effectiveness Directorate, Wright-Patterson AFB, OH USA
Cognitive Works Aids for C2 Planning: Actionable Information to Support Operational Decision Making
Wampler, Jeffrey; Whitaker, Randall; Roth, Emilie; Scott, Ronald; Stilson, Mona; Thomas-Meyers, Gina; Jun 2005; 58 pp.; In English; Original contains color illustrations
Report No.(s): AD-A460961; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As the Department of Defense (DoD) moves toward a net-centric environment, all the services are becoming increasingly dependent on information technologies (IT) to process data, present relevant information, and aid Command and Control (C2) work . Just as the amount of available data and reliance on IT increase, so do the challenges of providing, in as concise a form as possible, only the relevant and actionable information needed to support C2 operators. This paper describes a design for a global mission planning C2 work aid. The discussion describes a cognitive based design approach to developing work aids called Work Centered Support Systems (WCSS) and demonstrates the actionable information used in an operational scenario to optimally support critical decision making. Although the work aid is demonstrated in a global mission planning scenario, the WCSS visualization principles can be applied to a variety of air operations C2 work.
DTIC
Command and Control; Decision Making; Decision Support Systems

20070025422 National Inst. of Justice, Washington, DC, USA
Americans with Disabilities Act: Emergency Response Systems and Telecommunication Devices for the Deaf
Rubin, P. N.; Dunne, T.; Nov. 1994; 8 pp.; In English
Report No.(s): PB2007-108975; NCJ-151177; No Copyright; Avail.: CASI: A02, Hardcopy

NIJ's initiative to examine the implications of the Americans With Disabilities Act (ADA) for criminal justice agencies at the State and local levels was created to respond to the need for understanding the Act in the criminal justice field and the

new opportunities it offers persons with disabilities. This Research in Action, one of a series designed to explain how the ADA will affect the criminal justice system, focuses on first steps public safety agencies should take to accommodate the 911 telephone emergency response system to handle telecommunication devices for the deaf (TDDs). ADA requires that 'telephone emergency services, including 911 services, provide direct access to people who use TDDs.' Based on a case study of the Denver emergency response system, key requirements for accommodating TDD's include: Having a TDD at every telecommunicator position where possible; establishing standard operating procedures for responding and transferring TDD calls; and testing equipment and telecommunicators regularly.
NTIS
Auditory Defects; Disabilities; Emergencies; Telecommunication

20070025423 Johns Hopkins Univ., Baltimore, MD, USA
Analysis of Communications Effectiveness for First Responders during TOPOFF 2000
Arnold, A. G.; DiPietro, G. R.; Mucha, T. L.; Schaffer, C. W.; Sadowski, A. M.; Oct. 16, 2000; 79 pp.; In English
Contract(s)/Grant(s): NCJRS-2000-LT-BX-K001
Report No.(s): PB2007-108982; No Copyright; Avail.: CASI: A05, Hardcopy

Exercise Top Officials (TOPOFF) 2000 was designed to assess the Nation's crisis and consequence management capability by presenting a challenging series of geographically-dispersed terrorist threats and acts to Federal, State, and local agencies. TOPOFF was a Congressionally-mandated, no-notice national exercise that began on 16 May, 2000 and ran through 24 May, 2000. Live exercise play was conducted in two host cities, Denver, CO, and Portsmouth, NH. Each city was presented with a mock terrorism event, involving a Weapon of Mass Destruction (WMD), to test the response of agencies at the State and local levels.
NTIS
Emergencies; Management Methods; Telecommunication; Transponders

20070025430 Foster-Miller Associates, Inc., Waltham, MA, USA
Preliminary Development of a Railroad Dispatcher Taskload Assessment Tool: Identification of Dispatcher Tasks and Data Collection Methods
Reinach, S.; Apr. 2007; 69 pp.; In English
Contract(s)/Grant(s): DFRA-010350
Report No.(s): PB2007-108886; No Copyright; Avail.: CASI: A04, Hardcopy

This report summarizes research conducted to identify and document dispatcher tasks and activities and determine how data on these tasks are currently collected. The researcher generated an initial set of dispatcher tasks based on past research and literature and subject matter expertise. The researcher developed two questionnaires to expand the list, identify other factors that affect dispatcher taskload, and determine how challenging it is to collect data on these tasks. Representatives from all eight Federal Railroad Administration regional offices, railroad officers, and railroad dispatchers received questionnaires. The researcher identified 67 dispatcher tasks and organized them into 6 top-level task categories. Non-task factors that either affect a dispatcher's taskload or can be used to describe the circumstances in which taskload is measured were also identified. Respondents also identified how taskload data can be collected based on eight different data collection methods. One single, efficient mechanism to collect all of these data does not currently exist. In addition, taskload data collection would take time, involve effort, and would be obtrusive. Lastly, the researcher explored cognitive aspects of dispatching. Based on results from the taskload questionnaires, and an understanding of the cognitive aspect of dispatching, a model of railroad dispatching is generated.
NTIS
Data Acquisition; Industries; Rail Transportation; Telecommunication

20070025578 Maine and Asmus, Nashua, NH, USA
Reduced Complexity Multi-Turbo Multi-User Detector
Mills, D. G., Inventor; 5 Apr 04; 27 pp.; In English
Patent Info.: Filed Filed 5 Apr 04; US-Patent-Appl-SN-10-818-536
Report No.(s): PB2007-104727; No Copyright; Avail.: CASI: A03, Hardcopy

A reduced complexity Turbo multi-user detector (MUD) processing system in multiple access communications channels that decreases the likelihood of improper decoding of the final values of interest and decreases the computation complexity for each iteration, thereby allowing for a reduction in the number of iterations performed and lowers the overall complexity

without negatively impacting performance. In one form the present invention comprises a multi-user detector coupled to two or more decoder sections, two ore more recoders, and a compare and adjust section in such a manner that data flows iteratively to correct for errors in a computationally efficient manner.
NTIS
Channels (Data Transmission); Decoding; Multiple Access; Detectors

20070025579 Swedish Defence Research Establishment, Linkoeping, Sweden
Ad Hoc Networks Routing and MAC Design (Ad hoc Naet Routing och MAC Design)
Farman, L.; Froenkvist, J.; Nilsson, J.; Persson, K.; Skoeld, M.; Dec. 2005; 72 pp.; In English
Report No.(s): PB2007-106444; FOI-R-1801-SE; No Copyright; Avail.: National Technical Information Service (NTIS)
A tactical ad hoc network is an important component in future military communications. Such a network must be robust, self-forming, self-healing and be able to support different types of service requirements even in a high mobility scenario. To support Quality of Service (QoS) and high mobility careful design of the ad hoc network protocols is required. This report investigates issues concerning the control of ad hoc networks and in particular the design of MAC and routing protocols. Furthermore, the routing and MAC protocols need to interact with each other and also with other protocol layers. When designing the network control, there is a need to understand what can be done on a single layer as well as through cross-layer interactions. Different protocols are preferred in different situations and this is one of the main topics for our investigation. Another topic has been the networking benefits of using variable data rates. This report summarizes the three-year long Heterogeneous Ad Hoc Network project.
NTIS
Telecommunication; Wireless Communication; Computer Networks; Protocol (Computers); Network Control

20070025590 Nixon and Vanderhye, P.C., Arlington, VA, USA
Inflatable-Collapsible Transreflector Antenna
Mrstik, A. V., Inventor; Gilbert, M. A., Inventor; Grace, M. P., Inventor; 2 Nov 04; 21 pp.; In English
Contract(s)/Grant(s): DAAH01-96-C-R203; E175101
Patent Info.: Filed Filed 2 Nov 04; US-Patent-Appl-SN-10-978 823
Report No.(s): PB2007-104680; No Copyright; Avail.: CASI: A03, Hardcopy
A large aperture lightweight antenna uses an inflatable spherical surface deployed within a lighter than air platform. Beam steering is accomplished by moving the RF feedpoint(s) with respect to the reflector. The antenna can use an inflatable collapsible transreflector.
NTIS
Collapse; Expandable Structures; Reflector Antennas

20070026068 Chinese Inst. of Engineers, Taipei, Taiwan, Province of China
Journal of the Chinese Institute of Engineers, Volume 29, Number 7, November 2006. Transactions of the Chinese Institute of Engineers, Series A
Chen, J. L.; Nov. 2006; 132 pp.; In English
Report No.(s): PB2007-105583; Copyright; Avail.: National Technical Information Service (NTIS)
;Contents: A Survey on Localization Techniques for Wireless Network; Node Architectures for Aggregation of Traffic from Access Networks; Design of a Resource Advertisement and Discovery Protocol for Large and Dense MANETs; Development of 60 GHz Front End Circuits for High Data Rate Communication Systems; An Integrated Analysis for MC-CDMA System with Synchronization Errors over Fading Channels; Design of Non-Uniform Linear Phased Arrays Using Genetic Algorithms to Provide Maximum Interference Reduction Capability in a Wireless Communication System; Stack Robust Fine Granularity Scalable Video Coding; Low Complexity Adaptive Error Control for Receiver-Driven Layered Video Multicast; and a Novel Algorithm for Node Enriching and Link Candidate P-Cycles Design in WDM Mesh Network.
NTIS
China; Communication Networks; Engineers; Telecommunication; Wireless Communication

20070026081 Swedish Defence Research Establishment, Linkoeping, Sweden
Tactical Communication Systems for the New Warfare
Ahlin, L.; Linder, S.; Nilsson, J.; Tullberg, H.; Wiklundh, K.; Dec. 2005; 28 pp.; In Swedish
Report No.(s): PB2007-105536; FOI-R-1824-SE; No Copyright; Avail.: National Technical Information Service (NTIS)
The purpose with this report is to summarize the activities within the project Tactical Communication Systems for the

New Warfare. A communication system capable of adapting to the radio channel, user demands and network properties is expected to benefit compared to a non-adaptive system. Different adaptive technical solutions for a radio link have been investigated. The results show that a system with adaptive modulation and receive diversity has higher throughput than a system without receive diversity. Furthermore, a system with receive diversity is less sensitive to delays of feedback information. A communication system based on OFDM and adaptive modulation was used for simulations. Moreover, a demonstrator has been further developed where an adaptive and a static system can be compared in different military scenarios. Furthermore, interference management for flexible radio systems has been studied. The purpose is to derive approximations of interference signals to predict the impact on digital communication systems. The work shows that the measure Amplitude Probability Distribution (APD) is useful to estimate the impact on uncoded and coded digital systems. Within the project, our strategy for the research and development within the area of tactical communications for the Armed Forces has been worked out.
NTIS
Telecommunication; Warfare; Radio Communication; Armed Forces

20070026083 General Dynamics Corp., Oakton, VA USA
Rethinking Defensive Information Warfare
French, Geoffrey S; Jun 2004; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465836; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Although the origins of information warfare lie in the defense of critical computer systems, defensive information warfare (DIW) per se has advanced little beyond an information assurance model. Information assurance is an integral part of any military organization's operations, but it falls far short of meeting the needs for robust defense of critical command-and-control (C2) computer networks against a sophisticated adversary. By looking at the ways that militaries have responded to challenging defensive situations in the past, some insights can be made into the nature of IW and potential application of conventional operations. This paper examines defensive tactics and strategies from the German defense in depth that emerged from World War I to the American Active Defense that developed in the Cold War and proposes a new mindset for DIW that draws on these operational concepts from military history.
DTIC
Warfare; Computer Systems Programs; Military Operations; Computer Networks

20070026085 Swedish Defence Research Establishment, Linkoeping, Sweden
Performance Studies of an Adaptive Air-Interface for a Tactical Waveform
Linder, S.; Paeaejaervi, L.; Tronarp, O.; Sep. 2005; 36 pp.; In English
Report No.(s): PB2007-105544; FOI-R-1729-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

In this work some adaptive techniques of an air-interface for a tactical waveform are studied. The techniques are simulated in a mobile scenario with map-based channel model. The communication system simulator is based on OFDM. The effects of space diversity, both transmit and receive, adaptive modulation and feedback delay have been investigated. Results show that space diversity in combination with adaptive modulation enables a higher system throughput compared to a system with no space diversity. Furthermore, the usage of space diversity reduces the sensitivity to delays of the feedback information.
NTIS
Telecommunication; Waveforms

20070026102 Naval Research Lab., Washington, DC USA
Covert Channels and Anonymizing Networks
Moskowitz, Ira S; Crepeau, Daniel P; Newman, Richard E; Miller, Allen R; Oct 30, 2003; 11 pp.; In English
Report No.(s): AD-A465268; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There have long been threads of investigation into covert channels, and threads of investigation into anonymity, but these two closely related areas of information hiding have not been directly associated. This paper represents an initial inquiry into the relationship between covert channel capacity and anonymity, and poses more questions than it answers. Even this preliminary work has proven difficult, but in this investigation lies the hope of a deeper understanding of the nature of both

areas. MIXes have been used for anonymity, where the concern is shielding the identity of the sender or the receiver of a message, or both. In contrast to traffic analysis prevention methods which conceal larger traffic patterns, we are concerned with how much information a sender to a MIX can leak to an eavesdropping outsider, despite the concealment efforts orts of MIXes acting as firewalls.
DTIC
Communication Networks; Channel Capacity; Transmitters

20070026118 Economics and Statistics Administration, Washington, DC, USA
Information and Communication Technology: 2004
Mar. 2006; 51 pp.; In English
Report No.(s): PB2007-110291; ICT/04; No Copyright; Avail.: CASI: A04, Hardcopy

Supplemental to the current Annual Capital Expenditure Survey (ACES), the Information and Communication Technology (ICT) Survey collects investment figures related to technology falling below a company's capitalization threshold. This survey is sent to a sample of approximately 46,000 private non-farm employer businesses operating in the USA. The ICT survey collects industry-level data for two equipment categories of non-capitalized expenses (purchases and operating leases/rental payments) and two software categories of non-capitalized expenses (purchases and licensing and software service/maintenance agreements). There are four types of ICT equipment and software (computer and peripheral equipment; ICT equipment excluding computers and peripherals; electromedical and electrotherapeutic apparatus; and computer software (including payroll for developing software)). Companies report data for industries in which they operate and incur non-capitalized expenses. Industries in the survey are comprised of 3-digit and selected 4-digit North American Industry Classification System codes.
NTIS
Information Systems; Computers; Interprocessor Communication; Technologies

20070026143 Budapest Univ. of Technology and Economics, Budapest, Hungary
Study of the Capabilities of Mobile Phones with Cameras to Obtain Geometric Data
Fekete, K.; Schrott, P.; Sep. 2005; 85 pp.; In English
Report No.(s): PB2007-110261; Copyright; Avail.: National Technical Information Service (NTIS)

Mobile phones with cameras enable us to take photos of any objects at any time. The question arises whether this new device of communication can play a role in obtaining geometric data and what accuracy demands can still be satisfied by this device. Our series of experiments essentially involve taking photos of a geometrically defined area and examining the degree of likelyhood of the photogrammetric solution to the known geometry. This study was extended to various cameras, the number of points with known co-ordinates, the number of shots, and the object distance which has a decisive impact on picture scale. Furthermore, we compared the accuracy values of the results yielded by the processing of images taken by mobile phones with cameras and by other cameras. Numerical results are disclosed in a tabular format and the conclusions to be drawn from the numbers are summarized.
NTIS
Cameras; Geometric Accuracy; Photographs

20070026154 Newcastle-upon-Tyne Univ., Newcastle, UK
Cross-Layer Design for Information Dissemination in Wireless Sensor Networks: State-of-the-Art and Research Challenges
Jambli, M. N.; Tully, A.; Mar. 2007; 9 pp.; In English
Report No.(s): PB2007-109989; CS-TR-1011; Copyright; Avail.: National Technical Information Service (NTIS)

In recent years, Wireless Sensor Networks (WSNs) have emerged as a highly important research area because of the rapid advances in hardware, sensor and wireless networking technologies. These advances will also enable WSNs to become key to true ubiquitous computing systems in the near future. However, due to resource constraints and unreliability of wireless networks, efficient communication protocols for WSNs are needed. But, the majority of proposed communication protocols in WSNs are developed for specific networking layers based on traditional layered protocol architecture. Such protocols may successfully improve energy/efficiency for each specific layer in WSNs communication but they are not linked together to fully optimizing the overall network performance while minimizing the energy consumption. Thus, it is essential to design a flexible

communication protocol using cross-layer techniques which can significantly improve energy conservation for information dissemination in WSNs.
NTIS
Communication Networks; Information Dissemination; Wireless Communication

20070026164 Swedish Defence Research Establishment, Linkoeping, Sweden
A Tactical Communication Scenario in Urban Terrain
Persson, K.; Sterner, U.; Fors, K.; Loefsved, E.; Waern, A.; Dec. 2005; 28 pp.; In Swedish
Report No.(s): PB2007-106447; FOI-R-1884-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

A tactical communication scenario in urban terrain has been developed. The purpose of the scenario is to be used as a tool for analyses, evaluations, and presentations, when studying e.g. functionality and performance of communications systems. The scenario describes search and patrolling in urban terrain. During one hour the positions for each of 19 nodes are described with an updating interval of one second. For each time step, the link attenuation is calculated between each pair of nodes. The Radiowave Propagation Simulator (RPS) has been used for calculations. Different models for computing the link attenuation have been used, but they have either been too complex and time-consuming or too simple to give good results. However, more studies of models for computing link attenuation should be done in order to be able to get good enough results in a limited period of time.
NTIS
Cities; Telecommunication; Terrain

20070026166 Battelle Memorial Inst., Richland, WA, USA
Advanced Capability RFID System
Gilbert, R. W., Inventor; Steele, K. E., Inventor; Anderson, G. A., Inventor; 9 Feb 04; 8 pp.; In English
Contract(s)/Grant(s): DE-AC06-76RLO08130
Patent Info.: Filed Filed 9 Feb 04; US-Patent-Appl-SN-10-775-023
Report No.(s): PB2007-104602; No Copyright; Avail.: CASI: A02, Hardcopy

A radio-frequency transponder device having an antenna circuit configured to receive radio-frequency signals and to return modulated radio-frequency signals via continuous wave backscatter, a modulation circuit coupled to the antenna circuit for generating the modulated radio-frequency signals, and a microprocessor coupled to the antenna circuit and the modulation circuit and configured to receive and extract operating power from the received radio-frequency signals and to monitor inputs on at least one input pin and to generate responsive signals to the modulation circuit for modulating the radio-frequency signals. The microprocessor can be configured to generate output signals on output pins to associated devices for controlling the operation thereof. Electrical energy can be extracted and stored in an optional electrical power storage device.
NTIS
Radio Frequencies; Microprocessors; Electrical Engineering; Systems Engineering

20070026167 Saint John (Wells) P.S., Spokane, WA, USA
Communications Device Identification Methods, Communications Methods, Wireless Communications Readers, Wireless Communications Systems, and Articles of Manufacture
Steele, K. D., Inventor; Anderson, G. A., Inventor; Gilbert, R. W., Inventor; 6 Jun 04; 12 pp.; In English
Contract(s)/Grant(s): DE-AC0676RLO1830
Patent Info.: Filed Filed 6 Jun 04; US-Patent-Appl-SN-10-774-146
Report No.(s): PB2007-104601; No Copyright; Avail.: CASI: A03, Hardcopy

Communications device identification methods, communications methods, wireless communications readers, wireless communications systems, and articles of manufacture are described. In one aspect, a communications device identification method includes providing identification information regarding a group of wireless identification devices within a wireless communications range of a reader, using the provided identification information, selecting one of a plurality of different search procedures for identifying unidentified ones of the wireless identification devices within the wireless communications range, and identifying at least some of the unidentified ones of the wireless identification devices using the selected one of the search procedures.
NTIS
Communication Equipment; Readers; Telecommunication; Wireless Communication

20070026194 Dalina Law Group, P.C., La Jolla, CA, USA
Portable Antenna Positioner Apparatus and Method
Webb, S., Inventor; Martin, D., Inventor; 26 Apr 05; 19 pp.; In English
Contract(s)/Grant(s): USAF-F19628-03-C-0039
Patent Info.: Filed Filed 26 Apr 05; US-Patent-Appl-SN-11-115 960
Report No.(s): PB2007-104011; No Copyright; Avail.: CASI: A03, Hardcopy

Embodiments of the portable antenna positioner described provide a lightweight, collapsible and rugged antenna positioner for use in receiving low earth orbit, geostationary and geosynchronous satellite transmissions. By collapsing the antenna positioner, it may be readily carried by one person or shipped in a compact container. The antenna positioner may be used in remote locations with simple or automated setup and orientation. In order to operate the apparatus, azimuth is adjusted by rotating an antenna in relation to a positioner base and elevation is adjusted by rotating an elevation motor coupled with the antenna. The apparatus may update ephemeris data via satellite, may comprise a built-in receiver and may couple with a second positioner base comprising cryptographic, router or power functionality. The apparatus may comprise storage devices such as a hard drive or flash disk for storing data to and from at least one satellite.
NTIS
Portable Equipment; Positioning Devices (Machinery); Antennas

20070026239 Department of Energy, Washington, DC, USA
Powering Cell Phones with Fuel Cells Running On Renewable Fuels (September 30, 2004-September 30, 2006)
Zhang, R.; Jan. 2007; 12 pp.; In English
Contract(s)/Grant(s): DE-FG36-04GO14325
Report No.(s): DE2007-899684; No Copyright; Avail.: National Technical Information Service (NTIS)

The major goals of this project were to increase lifetime, increase energy density, and reduce material costs. The combination of identifying corrosion resistant materials and changing catalysts increased lifetimes. Work to increase the energy density included increasing the concentration of the formic acid fuel from 12M (ca. 50 wt%) to 22M (ca. 85 wt%) and decreasing the amount of fuel crossing over. The largest expense of the device is the cathode catalyst. At the beginning of the project Pt loading was over 8 mg/cm2 on our cathodes. Through optimization work we managed to bring down the cathode loading to approximately half of what we started with.
NTIS
Fuel Cells; Fuels; Renewable Energy; Telephones

20070026257 National Inst. of Standards and Technology, Boulder, CO, USA
TEM Horn Antenna Design Principles
Grosvenor, C. A.; Johnk, R. T.; Novotny, D. R.; Canales, S.; Davis, B.; Jan. 2007; 80 pp.; In English
Report No.(s): PB2007-106514; NIST/TN-1544; No Copyright; Avail.: National Technical Information Service (NTIS)

The National Institute of Standards and Technology has developed several ultra-wideband, TEM horn antennas with Phase linearity, short impulse duration, and a near-constant antenna factors. They are used as time-domain antennas for measuring impulsive fields with minimal distortion. The listed characteristics make TEM horn antennas ideal for separating events in the time domain. This time-domain separation allows for an accurate response from nearby scattering objects or representation of complicated antenna patterns or frequency responses from sources. This report describes the development of each antenna, their characteristics, plus numerical modeling applied to each antenna to study various aspects of design, and various measurement applications of these antennas. Applications include site attenuation measurements, chamber evaluations, radar imaging studies, and aircraft shielding evaluations. This report is intended for those who wish to construct these types of broadband antennas or to use the technology developed at NIST.
NTIS
Antenna Design; Design Analysis; Horn Antennas

20070026259 Swedish Defence Research Establishment, Linkoeping, Sweden
Study of a Tactical System for Quantum Key Distribution
Johnsson, P.; Kullander, F.; Sjoeqvist, L.; Feb. 2006; 36 pp.; In Swedish
Report No.(s): PB2007-106495; FOI-R-1942-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

Quantum key distribution is a totally secure method to distribute a cryptographic key between two spatially separated parties. Two channels are needed to perform quantum key distribution. One channel is used for transmitting single photons

and is usually called the quantum channel. The other channel, usually called the classic (or public) channel, is used for communication between the sender and the receiver to extract a secure (or private) key form the information sent on the quantum channel. The method is described in the first part of the report together with a literature survey on the subject. The possibilities and limitations of the method in tactical application are also discussed. Thereafter are the different parts in a tactical system described, e.g. the quantum transmitter and receiver. There are several benefits of using a free-space communication link also for the classical communication. Especially the possibility of integrating the quantum channel with to retro-communication link is studied and suggestion of an integrated solution is presented. The transmission rate of the key distribution for a tactical system is analyzed together with suggestions how to implement such a system.
NTIS
Cryptography; Quantum Efficiency; Telecommunication

20070026262 Swedish Defence Research Establishment, Linkoeping, Sweden
Stochastic Channel Model for MIMO Systems in Urban Environments
Jonsson, A.; Nyman, M.; Jun. 2006; 50 pp.; In Swedish
Report No.(s): PB2007-106492; FOI-R-2011-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

In the Swedish Armed Forces there is an on-going development of the armed forces where the goal is the ability to execute operations more quickly and flexibility than today. This will make demands on the future radio systems, like robustness, capacity, stealth and availability that are higher than today's radio system can achieve. Our work has been to find an existing channel model for a Multiple Input Multiple Output (MIMO) system which was suitable for us to modify. The selected channel model is 3GPP-SCM which we develop/change so that it will fit the future demands for the Swedish Defense Research Agency's simulation work. The changed channel model will be used for simulations of an adaptive radio node (ARN) in an urban environment. The results and simulations made to validate the model show that channel model works according to the requirements.
NTIS
Cities; Mathematical Models; MIMO (Control Systems); Stochastic Processes; Telecommunication

20070026264 Missouri Univ., Rolla, MO, USA
Flood Frog: An Autonomous Wireless Device for Flood Detection Monitoring
Plessi, V.; Bastianini, F.; Sedighsarvestani, S.; Jan. 2007; 22 pp.; In English
Contract(s)/Grant(s): DTRS98-G0021
Report No.(s): PB2007-106456; UTC-R158; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes the real-time data acquisition, communication, and alerting capabilities of the Flood Frog, an embedded an autonomous device equipped with multiple sensors for environmental and structural monitoring. The system is capable of operating for several years without human intervention. Battery power and utilization of the GSM mobile network result in a completely wireless system. Coupled with the low cost of the device, this allows deployment in locations where automatic monitoring was previously hindered by cost of infeasibility of installation.
NTIS
Autonomy; Floods; Telecommunication; Warning Systems; Wireless Communication

20070026266 Swedish Defence Research Establishment, Linkoeping, Sweden
Ad hoc Networks - Challenges and Possibilities
Farman, L.; Groenkvist, J.; Hansson, A.; Johansson, E.; Nilsson, J.; Dec. 2005; 56 pp.; In Swedish
Report No.(s): PB2007-106448; FOI-R-1799-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

A tactical ad hoc network is an important component in future military communications. Such a network must be robust, self-forming, self-healing and be able to support different types of service requirements even in a high mobility scenario. To support quality of Service (QoS) and high mobility careful design of the ad hoc network protocols is required. This report gives an overview of important issues regarding ad hoc network control. Furthermore, our research in this area is presented here. The research have been focused both on the design of MAC and routing protocols, as well as Quality of Service (QoS) and the use of adaptive radio nodes.
NTIS
Communication Networks; Network Control

20070026275 Dorsey and Whitney, LLP, San Francisco, CA, USA
Secure Videoconferencing Equipment Switching System and Method
Hansen, M. E., Inventor; 20 Apr 04; 11 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Patent Info.: Filed Filed 20 Apr 04; US-Patent-Appl-SN-10-834-421
Report No.(s): PB2007-104065; No Copyright; Avail.: CASI: A03, Hardcopy

A switching system and method are provided to facilitate use of videoconference facilities over a plurality of security levels. The system includes a switch coupled to a plurality of codecs and communication networks. Audio/Visual peripheral components are connected to the switch. The switch couples control and data signals between the Audio/Visual peripheral components and one but nor both of the plurality of codecs. The switch additionally couples communication networks of the appropriate security level to each of the codecs. In this manner, a videoconferencing facility is provided for use on both secure and non-secure networks.

NTIS
Patent Applications; Switching; Teleconferencing; Video Communication

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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*.

20070025201 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Qualification Strategies of Field Programmable Gate Arrays (FPGAs) for Space Application
Sheldon, Douglas; Schone, Harald; October 26, 2005; 11 pp.; In English; 18th Microelectronics Workshop (18MEWS), 26 Oct. 2005, Tsukuba, Japan; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40100

This viewgraph document reviews the issue of using Field Programmable Gate Arrays (FPGAs) in Space Application, and the some of the strategies for qualifying the FPGA. Qualification and risk management of such complex systems requires new approaches. The paper presents a matrix approach to qualification has been presented that: - Complements historical specifications - Highlights the importance of device physics as a cornerstone to qualification. - Provides levels of risk management that expressly document trade offs. - Stresses the role of the FPGA vendor as team member in the development of modern spacecraft.

CASI
Field-Programmable Gate Arrays; Inspection; Qualifications; Aerospace Systems; Reliability

20070025273 Naval Research Lab., Washington, DC USA
Energy-Aware Wireless Networking with Directional Antennas: The Case of Session-Based Broadcasting and Multicasting
Wieselthier, Jeffrey E; Nguyen, Gam D; Ephremides, Anthony; Sep 2002; 17 pp.; In English
Report No.(s): AD-A464912; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Abstract We consider ad hoc wireless networks that use directional antennas and have limited energy resources. To explore quantitatively the advantage offered by the use of directional antennas over the case of omnidirectional antennas, we consider the case of connection-oriented multicast traffic. Building upon our prior work on multicasting algorithms, we introduce two protocols that exploit the use of directional antennas and evaluate their performance. We observe significant improvement with respect to the omnidirectional case, in terms of both energy efficiency and network lifetime. Additionally, we show that further substantial increase in the network's lifetime can be achieved by incorporating a simple measure of a node's residual energy into the node's cost function.

DTIC
Broadcasting; Communication Networks; Directional Antennas

20070025295 Air Force Research Lab., Rome, NY USA

Fabrication Process for Electroabsorption Modulators

Johns, Steven; Bussjager, Rebecca; Mar 2007; 33 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A465555; AFRL-SN-RS-TR-2007-57; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report focuses on the fabrication aspects of Electroabsorption Modulator (EAM) devices developed by the University of California at San Diego (UCSD). Air Force Research Laboratory (AFRL) SNDP personnel learned the processes directly at UCSD with the primary goal of transitioning the process to AFRL/SNDP. EAMs were designed to operate at 1550 nm using Indium Phosphide (InP) technology with semi-insulating wafers purchased from Tee Wel (Taiwan). Most of the process uses negative photoresist and is an 8-step mask procedure. The final metal coating is most critical to making robust n- and p-contacts. Without good metallization, wire bonding into a package fails. This report acts as a recipe aid to EAM device fabrication. Various times, levels, temperature, etc., quoted in this report were determined after careful calibration studies for each processing step and should only be used as guide values. Parameters change as materials age and machines change.

DTIC

Electromagnetic Absorption; Fabrication; Lasers; Light Modulation; Modulators; Photoabsorption

20070025319 Auburn Univ., AL USA

An Experimental Investigation of Improving Human Problem-Solving Performance by Guiding Attention and Adaptively Providing Details on Information Displays

Narayanan, N H; Apr 2007; 12 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0324

Report No.(s): AD-A465831; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents a summary of the research activities, major accomplishments, publications and presentations resulting from the project supported by ONR grant N00014-03-1-0324 to Auburn University. Key contribution of this project was the development and experimental testing of a variety of information displays, called 'reactive information displays,' that could modify the presented information in real-time in response to the viewer's gaze patterns. Designs of these displays were based on a cognitive model of multimodal information comprehension developed in a previous ONR project (N00014-96-1-1187) Reactive information displays were tested in the domains of mechanics and computer science. Results showed that various display strategies for augmenting information presented based on knowledge about both the viewer's gaze patterns and the problem solving procedure he or she is employing could indeed improve problem-solving performance.

DTIC

Cognition; Display Devices; Information Systems; Mental Performance; Problem Solving

20070025418 Sandia National Labs., Albuquerque, NM USA

Improving Switching Performance of Power MOSFETs Used in High Rep-Rate, Short Pulse, High-Power Pulsers

Cook, E. G.; Sep. 27, 2006; 5 pp.; In English

Report No.(s): DE2007-896001; UCRL-TR-224792; No Copyright; Avail.: Department of Energy Information Bridge

As their switching and power handling characteristics improve, solid-state devices are finding new applications in pulsed power. This is particularly true of applications that require fast trains of short duration pulses. High voltage (600-1200V) MOSFETs are especially well suited for use in these systems, as they can switch at significant peak power levels and are easily gated on and off very quickly. MOSFET operation at the shortest pulse durations is not constrained by the intrinsic capabilities of the MOSFET, but rather by the capabilities of the gate drive circuit and the system physical layout. This project sought to improve MOSFET operation in a pulsed power context by addressing these issues. The primary goal of this project is to improve the switching performance of power MOSFETs for use in high rep-rate, short pulse, high-power applications by improving the design of the gate drive circuits and the circuit layouts used in these systems. This requires evaluation of new commercial gate drive circuits and upgrading the designs of LLNL-developed circuits. In addition, these circuits must be tested with the fastest available high-voltage power MOSFETs.

NTIS

Field Effect Transistors; Metal Oxide Semiconductors; Switching; Pulse Modulation; Electric Pulses

20070025427 National Inst. of Standards and Technology, Boulder, CO, USA; Colorado Univ., Boulder, CO, USA
Workshop on Reliability Issues in Nanomaterials
Keller, R. R.; Read, D. T.; Mahajan, R.; Jan. 2007; 34 pp.; In English
Report No.(s): PB2007-107296; NIST/SP-1043; No Copyright; Avail.: CASI: A03, Hardcopy

The Workshop on Reliability Issues in Nanomaterials was held at the Boulder Laboratories of the U.S. Department of Commerce on August 17-19, 2004. It was organized by the National Institute of Standards and Technology (NIST) and was designed to promote a particular subset of NIST's responsibilities under the National Nanotechnology Initiative (NNI). Attendees agreed that while the synergy among industry, academia, and national laboratories was effective, more fundamental materials research is needed, where the actual division of labor would be determined by market forces and policy. It was suggested that NIST could serve the unique role of developing metrology, standards, and materials characterization methods for improving reliability of nanomaterials. The most challenging and general metrology recommendation was the development of an atom imager, a hypothetical instrument capable of nondestructively measuring the chemical identity and precise three-dimensional position of every atom within a nanomaterial. Such an instrument was postulated to be the key tool for optimizing fabrication/manufacturing and controlling reliability of nanomaterials. Nearer-term recommendations centered on improving the metrological performance of scanned probe microscopy (SPM) and nanoindentation.
NTIS
Reliability; Nanotechnology; Composite Materials

20070025429 ICF Consulting, Fairfax, VA, USA
Byproducts of Sulfur Hexafluoride (SF6) Use in the Electric Power Industry
Jan. 2002; 11 pp.; In English
Contract(s)/Grant(s): EPA-68-W5-0068
Report No.(s): PB2007-108903; No Copyright; Avail.: CASI: A03, Hardcopy

Sulfur hexafluoride (SF6) is a relatively nontoxic gas used in a number of applications for its inert qualities. The dielectric and other physical and chemical properties related to its lack of reactivity have led to the extensive use of SF6 as an insulating medium in switching equipment (e.g., circuit breakers) by electric utilities. While SF6 is inert during normal use, when electrical discharges occur within SF6-filled equipment, toxic byproducts can be produced that pose a threat to health of workers who come into contact with them. This paper discusses these byproducts and how they are formed, and also summarizes relevant health and safety concerns, as well as handling, detection, and safety procedures and guidelines. U.S. EPA produced this background paper as a service to its partners in the SF6 Emission Reduction Partnership for Electric Power Systems. This is a voluntary program in which partner companies agree to reduce SF6 emissions through technically and economically feasible actions. SF6 is a potent and persistent greenhouse gas, with a global warming potential approximately 24,000 times greater than carbon dioxide over a 100-year time horizon and a residency in the atmosphere of more than 3,000 years. Although SF6 is critical to the reliable distribution of electricity, program participants recognize the importance of careful management and responsible use.
NTIS
By-Products; Electrical Insulation; Industries; Sulfur; Sulfur Hexafluoride

20070025522 Polster, Lieder, Woodruff and Lucchesi, L.C., St. Louis, MO, USA
Tunable Subwavelength Resonant Grating Filter
Chou, S. Y., Inventor; Chang, A. S. P., Inventor; Tan, H., Inventor; Wang, J. H., Inventor; Wu, W., Inventor; 30 Sep 03; 7 pp.; In English
Contract(s)/Grant(s): 341-6086-341-4131
Patent Info.: Filed Filed 30 Sep 03; US-Patent-Appl-SN-10-674 608
Report No.(s): PB2007-104128; No Copyright; Avail.: CASI: A02, Hardcopy

In accordance with the invention, a tunable subwavelength resonant grating filter comprises a liquid crystal cell having a pair of major surface walls. One wall of the cell is a coated subwavelength grating of a SRGF. The coating comprises a polymer layer to fill the grating trenches and a surfactant layer to facilitate uniform alignment of the liquid crystal material. The refractive index of the LCD material in the cell can then be electrically or thermally adjusted to tune the resonant wavelength.
NTIS
Tunable Filters; Gratings (Spectra)

20070025527 Sandia National Labs., Albuquerque, NM USA
Electrokinetic Pump
Patel, K. D., Inventor; 22 Apr 04; 8 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Patent Info.: Filed Filed 22 Apr 04; US-Patent-Appl-SN-10-830 773
Report No.(s): PB2007-104164; No Copyright; Avail.: CASI: A02, Hardcopy

A method for altering the surface properties of a particle bed. In application, the method pertains particularly to an electrokinetic pump configuration where nanoparticles are bonded to the surface of the stationary phase to alter the surface properties of the stationary phase including the surface area and/or the zeta potential and thus improve the efficiency and operating range of these pumps. By functionalizing the nanoparticles to change the zeta potential the electrokinetic pump is rendered capable of operating with working fluids having pH values that can range from 2-10 generally and acidic working fluids in particular. For applications in which the pump is intended to handle highly acidic solutions latex nanoparticles that are quaternary amine functionalized can be used.
NTIS
Electrokinetics; Pumps; Surface Properties

20070025566 Lober (T. A.) Patent Services, Concord, MA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
Magnetic Actuator Drive for Actuation and Resetting of Magnetic Actuation Materials
Marioni, M. A., Inventor; 4 Apr 05; 27 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0758
Patent Info.: Filed Filed 4 Apr 05; US-Patent-Appl-SN-11-098 753
Report No.(s): PB2007-104175; No Copyright; Avail.: CASI: A03, Hardcopy

A magnetic actuator is provided including a magnetic field-actuated material and a plurality of interconnected electrically conducting coils, each coil including a number of wire turns arranged relative to at least one other coil to produce at the magnetic field-actuated material, by superposition, a magnetic field that is substantially oriented in one of a plurality of selectable discrete directions. An actuator drive circuit is connected to the coils in a circuit configuration that reverses a direction of electrical current flow through at least one of the coils to reorient the magnetic field from a first selected direction to a second selected direction of the plurality of selectable discrete directions.
NTIS
Actuators; Magnetic Materials; Magnetic Fields

20070025573 Goodwin Procter, LLP, Boston, MA, USA
Achromatic Fiber-Optic Power Splitter and Related Methods
Willig, R. L., Inventor; 13 Nov 03; 13 pp.; In English
Contract(s)/Grant(s): N00030-01-C-0022
Patent Info.: Filed Filed 13 Nov 03; US-Patent-Appl-SN-10-712 177
Report No.(s): PB2007-104725; No Copyright; Avail.: CASI: A03, Hardcopy

An achromatic power splitter is formed from multiple optical fibers. The achromatic power splitter operates single mode, which permits the power splitter to operate substantially insensitive to changes in wavelength of the input light, to changes in the polarization of the input light, to changes in the temperature of the device, and to exposure to ionizing radiation.
NTIS
Directional Couplers; Fiber Optics; Splitting; Polarization

20070025582 Lawrence Livermore National Lab., Livermore, CA USA; California State Coll., Los Angeles, CA, USA
Method for Characterizing Mask Defects Using Image Reconstruction from X-Ray Diffraction Patterns
Hau-Riege, S. P., Inventor; 20 Feb 04; 15 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG48
Patent Info.: Filed Filed 20 Feb 04; US-Patent-Appl-SN-10-783 520
Report No.(s): PB2007-104729; No Copyright; Avail.: CASI: A03, Hardcopy

The invention applies techniques for image reconstruction from X-ray diffraction patterns on the three-dimensional imaging of defects in EUVL multilayer films. The reconstructed image gives information about the out-of-plane position and the diffraction strength of the defect. The positional information can be used to select the correct defect repair technique. This invention enables the fabrication of defect-free (since repaired) X-ray Mo--Si multilayer mirrors. Repairing Mo--Si

multilayer-film defects on mask blanks is a key for the commercial success of EUVL. It is known that particles are added to the Mo--Si multilayer film during the fabrication process. There is a large effort to reduce this contamination, but results are not sufficient, and defects continue to be a major mask yield limiter. All suggested repair strategies need to know the out-of-plane position of the defects in the multilayer.
NTIS
Defects; Extreme Ultraviolet Radiation; Image Reconstruction; Lithography; Quality Control; Semiconductor Devices; X Ray Diffraction

20070026069 Brown and Michaels, PC, Ithaca, NY, USA; Applied Pulsed Power, Ithaca, NY, USA
Packaging of Solid State Devices
Glidden, S. C., Inventor; Sanders, H. D., Inventor; 24 Feb 04; 11 pp.; In English
Contract(s)/Grant(s): DE-FG02-OOER82948
Patent Info.: Filed Filed 24 Feb 04; US-Patent-Appl-SN-10-785 345
Report No.(s): PB2007-104733; No Copyright; Avail.: CASI: A03, Hardcopy

A package for one or more solid state devices in a single module that allows for operation at high voltage, high current, or both high voltage and high current. Low thermal resistance between the solid state devices and an exterior of the package and matched coefficient of thermal expansion between the solid state devices and the materials used in packaging enables high power operation. The solid state devices are soldered between two layers of ceramic with metal traces that interconnect the devices and external contacts. This approach provides a simple method for assembling and encapsulating high power solid state devices.
NTIS
Packaging; Patent Applications; Solid State Devices

20070026070 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA
Semiconductor Devices Having Thermal Spacers
Allen, S. T., Inventor; Milligan, J. W., Inventor; 25 Feb 04; 12 pp.; In English
Contract(s)/Grant(s): N39997-99-C-3761
Patent Info.: Filed Filed 25 Feb 04; US-Patent-Appl-SN-10-786 962
Report No.(s): PB2007-104734; No Copyright; Avail.: CASI: A03, Hardcopy

A high power, high frequency semiconductor device has a plurality of unit cells connected in parallel. The unit cells each having a controlling electrode and first and second controlled electrodes. A thermal spacer divides at least one of the unit cells into a first active portion and a second active portion, spaced apart from the first potion by the thermal spacer. The controlling electrode and the first and second controlled electrodes of the unit cell cross over the first thermal spacer.
NTIS
Patent Applications; Semiconductor Devices; Spacers

20070026072 Koppel, Jacobs, Patrick and Heybl, Thousand Oaks, CA, USA
Light Emitting Diode with Porous SiC Substrate and Method for Fabricating
Li, T., Inventor; Ibbetson, J., Inventor; Keller, B., Inventor; 30 Sep 03; 11 pp.; In English
Contract(s)/Grant(s): DE-FC26-OONT40985
Patent Info.: Filed Filed 30 Sep 03; US-Patent-Appl-SN-10-676 953
Report No.(s): PB2007-104735; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for forming a porous layer on the surface of a semiconductor material wherein an electrolyte is provided and is placed in contact with one or more surfaces of a layer of semiconductor material. The electrolyte is heated and a bias is introduced across said electrolyte and the semiconductor material causing a current to flow between the electrolyte and the semiconductor material. The current forms a porous layer on the one or more surfaces of the semiconductor material in contact with the electrolyte. The semiconductor material with its porous layer can serve as a substrate for a light emitter. A semiconductor emission region can be formed on the substrate. The emission region is capable of emitting light omnidirectionally in response to a bias, with the porous layer enhancing extraction of the emitting region light passing through the substrate.
NTIS
Fabrication; Light Emitting Diodes; Patent Applications; Porosity; Silicon Carbides; Substrates

20070026073 Foley and Lardner, LLP, Madison, WI, USA

Spin Readout and Initialization in Semiconductor Quantum Dots

Friesen, M. G., Inventor; Tahan, C. G., Inventor; Joynt, R. J., Inventor; Eriksson, M. A., Inventor; 25 Feb 04; 13 pp.; In English

Contract(s)/Grant(s): DAAD19091-1-0515

Patent Info.: Filed Filed 25 Feb 04; US-Patent-Appl-SN-10-787 075

Report No.(s): PB2007-104736; No Copyright; Avail.: CASI: A03, Hardcopy

A semiconductor quantum dot device converts spin information to charge information utilizing an elongated quantum dot having an asymmetric confining potential along its length so that charge movement occurs during orbital excitation. A single electron sensitive electrometer is utilized to detect the charge movement. Initialization and readout can be carried out rapidly utilizing RF fields at appropriate frequencies.

NTIS

Quantum Dots; Readout; Semiconductor Devices; Semiconductors (Materials)

20070026074 Knight (Paul L.), Liberty Lake, WA, USA

Hotspot Spray Cooling

Tilton, C. L., Inventor; Tilton, D. E., Inventor; Weir, T. D., Inventor; Cader, T., Inventor; Knight, P. A., Inventor; 24 Feb 04; 13 pp.; In English

Contract(s)/Grant(s): F33615-03-M-2316

Patent Info.: Filed Filed 24 Feb 04; US-Patent-Appl-SN-10-786 452

Report No.(s): PB2007-104739; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is a spray cooling thermal management device that cools an electronic component creating a varying amount of heat across its surfaces. Liquid coolant is dispensed upon the surface of the component. In areas of the chip that generate large heat fluxes, typically referred to as the core, the liquid coolant is dispensed as a continuous atomized droplet pattern. The atomized pattern creates a high heat flux evaporative cooling thin-film over the one or more core areas. Rather than optimize the atomized pattern and flow based upon complete thin-film vaporization, the present invention optimizes the atomized pattern for maximum heat removal rates. Any excess, non-vaporized, fluid flowing outward from the hotspot is used to cool the lower heat flux (non-core) areas of the component through the creation of a thick coolant film thereon.

NTIS

Cooling; Sprayers; Electronics; Temperature Control; Heat

20070026157 Weingarten, Schurgin, Gagnebin and Lebovici. LLP, Boston, MA, USA

Optical Devices Featuring Textured Semiconductor Layers

Moustakas, T. D., Inventor; Cabalu, J. S., Inventor; 15 Apr 05; 21 pp.; In English

Contract(s)/Grant(s): DAAD19-00-2-0004

Patent Info.: Filed Filed 15 Apr 05; US-Patent-Appl-SN-11-107-150

Report No.(s): PB2007-104051; No Copyright; Avail.: CASI: A03, Hardcopy

A semiconductor sensor, solar cell or emitter or a precursor therefore having a substrate and textured semiconductor layer deposited onto the substrate. The layer can be textured as grown on the substrate or textured by replicating a textured substrate surface. The substrate or first layer is then a template for growing and texturing other semiconductor layers from the device. The textured layers are replicated to the surface from the substrate to enhance light extraction or light absorption. Multiple quantum wells, comprising several barrier and quantum well layers, are deposited as alternating textured layers. The texturing in the region of the quantum well layers greatly enhances internal quantum efficiency if the semiconductor is polar and the quantum wells are grown along the polar direction. This is the case in nitride semiconductors grown along the polar (0001) or (000-1) directions.

NTIS

Optical Equipment; Semiconductors (Materials); Sensors

20070026161 Bruckner (John), P.C, Austin, TX, USA

Nanotransfer and Nanoreplication using Deterministically Grown Sacrificial Nanotemplates

Melechko, A. V., Inventor; McKnight, T. E., Inventor; Gullorn, M. A., Inventor; Merkulov, V. I., Inventor; Duktycz, M. J., Inventor; 9 Feb 04; 19 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed Filed 9 Feb 04; US-Patent-Appl-SN-10-774-699
Report No.(s): PB2007-104603; No Copyright; Avail.: CASI: A03, Hardcopy

Methods, manufactures, machines and compositions are described for nanotransfer and nanoreplication using deterministically grown sacrificial nanotemplates. A method includes depositing a catalyst particle on a surface of a substrate to define a deterministically located position; growing an aligned elongated nanostructure on the substrate, an end of the aligned elongated nanostructure coupled to the substrate at the deterministically located position; coating the aligned elongated nanostructure with a conduit material; removing a portion of the conduit material to expose the catalyst particle; removing the catalyst particle; and removing the elongated nanostructure to define a nanoconduit.
NTIS
Nanostructures (Devices); Carbon Nanotubes; Replicas

20070026165 Kordzik (Kelly K.), Dallas, TX, USA; International Business Machines Corp., Endicott, NY, USA
Buffer/Driver Circuits
Kuang, J. B., Inventor; Ngo, H. C., Inventor; Nuwka, K. J., Inventor; 8 Aug 04; 16 pp.; In English
Contract(s)/Grant(s): NBCH303900004
Patent Info.: Filed Filed 8 Aug 04; US-Patent-Appl-SN-10-821 048
Report No.(s): PB2007-105871; No Copyright; Avail.: CASI: A03, Hardcopy

A buffer/driver having large output devices for driving multiple loads is configured with three parallel paths. The first logic path is made of small devices and is configured to provide the logic function of the buffer/driver without the ability to drive large loads. Second and third logic paths have the logic function of the first logic path up to the last inverting stage. The last inverting stage in each path is a single device for driving the logic states of the buffer output. The second and third logic paths have power-gating that allows the input to the pull-up and pull-down devices to float removing gate-leakage voltage stress. When the second and third logic paths are power-gated, the first logic path provides a keeper function to hold the logic state of the buffer output. The buffer/driver may be an inverter, non-inverter, or provide a multiple input logic function.
NTIS
Circuits; CMOS; Leakage; Buffers

20070026168 General Electric Co., Niskayuna, NY, USA
Phosphors Containing Borate of Terbium, Alkaline-Earth, and Group-3 Metals, and Light Sources Incorporating the Same
Comanzo, H. A., Inventor; Manivannan, V., Inventor; Srivastava, A. M., Inventor; Beers, W. W., Inventor; 29 Apr 04; 13 pp.; In English
Contract(s)/Grant(s): DE-FC26-99FT40632
Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-834-142
Report No.(s): PB2007-104050; No Copyright; Avail.: CASI: A03, Hardcopy

This invention relates photoluminescent materials (or phosphors) and lighting technology. In particular, this invention relates to phosphors containing borate of terbium, alkaline-earth, and Group-3 metals, and to light sources incorporating such. A phosphor is a luminescent material that absorbs radiation energy in a portion of the electromagnetic spectrum and emits energy in another portion of the electromagnetic spectrum. Phosphors of one important class are crystalline inorganic compounds of high chemical purity and of controlled composition to which small quantities of other elements (called 'activators') have been added to convert them into efficient fluorescent materials. With the right combination of activators and inorganic compounds, the color of the emission can be controlled. Most useful and well-known phosphors emit radiation in the visible portion of the electromagnetic spectrum in response to excitation by electromagnetic radiation outside the visible range. Well-known phosphors have been used in mercury vapor discharge lamps to convert ultraviolet ('UV') radiation emitted by the excited mercury vapor to visible light. Other phosphors are capable of emitting visible light upon being excited by electrons.
NTIS
Alkaline Earth Metals; Borates; Illuminating; Light Sources; Metals; Phosphors; Terbium

20070026170 Los Alamos National Lab., NM USA
Off-Axis Cooling of Rotating Devices Using a Crank-Shaped Heat Pipe
Jankowski, T. A., Inventor; Prenger, F. C., Inventor; Waynert, J. A., Inventor; 29 Apr 04; 27 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-835-897
Report No.(s): PB2007-104047; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is a crank-shaped heat pipe for cooling rotating machinery and a corresponding method of manufacture. The crank-shaped heat pipe comprises a sealed cylindrical tube with an enclosed inner wick structure. The crank-shaped heat pipe includes a condenser section, an adiabatic section, and an evaporator section. The crank-shape is defined by a first curve and a second curve existing in the evaporator section or the adiabatic section of the heat pipe. A working fluid within the heat pipe provides the heat transfer mechanism.
NTIS
Cooling; Eccentrics; Heat Pipes; Rotation

20070026190 Du Pont de Nemours (E. I.) and Co., Wilmington, DE, USA
Processes for Removing Organic Layers and Organic Electronic Devices Formed by the Processes
Sellars, M. J., Inventor; Truong, N., Inventor; 7 May 04; 19 pp.; In English
Contract(s)/Grant(s): DARPA-4332
Patent Info.: Filed Filed 7 May 04; US-Patent-Appl-SN-10-840 981
Report No.(s): PB2007-104015; No Copyright; Avail.: CASI: A03, Hardcopy

A process for protecting first electrodes, conductive leads and the underlying substrate from the process of removing organic layers during the fabrication of an organic electronic device. After first electrodes and conductive leads are formed over a substrate, a protective layer is selectively formed over the structure, with the protective layer not being disposed over selected portions of the first electrodes, the conductive leads and the substrate. Organic layers are then formed over the structure, and second electrodes are formed over the organic layers. Those portions of the organic layers disposed over the selected portions of the first electrodes, conductive leads and substrate are removed, and the protective layer protects adjacent portions of the first electrodes, conductive leads and substrate from the process of removing the portions of the organic layers.
NTIS
Electronic Equipment; Organic Materials; Fabrication

20070026191 Bruckner (John), P.C, Austin, TX, USA
Marine Asset Security and Tracking (MAST) System
Hanson, G. R., Inventor; Smith, S. F., Inventor; Moore, M. R., Inventor; Lesley, E., Inventor; Blair, J. S., Inventor; 6 May 04; 34 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 6 May 04; US-Patent-Appl-SN-10-840 092
Report No.(s): PB2007-104014; No Copyright; Avail.: CASI: A03, Hardcopy

Methods and apparatus are described for marine asset security and tracking (MAST). A method includes transmitting identification data, location data and environmental state sensor data from a radio frequency tag. An apparatus includes a radio frequency tag that transmits identification data, location data and environmental state sensor data. Another method includes transmitting identification data and location data from a radio frequency tag using hybrid spread-spectrum modulation. Another apparatus includes a radio frequency tag that transmits both identification data and location data using hybrid spread-spectrum modulation.
NTIS
Beams (Supports); Marine Transportation; Security; Warning Systems

20070026193 Hamilton, Brook, Smith and Reynolds, Concord, MA, USA; JENTEK Sensors, Inc., Watertown, MA, USA
Segmented Field Sensors
Goldfine, N. J., Inventor; Schlicker, D. E., Inventor; Grundy, D. C., Inventor; Windoloski, M. D., Inventor; Shay, I. C., Inventor; 11 Feb 05; 87 pp.; In English
Contract(s)/Grant(s): DTRS57-96-C-00108; N00421-97-C-1120
Patent Info.: Filed Filed 11 Feb 05; US-Patent-Appl-SN-11-056 334
Report No.(s): PB2007-104012; No Copyright; Avail.: CASI: A05, Hardcopy

Inductive sensors measure the near surface properties of conducting and magnetic material. A sensor may have primary windings with parallel extended winding segments to impose a spatially periodic magnetic field in a test material. Those extended portions may be formed by adjacent portions of individual drive coils. Sensing elements provided every other half wavelength may be connected together in series while the sensing elements in adjacent half wavelengths are spatially offset.

Certain sensors include circular segments which create a circularly symmetric magnetic field that is periodic in the radial direction. Such sensors are particularly adapted to surround fasteners to detect cracks and can be mounted beneath a fastener head. In another sensor, sensing windings are offset along the length of parallel winding segments to provide material measurements over different locations when the circuit is scanned over the test material. The distance from the sensing elements to the ends of the primary winding may be kept constant as the offset space in between sensing elements is varied. An image of the material properties can be provided as the sensor is scanned across the material.
NTIS
Segments; Surface Properties; Magnetic Fields; Sensors

20070026196 Christie, Parker and Half, LLP, Pasadena, CA, USA
Sequentially Charged Nanocrystal Light Emitting Device
Atwater, H. A., Inventor; Walters, R. J., Inventor; 6 Apr 05; 13 pp.; In English
Contract(s)/Grant(s): AFOSR-FA9550-04-1-0434
Patent Info.: Filed Filed 6 Apr 05; US-Patent-Appl-SN-11-100 807
Report No.(s): PB2007-104009; No Copyright; Avail.: CASI: A03, Hardcopy

A light emitting device including a transistor structure formed on a semiconductor substrate. The transistor structure having a source region, a drain region, a channel region between the source and drain regions, and a gate oxide on the channel region. The light emitting device including a plurality of nanocrystals embedded in the gate oxide, and a gate contact made of semitransparent or transparent material formed on the gate oxide. The nanocrystals are adapted to be first charged with first type charge carriers, and then provided second type charge carriers, such that the first and second type charge carriers form excitons used to emit light.
NTIS
Light Emitting Diodes; Nanocrystals; Semiconductors (Materials); Substrates

20070026198 Park, Vaughan and Fleming, LLP, Davis, CA, USA
Method and Apparatus for Detecting the Position of Light Which is Incident to a Semiconductor Die
Bosnyak, R. J., Inventor; Drost, R. J., Inventor; 7 May 04; 9 pp.; In English
Contract(s)/Grant(s): DARPA-NBCH020055
Patent Info.: Filed Filed 7 May 04; US-Patent-Appl-SN-10-840 865
Report No.(s): PB2007-104008; No Copyright; Avail.: CASI: A02, Hardcopy

One embodiment of the present invention provides a system for detecting light which is incident to a first semiconductor die. During operation, the system receives light at a photo-detector on the first semiconductor die, wherein associated circuitry converts the received light into a current. In doing so, the associated circuitry biases a gate voltage of an integrating transistor to be close to a threshold voltage of the integrating transistor, and applies the current from the photo-detector to the gate of the integrating transistor so that the current causes a charge to collect at the gate of the integrating transistor. This charge builds up and causes the integrating transistor to switch, thereby indicating that light has been received by the photo-detector.
NTIS
Detection; Electromagnetic Absorption; Semiconductors (Materials); Light (Visible Radiation); Position (Location)

20070026200 Honeywell International, Inc., Morristown, NJ, USA
Relative Humidity Sensor Enclosed with Kapton Type Heater
Speldrich, J. W., Inventor; Alderman, R. A., Inventor; 2 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): DE-FC36-02AL67615
Patent Info.: Filed Filed 2 Jun 04; US-Patent-Appl-SN-10-859 380
Report No.(s): PB2007-103999; No Copyright; Avail.: CASI: A03, Hardcopy

Sensor systems and methods are disclosed herein. A relative humidity sensor can be associated with one or more heating elements, wherein a perimeter of the relative humidity sensor is surrounded with a relatively conductive material. A thin substrate material can surround and laminate the heating element, such that the heating element is porous to permit humid air to pass through the heating element and wherein the at the heating element is assembled slightly offset from a surface of the relative humidity sensor. Air that is saturated with water vapor can then pass through and be heated by the heating element in order to evaporate water droplets associated with the water vapor to thereby reduce relative humidity to a measurable level.
NTIS
Heaters; Heating; Humidity; Kapton (Trademark); Meteorological Instruments; Patent Applications; Substrates

20070026202 Hoffmann and Baron, LLP, Syosset, NY, USA
Method and Apparatus for Signal Processing in a Sensor for Use in Spectroscopy
O'Connor, P., Inventor; DeGeronimo, G., Inventor; Grosholz, J., Inventor; 29 Apr 04; 33 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH108586
Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-835 092
Report No.(s): PB2007-103997; No Copyright; Avail.: CASI: A03, Hardcopy

A method for processing pulses arriving randomly in time on at least one channel using multiple peak detectors includes asynchronously selecting a non-busy peak detector (PD) in response to a pulse-generated trigger signal, connecting the channel to the selected PD in response to the trigger signal, and detecting a pulse peak amplitude. Amplitude and time of arrival data are output in first-in first-out (FIFO) sequence. An apparatus includes trigger comparators to generate the trigger signal for the pulse-receiving channel, PDs, a switch for connecting the channel to the selected PD, and logic circuitry which maintains the write pointer. Also included, time-to-amplitude converters (TACs) convert time of arrival to analog voltage and an analog multiplexer provides FIFO output. A multi-element sensor system for spectroscopy includes detector elements, channels, trigger comparators, PDs, a switch, and a logic circuit with asynchronous write pointer. The system includes TACs, a multiplexer and analog-to-digital converter.

NTIS
Patent Applications; Signal Processing; Spectroscopy

20070026204 Honeywell International, Inc., Morristown, NJ, USA
Relative Humidity Sensor Enclosed With Ceramic Heater
Speldrich, J. W., Inventor; Farrey, M. P., Inventor; 2 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): DE-FC36-02AL67615
Patent Info.: Filed Filed 2 Jun 04; US-Patent-Appl-SN-10-858 983
Report No.(s): PB2007-103994; No Copyright; Avail.: CASI: A03, Hardcopy

Sensor systems and methods are disclosed herein. A relative humidity sensor can be associated with one or more ceramic heating elements configured from a porous material. In general, a perimeter of the relative humidity sensor is surrounded with a relatively conductive material. A resistive material surrounds one or more of the ceramic heating elements, such that air that is saturated with water vapor passes through the porous material of the ceramic heating element(s). Water vapor can therefore be heated by the ceramic heating element(s) in order to evaporate water droplets associated with the water vapor and thereby reduce relative humidity to a measurable level. The porous material of the ceramic heating element(s) can be provided via a plurality of laser drilled holes to create such porosity.

NTIS
Ceramics; Heaters; Humidity; Meteorological Instruments; Patent Applications

20070026231 Swedish Defence Research Establishment, Linkoeping, Sweden
Investigation of HPM Front-Door Protection Devices and Component Susceptibility
Nilsson, T.; Jonsson, R.; Nov. 2005; 42 pp.; In English
Report No.(s): PB2007-103407; FOI-R-1771-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

An extensive investigation of front-door protection devices i.e. limiters have been made. The report contains both new resul7ts and summarizing results from previous measurements done on limiters. Both HPM and UWB measurements on various limiters have been done in order to characterize the limiters. The measurements show that not all limiters are suitable as protection against HMP and UWB pulses. The limiters that were found to provide the best protection are limiters based on diode technologies. PIN- and Schottky-diodes generally shows very good performance and they fulfill many parameter restrictions that have been set by FOI.

NTIS
Doors; Microwave Equipment; Microwaves; Protection

20070026258 Center for Night Vision and Electro-Optics, Fort Belvoir, VA, USA
Boresight Alignment Hardware for Commercial Optical Extension Tubes
Barr, D. N., Inventor; Nettleton, J. E., Inventor; 29 Apr 04; 6 pp.; In English
Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-839-450
Report No.(s): PB2007-104063; No Copyright; Avail.: CASI: A02, Hardcopy

An optical tube assembly set part that includes an optical tube section, a carrier smaller than the diameter of the optical

tube section for carrying an optical component, hardware for holding the carrier within the optical tube section, and hardware for sliding the carrier to line up the optical center of the optical component with a predetermined optical axis.
NTIS
Alignment; Boresights; Image Tubes; Optical Equipment; Patent Applications

20070026260 California Inst. of Tech., Pasadena, CA USA
Integrated Capacitive Microfluidic Sensors Method and Apparatus
Xie, J., Inventor; Shih, J., Inventor; Tai, Y. C., Inventor; 25 Mar 05; 26 pp.; In English
Contract(s)/Grant(s): DARPA-N66001-00-C-8092; NIH-5R01RR06217-10
Patent Info.: Filed Filed 25 Mar 05; US-Patent-Appl-SN-11-089-338
Report No.(s): PB2007-104062; No Copyright; Avail.: CASI: A03, Hardcopy

A microfluidic device and method for capacitive sensing. The device includes a fluid channel including an inlet at a first end and an outlet at a second end, a cavity region coupled to the fluid channel, and a polymer based membrane coupled between the fluid channel and the cavity region. Additionally, the device includes a first capacitor electrode coupled to the membrane, a second capacitor electrode coupled to the cavity region and physically separated from the first capacitor electrode by at least the cavity region, and an electrical power source coupled between the first capacitor electrode and the second capacitor electrode and causing an electric field at least within the cavity region. The polymer based membrane includes a polymer.
NTIS
Capacitance; Microfluidic Devices; Patent Applications

20070026267 Bureau of Reclamation, Denver, CO, USA
Transformers: Basic, Maintenance, and Diagnostics
Apr. 2005; 256 pp.; In English
Report No.(s): PB2007-109860; No Copyright; Avail.: National Technical Information Service (NTIS)

The document was created to provide guidance to Bureau of Reclamation powerplant personnel in maintenance, diagnostics, and testing of transformers and associated equipment. The document applies primarily to the maintenance and diagnostics of oil-filled power transformers (500 kilovoltamperes (kVA) and larger), owned and operated by Reclamation, although routine maintenance of other transformer types is addressed as well. Specific technical details are included in other documents and are referenced in the document. Guidance and recommendations herein are based on industry standards and experience gained at Reclamation facilities.
NTIS
Diagnosis; Maintenance; Transformers

20070026290 Sarnoff Corp., Shrewsbury, NJ, USA
Method and Apparatus for Automatic Registration and Visualization of Occluded Targets Using Ladar Data
Hsu, S. C., Inventor; Samarasekera, S., Inventor; Kumar, R., Inventor; Zhao, W. Y., Inventor; Hanna, K. J., Inventor; 16 Apr 04; 24 pp.; In English
Contract(s)/Grant(s): 01-D-0006
Patent Info.: Filed Filed 16 Apr 04; US-Patent-Appl-SN-10-825-946
Report No.(s): PB2007-104059; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for high-resolution 3D imaging ladar system which can penetrate foliage and camouflage to sample fragments of concealed surfaces of interest is disclosed. Samples collected while the ladar moves can be integrated into a coherent object shape. In one embodiment, a system and method for automatic data-driven registration of ladar frames, comprises a coarse search stage, a pairwise fine registration stage using an iterated closest points algorithm, and a multi-view registration strategy. After alignment and aggregation, it is often difficult for human observers to find, assess and recognize objects from a point cloud display. Basic display manipulations, surface fitting techniques, and clutter suppression to enhance visual exploitation of 3D imaging ladar data may be utilized.
NTIS
Detection; Infrared Detectors; Laser Range Finders; Lasers; Optical Radar; Rangefinding; Targets

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*.

20070025231 Lawrence Livermore National Lab., Livermore, CA USA
DYNA3D Non Reflecting Boundary Conditions-Test Problems
Zywicz, E.; Jul. 20, 2006; 10 pp.; In English
Report No.(s): DE2007-895422; UCRL-TR-224947; No Copyright; Avail.: National Technical Information Service (NTIS)

Two verification problems were developed to test non-reflecting boundary segments in DYNA3D (Whirley and Engelmann, 1993). The problems simulate 1-D wave propagation in a semi-infinite rod using a finite length rod and non-reflecting boundary conditions. One problem examines pure pressure wave propagation, and the other problem explores pure shear wave propagation. In both problems the non-reflecting boundary segments yield results that differ only slightly (less than 6%) during a short duration from their corresponding theoretical solutions. The errors appear to be due to the inability to generate a true step-function compressive wave in the pressure wave propagation problem and due to segment integration inaccuracies in the shear wave propagation problem. These problems serve as verification problems and as regression test problems for DYNA3D.
NTIS
Boundary Conditions; Boundary Layers; Reflection; Wave Propagation; S Waves

20070025276 Florida Univ., Gainesville, FL USA
Formation Criterion for Synthetic Jets
Holman, Ryan; Utturkar, Yogen; Mittal, Rajat; Smith, Barton L; Cattafesta, Louis; Oct 2005; 8 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0135
Report No.(s): AD-A464951; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A formation criterion for synthetic jets is proposed and validated. A synthetic jet actuator is a zero-net mass-flux device that imparts momentum to its surroundings. Jet formation is defined as the appearance of a time-averaged outward velocity along the jet axis and corresponds to the generation and subsequent convection or escape of a vortex ring. It is shown that over a wide range of operating conditions synthetic jet formation is governed by the jet Strouhal number Sr (or Reynolds number Re and Stokes number S). Both numerical simulations and experiments are performed to supplement available two-dimensional and axisymmetric synthetic jet formation data in the literature. The data support the jet formation criterion 1/Sr = Re/S2 >K, where the constant K is approximately 1 and 0.16 for two-dimensional and axisymmetric synthetic jets, respectively. In addition, the dependence of the constant K on the normalized radius of curvature of a rounded orifice or slot is addressed. The criterion is expected to serve as a useful design guide for synthetic jet formation in flow control, heat transfer, and acoustic liner applications, in which a stronger jet is synonymous with increased momentum transfer, vorticity generation, and acoustic nonlinearities.
DTIC
Criteria; Flow Distribution; Flow Visualization; Fluid Jets

20070025284 Naval Research Lab., Washington, DC USA
A Comparison of Optical Turbulence Models
Doss-Hammel, Steve; Oh, Eun; Ricklin, Jennifer; Eaton, Frank; Gilbreath, Charmaine; Tsintikidis, Dimitri; Jan 2004; 12 pp.; In English
Report No.(s): AD-A465265; PMS-405; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Navy has an interest in the use of laser systems for surface ships. Such systems must operate within a thin near-surface environment called the marine atmospheric surface layer. There exist substantial gradients in temperature and momentum within this layer which make turbulence a strong function of height. We are interested in robust and simple optical turbulence models that can be used to predict turbulence along near horizontal paths. We discuss several different models that are based upon similarity theory, and we compare the models with field transmission data taken from both over-water and over-land propagation paths.
DTIC
Optical Properties; Turbulence; Turbulence Models

20070025525 Simpson and Simpson, PLLC, Williamsville, NY, USA; State Univ. of New York, Buffalo, NY, USA
Method and Apparatus for Measuring Changes in Cell Volume
Sachs, F., Inventor; Hua, Z., Inventor; Besch, S., Inventor; Chopra, H. D., Inventor; Auerbach, A., Inventor; 4 Mar 05; 33 pp.; In English
Contract(s)/Grant(s): CMS-02-012; 5RO1HL054887-09
Patent Info.: Filed Filed 4 Mar 05; US-Patent-Appl-SN-11-072 732
Report No.(s): PB2007-104158; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for measuring changes in cell volume generally includes introducing cells into a chamber having a volume between 2 and 100 times the volume of the introduced cell. A first electrically conductive extracellular fluid is introduced into the chamber and a current is applied. The current flow is measured. The first fluid is exchanged with a second electrically conductive extracellular fluid and a current is applied. The current flow is measured. The first current flow result and the second current flow result are used in conjunction with known current flows to monitor changes in the volume corresponding to fluid flow between the cell and an extracellular fluid.
NTIS
Fluid Flow; Methodology

20070025572 Coleman Sudol Sapone, PC, Bridgeport, CT, USA; Science and Technology Corp., Albuquerque, NM, USA
Flow Cytometry for High Throughput Screening
Sklar, L. A., Inventor; Edwards, B. S., Inventor; Kuckuck, F. W., Inventor; 25 Feb 05; 9 pp.; In English
Contract(s)/Grant(s): NIH 1R24 GM 60799
Patent Info.: Filed Filed 25 Feb 05; US-Patent-Appl-SN-11-066 843
Report No.(s): PB2007-104665; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention, provides a flow cytometry apparatus for the detection of particles from a plurality of samples comprising: means for moving a plurality of samples comprising particles from a plurality of respective source wells into a fluid flow stream; means for introducing a separation gas between each of the plurality of samples in the fluid flow stream; and means for selectively analyzing each of the plurality of samples for the particles. The present invention also provides a flow cytometry method employing such an apparatus.
NTIS
Cytometry; Detection; Fluid Flow

20070026124 Lawrence Livermore National Lab., Livermore, CA USA
Bubble Counts for Rayleigh-Taylor Instability Using Image Analysis
Miller, P. L.; Gezahegne, A. G.; Cook, A. W.; Cabot, W. H.; Kamath, C.; Jan. 30, 2007; 6 pp.; In English
Report No.(s): DE2007-900067; UCRL-PROC-227585; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe the use of image analysis to count bubbles in 3-D, large-scale, LES (1) and DNS (2) of the Rayleigh-Taylor instability. We analyze these massive datasets by first converting the 3-D data to 2-D, then counting the bubbles in the 2-D data. Our plots for the bubble count indicate there are four distinct regimes in the process of the mixing of the two fluids. We also show that our results are relatively insensitive to the choice of parameters in our analysis algorithms.
NTIS
Bubbles; Counting; Image Analysis; Taylor Instability

20070026183 Technische Univ., Vienna, Austria
Analysis of Rayleigh-Taylor Instability, Part 1, Bubble and Spike Count
Kamath, C.; Gezahegne, A.; Miller, P.; Aug. 11, 2006; 65 pp.; In English
Report No.(s): DE2007-900052; UCRL-TR-223676; No Copyright; Avail.: National Technical Information Service (NTIS)

The use of high-performance computers to simulate hydrodynamic instabilities has resulted in the generation of massive amounts of data. One aspect of the analysis of this data involves the identification and characterization of coherent structures known as 'bubbles' and 'spikes'. This can be a challenge as there is no precise definition of these structures, and the large size of the data, as well as its distributed nature, precludes any extensive experimentation with different definitions and analysis algorithms. In this report, we describe the use of image processing techniques to identify and count bubbles and spikes in the Rayleigh-Taylor instability, which occurs when an initially perturbed interface between a heavier fluid and a lighter fluid is allowed to grow under the influence of gravity. We analyze data from two simulations, one a large-eddy simulation with 30

terabytes of analysis data, and the other a direct numerical simulation with 80 terabytes of analysis data. We consider different techniques to first convert the three-dimensional data to two dimensions and then count the structures of interest in the two-dimensional data. Our analysis of the bubble and spike counts over time indicates that there are four distinct regimes in the process of the mixing of the two fluids, starting from the initial linear stage, followed by the non-linear stage with weak turbulence, the mixing transition stage, and the final stage of strong turbulence. We also show that our results are relatively insensitive to the parameters used in our algorithms.
NTIS
Bubbles; Computerized Simulation; Taylor Instability

20070026280 Johns Hopkins Univ., Baltimore, MD, USA
Measurements and Computations of Fuel Droplet Transport in Turbulent Flows
Katz, J.; Knio, O.; January 2006; 15 pp.; In English
Contract(s)/Grant(s): DE-FG02-03ER46047
Report No.(s): DE2007-897517; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project is to study the dynamics of fuel droplets in turbulent water flows. The results are essential for development of models capable of predicting the dispersion of slightly light/heavy droplets in isotropic turbulence. Since we presently do not have any experimental data on turbulent diffusion of droplets, existing mixing models have no physical foundations. Such fundamental knowledge is essential for understanding/modeling the environmental problems associated with water-fuel mixing, and/or industrial processes involving mixing of immiscible fluids. The project has had experimental and numerical components: 1. The experimental part of the project has had two components. The first involves measurements of the lift and drag forces acting on a droplet being entrained by a vortex. The experiments and data analysis associated with this phase are still in progress, and the facility, constructed specifically for this project is described in Section 3. In the second and main part, measurements of fuel droplet dispersion rates have been performed in a special facility with controlled isotropic turbulence. As discussed in detail in Section 2, quantifying and modeling the of droplet dispersion rate requires measurements of their three dimensional trajectories in turbulent flows. To obtain the required data, we have introduced a new technique - high-speed, digital Holographic Particle Image Velocimetry (HPIV). The technique, experimental setup and results are presented in Section 2. Further information is available in Gopalan et al. (2005, 2006). 2. The objectives of the numerical part are: (1) to develop a computational code that combines DNS of isotropic turbulence with Lagrangian tracking of particles based on integration of a dynamical equation of motion that accounts for pressure, added mass, lift and drag forces, (2) to perform extensive computations of both buoyant (bubbles) and slightly buoyant (droplets) particles in turbulence conditions relevant to the experiments, and (3) to explore whether the corresponding predictions can explain the experimentally-observed behavior of the rise and dispersion of oil droplets in isotropic turbulence. A brief summary of results is presented in Section 4.
NTIS
Drops (Liquids); Isotropic Turbulence; Turbulent Flow; Transport Theory

20070026345 Sest, Inc., Middleburgh Heights, OH, USA
Thermal Performance of High Temperature Titanium-Water Heat Pipes by Multiple Heat Pipe Manufacturers
Sanzi, James L.; July 02, 2007; 18 pp.; In English; Space Technology and Applications International Forum (STAIF-2007), 11-14 Feb. 2007, Albuquerque, NM, USA; Original contains color illustrations
Contract(s)/Grant(s): NNC05BA21B; WBS 463169.04.03
Report No.(s): NASA/CR-2007-214820; E-15978; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070026345

Titanium-water heat pipes are being investigated for use in heat rejection systems for lunar and Mars fission surface power systems. Heat pipes provide an efficient and reliable means to transfer heat to a radiator heat rejection system. NASA Glenn Research Center requisitioned nine titanium water heat pipes from three vendors. Each vendor supplied three heat pipes 1.25 cm diameter by 1.1 meter long with each vendor selecting a different wick design. Each of the three heat pipes is slightly different in construction. Additional specifications for the heat pipes included 500 K nominal operating temperature, light weight, and freeze tolerance. The heat pipes were performance tested gravity-aided, in the horizontal position and at elevations against gravity at 450 and 500 K. Performance of the three heat pipes is compared. The heat pipe data will be used to verify models of heat pipe radiators that will be used in future space exploration missions.
Author
Heat Pipes; Operating Temperature; Temperature Effects; Titanium; Heat Transfer

20070027704 NASA Langley Research Center, Hampton, VA, USA

Overview of Supersonic Aerodynamics Measurement Techniques in the NASA Langley Unitary Plan Wind Tunnel

Erickson, Gary E.; August 2007; 107 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 136905.02.04.04.01.04

Report No.(s): NASA/TM-2007-214894; L-19380; No Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070027704

An overview is given of selected measurement techniques used in the NASA Langley Research Center (NASA LaRC) Unitary Plan Wind Tunnel (UPWT) to determine the aerodynamic characteristics of aerospace vehicles operating at supersonic speeds. A broad definition of a measurement technique is adopted in this paper and is any qualitative or quantitative experimental approach that provides information leading to the improved understanding of the supersonic aerodynamic characteristics. On-surface and off-surface measurement techniques used to obtain discrete (point) and global (field) measurements and planar and global flow visualizations are described, and examples of all methods are included. The discussion is limited to recent experiences in the UPWT and is, therefore, not an exhaustive review of existing experimental techniques. The diversity and high quality of the measurement techniques and the resultant data illustrate the capabilities of a ground-based experimental facility and the key role that it plays in the advancement of our understanding, prediction, and control of supersonic aerodynamics.

Author

Wind Tunnel Tests; General Overviews; Aerodynamic Characteristics; Aerospace Vehicles; Supersonic Wind Tunnels; Aircraft Models

20070027883 NASA Langley Research Center, Hampton, VA, USA

Spatial Evolution of Resonant Harmonic Mode Triads in a Blasius Boundary Layer

Davila, Jose B.; King, Rudolph A.; June 25, 2007; 13 pp.; In English; 37th AIAA Fluid Dynamics Conference and Exhibit, 25-28 Jun. 2007, Miami, FL, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 732759.07.03

Report No.(s): AIAA Paper-207-3981; Copyright; Avail.: CASI: A03, Hardcopy

Blasius boundary layer evolution is studies by means of bicoherence calculations. The layer is acoustically excited at the T-S frequency to provide a controlled transition. Measurements are made using a smooth surface as well as various roughness patterns. The bicoherence calculations are used to determine the extent to which frequency resonant velocity fluctuation waves can participate in energy exchange. The emphasis is on downstream variation of the individual interactions among harmonic modes. A limited picture of the role of quadratic wave interactions is revealed.

Author

Blasius Equation; Boundary Layers; Harmonics; Low Speed Wind Tunnels; Wind Tunnel Tests; Spatial Distribution; Resonant Frequencies

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*.

20070025338 Physical Optics Corp., Torrance, CA USA

Multiple Target Laser Designator (MTLD)

Kurtz, Russell; Mar 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-05-C-0423

Report No.(s): AD-A465922; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Physical Optics Corporation (POC) is developing a Multiple Target Laser Designator (MTLD) based on a scanning element and a lightweight angular multiplexed holographic optical element (HOE) antenna. It has a wide field of view (FOV) with only a few detectors, and requires no additional hardware for beam pointing and tracking. In the sixth quarter of the MTLD project, we have optimized the MTLD algorithm for target tracking and position estimation (Task 6). We have also optimized holographic antenna fabrication for effective MTLD system integration (Tasks 3 and 7 and Milestone 3). For the optimal system integration and a quick demonstration of the real-time multitargets laser designation with different codes, we have further investigated other more mature scanner technologies, and selected a COTS high-speed and high-precision

miniature x-y galvo scanner for optimization of multitarget designation algorithm and integration into a MTLD prototype (Tasks 6 and 7). We have been fabricating and testing the preliminary MTLD prototype to demonstrate multitarget designation with coded laser pulses (Tasks 7 and 8). We have continued to explore the commercial potential of MTLD (Task 9).
DTIC
Laser Target Designators; Lasers; Targets

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*.

20070025281 Technische Univ., Vienna, Austria
Feasibility Study of the Plasma Mirror Concept for High Power Lasers
Schuoecker, Dieter; Sep 2006; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8655-05-1-3045
Report No.(s): AD-A465232; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report results from a contract tasking Vienna University of Technology as follows: 1) Theoretical Assessment: The reflectivity of a plasma at least at the radiation of a carbon dioxide laser depends strongly on the number of free electrons per unit volume. The latter electron density is known from the literature for the case of a metal vapor plasma in deep penetration laser welding or drilling for the case of plasma shielding. So by comparing theoretical work on plasma shielding in the case of deep penetration welding and the outcomings of the arc models, arc currents can be estimated where electron densities become comparable to those which cause plasma shielding in laser welding and where the desired mirror action can be expected.
DTIC
Feasibility; High Power Lasers; Laser Beams; Mirrors; Plasmas (Physics)

20070025551 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Companhia Brasileira de Metalurgia e Mineracao, Sao Paulo, Brazil
Development of Large Grain/Single Crystal Niobium Cavity Technology at Jefferson Lab
Kneisel, P.; Myneni, G. R.; Ciovati, G.; Sekutowicz, J.; Carneiro, T.; Oct. 31, 2006; 7 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-899683; JLAB-ACC-07-623; DOD/OR/23177-0028; No Copyright; Avail.: National Technical Information Service (NTIS)

Approximately two years ago we started to develop high performance niobium accelerating cavities based on large grain or single crystal high purity niobium. We have fabricated and tested 15 single cell cavities of various shapes and frequencies between 1300 MHz and 2300 MHz using material from a total of 9 different very large grain niobium ingots from four niobium suppliers. The materials differed not only in grain sizes, but also in RRR value and in the amount of Ta contained in the material. In one ingot supplied by CBMM the central grain exceeded 7 inches in diameter and this was used to fabricate two 2.2 GHz cavities. A single crystal 1300 MHz mono-cell cavity was also produced at DESY by rolling out a single crystal to the size required for this cavity. It was sent to Jlab for surface treatment and testing. In addition, we have fabricated three 7-cell cavities: two of the Jlab high gradient (HG) shape and one of the ILC Low Loss shape. Two 9-cell TESLA shape cavities are presently in fabrication at Jlab and are close to completion.
NTIS
Niobium; Single Crystals; Laser Cavities

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*.

20070025190 NASA Glenn Research Center, Cleveland, OH, USA

Stability Analysis of a High-Speed Seal Test Rotor With Marginal and Extended Squeeze-Film Dampers: Theoretical and Experimental Results

Proctor, Margaret P.; Gunter, Edgar J.; July 17, 2007; 21 pp.; In English; Fourth Biennial International Symposium on Stability Control of Rotating Machinery (ISCORMA-4), 27-31 August 2007, Calagary, Alberta, Canada; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2007-214849; ISCORMA-4-201; E-16048-1; Copyright; Avail.: CASI: A03, Hardcopy

A case study of a high-speed seal test rotor shows how rotor dynamic analysis can be used to diagnose the source of high vibrations and evaluate a proposed remedy. Experimental results are compared with the synchronous and non-synchronous whirl response analysis of a double overhung, high-speed seal test rotor with ball bearings supported in 5.84- and 12.7-mm-long, un-centered squeeze-film oil dampers. Test performance with the original damper of length 5.84 mm was marginal. Non-synchronous whirling occurred at the overhung seal test disk and there was a high amplitude synchronous response near the drive spline above 32,000 rpm. Nonlinear synchronous unbalance and time transient whirl studies were conducted on the seal test rotor with the original and extended damper lengths. With the original damper design, the nonlinear synchronous response showed that unbalance could cause damper lockup at 33,000 rpm. Alford cross-coupling forces were also included at the overhung seal test disk for the whirl analysis. Sub-synchronous whirling at the seal test disk was observed in the nonlinear time transient analysis. With the extended damper length of 12.7 mm, the sub-synchronous motion was eliminated and the rotor unbalance response was acceptable to 45,000 rpm with moderate rotor unbalance. Seal test rotor orbits and vibration levels with the extended squeeze film dampers showed smooth operation to 40,444 rpm.

Author

High Speed; Stability Tests; Rotor Dynamics; Squeeze Films; Mechanical Engineering; Seals (Stoppers); Vibration Isolators

20070025226 NASA Glenn Research Center, Cleveland, OH, USA

Vibration Transmission through Bearings with Application to Gearboxes

Fleming, David P.; July 2007; 14 pp.; In English; Fourth Biennial International Symposium on Stability Control of Rotating Machinery (SICORMA-4), 27-31 Aug. 2007, Calgary, Alberta, Canada; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 877868.02.07.03.04.01

Report No.(s): NASA/TM-2007-214954; ISCORMA-4-510; E-16131; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070025226

Cabin noise has become a major concern to manufacturers and users of helicopters. Gear noise is the largest part of this unwanted sound. The crucial noise path is generally considered to be from the gears through the gear-supporting shafts and bearings into the gearbox case, and from there either through the gearbox mounts or the surrounding air to the helicopter cabin. If the noise, that is, the gear and shaft vibration, can be prevented from traveling through the gearbox bearings, then the noise cannot make its way into the helicopter cabin. Thus the vibration-transmitting properties of bearings are of paramount importance. This paper surveys the literature concerning evaluation of properties for the types of bearings used in helicopter gearboxes. A simple model is proposed to evaluate vibration transmission, using measured or calculated bearing stiffness and damping. Less-commonly used types of gearbox bearings (e.g., fluid film) are evaluated for their potential in reducing vibration transmission.

Author

Vibration Damping; Shafts (Machine Elements); Noise (Sound); Vibration; Gears

20070025577 Finnegan, Henderson, Farabow, Garrett, Dunner, LLP, Washington, DC, USA; Caterpillar, Inc., Peoria, IL, USA

Combustion Engine Including Exhaust Purification with On-Board Ammonia Production

Weber, J. R., Inventor; Leman, S. A., Inventor; Coleman, G. N., Inventor; Duffy, K. P., Inventor; Fluga, E. C., Inventor; 19 Nov 04; 26 pp.; In English

Contract(s)/Grant(s): DEFG05970R22605

Patent Info.: Filed Filed 19 Nov 04; US-Patent-Appl-SN-10-992 070
Report No.(s): PB2007-105953; No Copyright; Avail.: CASI: A03, Hardcopy

Engines and methods of controlling an engine may include producing ammonia from exhaust gas and using the ammonia to reduce certain emission components of the exhaust. Timing of valve closing/opening and use of an air supply system may enable engine operation according to a Miller cycle.
NTIS
Ammonia; Exhaust Emission; Internal Combustion Engines; Nitrogen Oxides; Purification; Control Equipment; Combustion Products

20070026097 NASA Glenn Research Center, Cleveland, OH, USA
Investigation of Low-Cycle Bending Fatigue of AISI 9310 Steel Spur Gears
Handschuh, Robert F.; Krantz, Timothy L.; Lerch, Bradley A.; Burke, Christopher S.; July 09, 2007; 14 pp.; In English; 10th International Power Transmission and Gearing Conference, 4-7 Sep. 2007, Las Vegas, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 877868.02.07.03.01.01
Report No.(s): NASA/TM-2007-214914; ARL-TR-4100; E-16062-1; Copyright; Avail.: CASI: A03, Hardcopy

An investigation of the low-cycle bending fatigue of spur gears made from AISI 9310 gear steel was completed. Tests were conducted using the single-tooth bending method to achieve crack initiation and propagation. Tests were conducted on spur gears in a fatigue test machine using a dedicated gear test fixture. Test loads were applied at the highest point of single tooth contact. Gear bending stresses for a given testing load were calculated using a linear-elastic finite element model. Test data were accumulated from 1/4 cycle to several thousand cycles depending on the test stress level. The relationship of stress and cycles for crack initiation was found to be semi-logarithmic. The relationship of stress and cycles for crack propagation was found to be linear. For the range of loads investigated, the crack propagation phase is related to the level of load being applied. Very high loads have comparable crack initiation and propagation times whereas lower loads can have a much smaller number of cycles for crack propagation cycles as compared to crack initiation.
Author
Crack Initiation; Crack Propagation; Gears; Loads (Forces); Steels; Bending Fatigue

38
QUALITY ASSURANCE AND RELIABILITY

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

20070025228 Lawrence Livermore National Lab., Livermore, CA USA
New Applications of Gamma Spectroscopy: Characterization Tools for D&D Process Development, Inventory Reduction Planning and Shipping, Safety Analysis and Facility Management During the Heavy Element Facility Risk Reduction Program
Mitchell, M.; Anderson, B.; Bray, L.; Vellinger, R.; West, M.; Apr. 07, 2006; 16 pp.; In English
Report No.(s): DE2007-895413; UCRL-CONF-220437; No Copyright; Avail.: Department of Energy Information Bridge

Novel applications of gamma ray spectroscopy for D&D process development, inventory reduction, safety analysis and facility management are discussed in this paper. These applications of gamma spectroscopy were developed and implemented during the Risk Reduction Program (RPP) to successfully downgrade the Heavy Element Facility (B251) at Lawrence Livermore National Laboratory (LLNL) from a Category II Nuclear Facility to a Radiological Facility. Non-destructive assay in general, gamma spectroscopy in particular, were found to be important tools in project management, work planning, and work control (Expect the unexpected and confirm the expected), minimizing worker dose, and resulted in significant safety improvements and operational efficiencies. Inventory reduction activities utilized gamma spectroscopy to identify and confirm isotopics of legacy inventory, ingrowth of daughter products and the presence of process impurities; quantify inventory; prioritize work activities for project management; and to supply information to satisfy shipper/receiver documentation requirements. D&D activities utilize in-situ gamma spectroscopy to identify and confirm isotopics of legacy contamination; quantify contamination levels and monitor the progress of decontamination efforts; and determine the point of diminishing returns in decontaminating enclosures and glove boxes containing high specific activity isotopes such as 244Cm and 238Pu.
NTIS
Characterization; Decommissioning; Decontamination; Heavy Elements; Radioactive Wastes; Safety; Spectroscopy; Waste Management; Gamma Ray Spectra

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*.

20070026310 Lawrence Livermore National Lab., Livermore, CA USA
Novel Mechanical Method to Measure Shear Strength in Specimens Under Pressure
Escobedo, J. P.; Field, D.; Lassila, D.; Leblanc, M.; Apr. 12, 2006; 8 pp.; In English
Report No.(s): DE2007-895718; UCRL-PROC-220534; No Copyright; Avail.: Department of Energy Information Bridge

A new experimental apparatus has been developed for performing shear tests on specimens held under moderately high hydrostatic pressures (on the order of 4 GPa). This testing procedure experimentally determines the pressure-dependent shear strength of thin foil specimens. The experiments provide calibration data for models of materials subjected to extreme pressures such as the Steinberg-Guinan hardening model and can assist in model validation for discrete dislocation dynamics simulations, among others. This paper reports the development of the experimental procedures and the results of initial experiments on thin foils of polycrystalline Ta performed under hydrostatic pressures ranging from 1 to 4 GPa. Both yielding and hardening behavior of Ta are observed to be sensitive to the imposed pressure.
NTIS
Foils (Materials); Hydrostatic Pressure; Shear Strength

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*.

20070025598 Mirick, OConnell, DeMallie, and Lougee, LLP, Westborough, MA, USA
Methods for Determining a Measure of Atmospheric Aerosol Optical, Properties Using a Multi-or Hyperspectral, Multi-Pixel Image
Berstein, L. S., Inventor; Golden, S. M., Inventor; Perkins, T. C., Inventor; Berk, A., Inventor; Levine, R. Y., Inventor; 7 Apr 05; 16 pp.; In English
Contract(s)/Grant(s): AF-F19628-02-C-0054
Patent Info.: Filed Filed 7 Apr 05; US-Patent-Appl-SN-11-100 670
Report No.(s): PB2007-104675; No Copyright; Avail.: CASI: A03, Hardcopy

A method of automatically determining a measure of atmospheric aerosol optical properties using a multi- or hyper-spectral, multi-pixel image. A plurality of spectrally-diverse pixels are resolved from the image. A statistical spectral deviation of the spectrally-diverse pixels is determined, and then corrected for non-aerosol transmittance losses. One or more wavelength-dependent aerosol optical depths are derived from the statistical spectral deviation. Wavelength-dependent gaseous optical depths can be derived from the statistical spectral deviation.
NTIS
Aerosols; Atmospheric Chemistry; Meteorological Parameters; Optical Properties; Pixels

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*.

20070025321 North Carolina Univ., Chapel Hill, NC USA
Stone Quarries and Sourcing in the Carolina Slate Belt
Steponaitis, Vincas P; McReynolds, Theresa E; Irwin, E; Jeffrey, D; Moore, Christopher R; Apr 2006; 211 pp.; In English
Contract(s)/Grant(s): DACA42-02-D-0010-D02
Report No.(s): AD-A465839; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study investigated potential sources of lithic raw materials utilized by prehistoric hunter-gathers in the vicinity of

Fort Bragg in the North Carolina Sandhills. The study was designed to achieve two main objectives: (1) to evaluate the effectiveness of a range of mineralogical and chemical techniques for 'fingerprinting' potential sources of raw materials and (2) to apply these techniques in determining for sources of ancient stone tools found at Fort Bragg. Seventy-one rock samples from 12 different quarry zones, along with nine prehistoric artifacts, were examined using five different techniques: petrography, neutron activation analysis (NAA), neodymium-isotope analysis. x-ray fluorescence (XRF), and inductively coupled plasma mass spectrometry (ICP-MS). Each technique provided useful information, but there were significant discrepancies among the assignments of geological sources using the different lines of evidence. The two most useful techniques proved to be petrography and Nd-isotopic analysis. although the elemental data were also very helpful in certain cases.
DTIC
Geology; Mines (Excavations)

20070025540 NASA Dryden Flight Research Center, Edwards, CA, USA
NASA Experience with UAS Science Applications
Curry, Robert E.; Jennison, Chris; May 07, 2007; 20 pp.; In English; American Society for Photogrammetry and Remote Sensing 2007 Annual Conference, 7-11 May 2007, Tampa, FL, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025540

Viewgraphs of NASA's Unmanned Aerial Systems (UAS) as it applies to Earth science missions is presented. The topics include: 1) Agenda; 2) Background; 3) NASA Science Aircraft Endurance; 4) Science UAS Development Challenges; 5) USCG Alaskan Maritime Surveillance; 6) NOAA/NASA UAV Demonstration Project; 7) Western States Fire Mission; 8) Esperanza Fire Emergency Response; 9) Ikhana (Predator B); 10) UAV Synthetic Aperture Radar (UAVSAR); 11) Global Hawk; and 12) Related Technologies
CASI
Earth Sciences; Pilotless Aircraft; NASA Programs; Air Navigation

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*.

20070025514 Georgia School of Technology, Atlanta, GA, USA
Nanostructured Composite Electrodes for Lithium Batteries
Liu, M.; Gole, J.; January 2006; 18 pp.; In English
Contract(s)/Grant(s): DE-FG02-01ER152200
Report No.(s): DE2007-896312; No Copyright; Avail.: Department of Energy Information Bridge

The objective of this study was to explore new ways to create nanostructured electrodes for rechargeable lithium batteries. Of particular interests are unique nanostructures created by electrochemical deposition, etching and combustion chemical vapor deposition (CCVD). Three-dimensional nanoporous Cu6Sn5 alloy has been successfully prepared using an electrochemical co-deposition process. The walls of the foam structure are highly-porous and consist of numerous small grains. This represents a novel way of creating porous structures that allow not only fast transport of gas and liquid but also rapid electrochemical reactions due to high surface area. The Cu6Sn5 samples display a reversible capacity of approx. 400 mAhg-1. Furthermore, these materials exhibit superior rate capability. At a current drain of 10 mA/cm2(20C rate), the obtainable capacity was more than 50% of the capacity at 0.5 mA/cm2 (1C rate). Highly open and porous SnO2 thin films with columnar structure were obtained on Si/SiO2/Au substrates by CCVD. The thickness was readily controlled by the deposition time, varying from 1 to 5 microns. The columnar grains were covered by nanoparticles less than 20 nm. These thin film electrodes exhibited substantially high specific capacity.
NTIS
Electrodes; Lithium Batteries; Nanostructures (Devices); Composite Materials

20070025523 Quarles and Brady, LLP., Milwaukee, WI, USA
Surface Modified Stainless Steels for PEM Fuel Cell Bipolar Plates
Brady, M. P., Inventor; Wang, H., Inventor; Turner, J. A., Inventor; 3 Mar 05; 18 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 3 Mar 05; US-Patent-Appl-SN-11-071 830
Report No.(s): PB2007-104153; No Copyright; Avail.: CASI: A03, Hardcopy

A nitridation treated stainless steel article (such as a bipolar plate for a proton exchange membrane fuel cell) having lower interfacial contact electrical resistance and better corrosion resistance than an untreated stainless steel article is disclosed. The treated stainless steel article has a surface layer including nitrogen-modified chromium-base oxide and precipitates of chromium nitride formed during nitridation wherein oxygen is present in the surface layer at a greater concentration than nitrogen. The surface layer may further include precipitates of titanium nitride and/or aluminum oxide. The surface layer in the treated article is chemically heterogeneous surface rather than a uniform or semi-uniform surface layer exclusively rich in chromium, titanium or aluminum. The precipitates of titanium nitride and/or aluminum oxide are formed by the nitriding treatment wherein titanium and/or aluminum in the stainless steel are segregated to the surface layer in forms that exhibit a low contact resistance and good corrosion resistance.
NTIS
Bipolarity; Corrosion Resistance; Fuel Cells; Stainless Steels

20070025587 Intellectual Property/Technology Law, Research Triangle Park, NC, USA
Microfibrous Fuel Cell Assemblies Comprising Fiber-Supported Electrocatalyst Layers and Methods of Making Same
Eshraghi, R. R., Inventor; Lin, C., Inventor; Lin, J. C., Inventor; Ketterer, M. E., Inventor; 6 Jan 05; 28 pp.; In English
Contract(s)/Grant(s): NIST-70NANB1H3039
Patent Info.: Filed Filed 6 Jan 05; US-Patent-Appl-SN-11-030 703
Report No.(s): PB2007-104698; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to a microfibrous fuel cell structure of elongated form with a longitudinal axis. Such microfibrous fuel cell comprises electrocatalyst layers supported by a fiber network formed of unidirectional or substantially unidirectional conductive fibers. The conductive fibers of such fiber network are oriented parallelly or substantially parallel to the longitudinal axis of the fuel cell, therefore allowing such fiber network to conform to the curvature of the microfibrous fuel cell along the radial direction but without causing overbending of the individual fibers.
NTIS
Electrocatalysts; Fuel Cells; Microfibers; Layers

20070025595 Wolf Greenfield and Sacks, PC, Boston, MA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA
Polymer Electrolyte Intercalation Compounds and Electrodes for Batteries
Ceder, G., Inventor; Chiang, Y. M., Inventor; Sadoway, D. R., Inventor; Aydinol, M. K., Inventor; Jang, Y. I., Inventor; 8 Apr 05; 38 pp.; In English
Contract(s)/Grant(s): DEFC07-941D13223; NIH-5P30-ES02109
Patent Info.: Filed Filed 8 Apr 05; US-Patent-Appl-SN-11-101 724
Report No.(s): PB2007-104697; No Copyright; Avail.: CASI: A03, Hardcopy

Solid battery components are provided. A block copolymeric electrolyte is non-crosslinked and non-glassy through the entire range of typical battery service temperatures, that is, through the entire range of at least from about 0C to about 70C. The chains of which the copolymer is made each include at least one ionically-conductive block and at least one second block immiscible with the ionically-conductive block. The chains form an amorphous association and are arranged in an ordered nanostructure including a continuous matrix of amorphous ionically-conductive domains and amorphous second domains that are immiscible with the ionically-conductive domains. A compound is provided that has a formula of Li(sub x)M(sub y)N(sub z)O(sub 2). M and N are each metal atoms or a main group elements, and x, y and z are each numbers from about 0 to about 1. y and z are chosen such that a formal charge on the M(sub y)N(*sub z) portion of the compound is (4-x). In certain embodiments, these compounds are used in the cathodes of rechargeable batteries. The present invention also includes methods of predicting the potential utility of metal dichalgogenide compounds for use in lithium intercalation compounds. It also provides methods for processing lithium intercalation oxides with the structure and compositional homogeneity necessary to realize the increased formation energies of said compounds. An article is made of a dimensionally-stable, interpenetrating microstructure of a first phase including a first component and a second phase, immiscible with the first phase, including a second component. The first and second phases define interphase boundaries between them, and at least one particle is positioned between a first phase and a second phase at an interphase boundary. When the first and second phases are

electronically-conductive and ionically-conductive polymers, respectively, and the particles are ion host particles, the arrangement is an electrode of a battery.
NTIS
Electric Batteries; Electrodes; Electrolytes; Intercalation

20070026108 Fermi National Accelerator Lab., Batavia, IL, USA; Bari Univ., Italy
Solar Atmosphere Neutrino Oscillations
Fogli, G. L.; Lisi, E.; Mirizzi, A.; Montanino, D.; Serpico, P. D.; January 2006; 3 pp.; In English
Report No.(s): DE2007-899708; FERMILAB-CONF-07-022-A; No Copyright; Avail.: National Technical Information Service (NTIS)

The Sun is a source of high energy neutrinos (E > 10 GeV) produced by cosmic ray interactions in the solar atmosphere. We studied the impact of three-flavor oscillations on the solar atmosphere neutrino fluxes observable at Earth. We find that peculiar matter oscillation effects in the Sun do exist, but are signicantly suppressed by averaging over the production region and over the neutrino and antineutrino components. In particular, the relation between the neutrino fluxes at the Sun and at the Earth can be approximately expressed in terms of phase-averaged 'vacuum' oscillations, dominated by a single mixing parameter.
NTIS
Oscillations; Solar Atmosphere; Solar Neutrinos

45
ENVIRONMENT POLLUTION

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

20070025431 National Centers for Environmental Prediction, Silver Spring, MD USA; Environmental Protection Agency, Washington, DC USA
NOAA-EPA's New National Air Quality Forecasting Capability: Initial Steps
Davidson, P. M.; Meagher, J. F.; Dec. 06, 2005; 24 pp.; In English
Report No.(s): PB2007-108994; No Copyright; Avail.: National Technical Information Service (NTIS)

Outline: Background and Current Capability; Path Forward: Transitioning capabilities to operations; and Progress toward expanded capabilities.
NTIS
Air Quality; Forecasting; Environment Protection; Earth Atmosphere

20070025432 Environmental Protection Agency, Washington, DC, USA
Clean and Efficient Automotive Technologies Under Development at EPA
Jan. 2004; 198 pp.; In English
Report No.(s): PB2007-109503; EPA-420-R-04-002; No Copyright; Avail.: National Technical Information Service (NTIS)

Under Clean Automotive Technology, EPA conducts this innovative research primarily to: Achieve ultra-low pollution emissions,Increase fuel efficiency, Reduce greenhouse gases By developing cost-effective technologies. Clean Automotive Technology also encourages manufacturers to produce cleaner and more fuel-efficient vehicles. The consumer benefits in that they might be able to recoup the higher initial vehicle costs through lower operating costs within a few years. This exciting program encourages the commercialization of promising technologies by actively pursuing the transfer of EPA's technologies into the private sector.
NTIS
Automobiles; Environment Protection; Technologies; Research and Development

20070025435 ARCADIS Geraghty and Miller, Inc., Durham, NC, USA
Measurement of Fugitive Emissions at a Bioreactor Landfill
Modrak, M.; Hashmonay, R.; Varma, R.; Kagann, R.; Aug. 2005; 122 pp.; In English
Report No.(s): PB2007-109512; EPA-600/R-05/096; No Copyright; Avail.: National Technical Information Service (NTIS)

The data presented in this report are from three field campaigns performed during September 2002, May 2003, and September 2003 by ARCADIS and the USA Environmental Protection Agency (U.S.EPA) to measure fugitive emissions at

a bioreactor landfill in Louisville, Kentucky, using an open-path Fourier transform infrared (OP-FTIR) spectrometer. The study involved a technique developed through research funded by U.S.EPAs National Risk Management Research Laboratory (NRMRL) that uses optical remote sensing-radial plume mapping (ORS-RPM). The horizontal radial plume mapping (HRPM) method was used to map surface concentrations, and the vertical radial plume mapping (VRPM) method was used to measure emissions fluxes down-wind of the site. Surveys were conducted in five areas at the Louisville facility: As-Built (an area designed as a bioreactor land-fill), Retrofit (an area converted to a bioreactor landfill), Control, Biocover, and Compost. In general, the As-Built area was found to have the highest methane fluxes. In addition to VRPM surveys, HRPM surveys were performed in the As-Built and Retrofit areas. Two definitive methane hot spots, having concentrations over 80 ppmv were found at the Retrofit area during the September 2002 campaign.
NTIS
Bioreactors; Fourier Transformation; Infrared Spectra; Landfills; Plumes; Radicals; Remote Sensing

20070025534 Pacific Northwest National Lab., Richland, WA, USA
DUSTRAN 1.0 User's Guide: A GIS-Based Atmospheric Dust Dispersion Modeling System
Allwine, K. J.; Rutz, F. C.; Shaw, W. J.; Rishel, J. P.; Fritz, B. G.; Sep. 2006; 148 pp.; In English
Contract(s)/Grant(s): DE-AC05-76RL01830
Report No.(s): DE2007-896342; PNNL-16055; No Copyright; Avail.: National Technical Information Service (NTIS)
The U.S. Department of Energy's Pacific Northwest National Laboratory just completed a multi-year project to develop a fully tested and documented atmospheric dispersion modeling system (DUST TRANsport or DUSTRAN) to assist the U.S. Department of Defense in addressing particulate air quality issues at military training and testing ranges. This manual documents the DUSTRAN modeling system and includes installation instructions, a user's guide, and detailed example tutorials.
NTIS
Atmospheric Models; Dust; Geographic Information Systems

20070025603 Environmental Protection Agency, Philadelphia, PA, USA
Pilot Region-Based Optimization Program for Fund-Lead Sites in EPA Region 3. Site Optimization Tracker: Raymark, Hatboro, Pennsylvania
Dec. 2006; 53 pp.; In English
Report No.(s): PB2007-108929; EPA/542/R-06/006F; No Copyright; Avail.: National Technical Information Service (NTIS)
Indoor air sampling in buildings and homes surrounding Superfund Sites has become a national issue, and Regional management is pursuing this topic at the policy level. Implementation of this RSE recommendation will hinge on Regional policy, and the time frame for devising that policy is unknown to the site manager and project liaison at this time. Work on this recommendation has been delayed until Regional policy is in place; however, the site team acknowledges that it is appropriate to conduct at least a preliminary evaluation. As part of this most recent follow-up meeting, the ROET has recommended that the soil gas survey that is planned at the site for locating a potential source area be modified to preliminarily evaluate soil gas concentrations between the source area and potential receptors for vapor intrusion.
NTIS
Air Quality; Buildings; Environment Protection; Environmental Cleanup; Indoor Air Pollution

20070025605 Pacific Northwest National Lab., Richland, WA, USA; Battelle Memorial Inst., Columbus, OH USA
Second Generation Model 2004: An Overview
Edmonds, J.; Pitcher, H.; Sands, R.; Oct. 2004; 40 pp.; In English
Contract(s)/Grant(s): AGRDW89939464-01; AGRDW89939645-01
Report No.(s): PB2007-108932; No Copyright; Avail.: National Technical Information Service (NTIS)
The Second Generation Model (SGM) is a computable general equilibrium model designed specifically to analyze issues related to energy, economy, and greenhouse gas emissions. It has fourteen global regions, multiple greenhouse gas emissions, vintaged capital stocks, explicit connections between technology and the economy, explicit treatment of energy and land stocks and is disaggregated to reflect the relative importance of sectors in determining greenhouse gas emissions. Model development began in 1991. The first model design paper was published in1993 (Edmonds, et al., 1993). The SGM was developed to complement the first generation model, referred to as the MiniCAM. The MiniCAM was also explicitly designed to address long-term, strategic issues related to energy, economy, and greenhouse gas emissions (Edmonds and Reilly, 1983)and continues to be used for that purpose. In contrast the SGM was designed to address transitional energy-economy-

technology-greenhouse- gas-emissions issues. This paper documents the present version of the SGM: SGM 2004. The SGM 2004 consists of a theoretical structure, computational implementation, and statistical expression. This paper documents the theoretical structure and some of the most important data shaping model behavior. It does not attempt to document the software employed to solve the statistical expression of the theoretical relationships nor does it provide a complete documentation of all of the data employed in SGM 2004. The SGM was developed at the Pacific Northwest National Laboratory (PNNL) and is maintained by the PNNL Joint Global Change Research Institute (JGCRI).
NTIS
Exhaust Emission; Exhaust Gases; Greenhouse Effect

20070026067 US Chemical Safety and Hazard Investigation Board, Washington, DC, USA
Investigation Report: Chlorine Release (16 Medically Evaluated, Community Evacuated): DPC Enterprises, L.P., Glendale, Arizona, November 17, 2003
Feb. 2007; 55 pp.; In English
Report No.(s): PB2007-108952; REPT-2004-02-I-AZ; No Copyright; Avail.: National Technical Information Service (NTIS)

On November 17, 2003, a chlorine gas release at DPC Enterprises (DPC) in Glendale, Arizona, led to the evacuation of 1.5 square miles of Glendale and Phoenix. Five residents and 11 police officers sought medical attention for symptoms of chlorine exposure and were treated and released. The DPC Enterprises facility in Glendale repackages chlorine from railcars into smaller containers. DPC captures chlorine vented from these operations in one of two caustic scrubbers that also produce household bleach for sale as a byproduct. The U.S. Chemical Safety and Hazard Investigation Board (CSB) determined that excess chlorine vented to the scrubber, where it completely depleted the active scrubbing material (caustic) and over-chlorinated the scrubber. The resulting bleach decomposition reaction released a cloud of toxic gases into the surrounding community. Emissions continued at a decreasing rate for about six hours. The incident ended when workers injected additional caustic into the scrubber to stop the decomposition reaction.
NTIS
Accident Investigation; Chlorine; Exposure

20070026110 Brookhaven National Lab., Upton, NY USA
Local Impacts of Mercury Emissions from the Monticello Coal Fired Power Plant
Suliivan, T. M.; Adams, J.; Milian, L.; Subramania, S.; Feagin, L.; Oct. 2006; 26 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-899614; BNL-77475-2007-IR; No Copyright; Avail.: National Technical Information Service (NTIS)

The Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR) as currently proposed by the U.S. Environmental Protection Agency (EPA) when fully implemented will lead to reduction in mercury emissions from coal-fired power plants by 70 percent to fifteen tons per year by 2018. The EPA estimates that mercury deposition would be reduced 8 percent on average in the Eastern USA. The CAMR permits cap-and-trade approach that requires the nationwide emissions to meet the prescribed level, but do not require controls on each individual power plant. This has led to concerns that there may be hot-spots of mercury contamination near power plants. Partially because of this concern, many states including Pennsylvania have implemented, or are considering, state regulations that are stricter on mercury emissions than those in the CAMR. This study examined the possibility that coal-fired power plants act as local sources leading to mercury hot spots, using two types of evidence. First, the world-wide literature was searched for reports of deposition around mercury sources, including coal-fired power plants. Second, soil samples from around two mid-sized U.S. coal-fired power plants were collected and analyzed for evidence of hot spots and for correlation with model predictions of deposition.
NTIS
Air Pollution; Coal; Mercury (Metal); Power Plants

20070026112 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Keio Univ., Tokyo, Japan; Tohoku Univ., Sendai, Japan; Tokyo Univ. of Science, Japan
Energy and Carbon Emissions: Country Studies
Murakami, S.; Levine, M. D.; Yoshinovin, H.; Inoue, T.; Ikaga, T.; Dec. 2006; 85 pp.; In English
Report No.(s): DE2007-899740; No Copyright; Avail.: National Technical Information Service (NTIS)

In response to the Kyoto Protocol for preventing global warming, signed in February 2005, the Kyoto Protocol Target

Achievement Plan was developed in March 2006. In this plan, CO2 emission reduction targets to be achieved in FY 2010 was set in each sector (industrial, residential, commercial, transport, energy conversion, etc.) and +6% CO2 emission increase allowed for the residential sector and +15% for the commercial and other sectors based on the standard of FY 1990. However, concerning the CO2 emission of FY 2002, those sectors must be reduced 22.8% and 16.7% respectively. Since the primary due period of 2008-2012 is close at hand, specific measures for the prevention of global warming should be implemented in all areas. First, this report outlines energy consumption and greenhouse gas emission trends in the residential and commercial sectors in Japan. It indicates that they have increased by 24% and 28% respectively in 2000 compared to 1990. The increase in residential energy consumption is caused by the widespread use of heating equipment, hot-water supply apparatus and other household electrical appliances. It also notes that residential energy consumption is much lower than in Western countries; heating, hot-water supply and other use each accounts for 1/3, so heating use is as small as approximately 1/5 of that in Western countries. The amount varies widely depending on region, and heating use accounts for 2/3 in cold Hokkaido. With respect to insulation for residential buildings, the report shows future projections for GHG emissions including fluorocarbon, which is used for insulation materials, and suggests that GHG emission can be reduced by just 0.6% compared to 1990 if any measure for cutting fluorocarbon emissions is implemented in addition to the promotion of thermal insulation. On the other hand, the report indicates that the increase in commercial energy use is caused by growth of the floor area of buildings. The energy consumption ratio per certain floor area is larger for hotels, hospitals and department stores, and smaller for schools. The report shows the future projections for CO2 emissions until 2050, and indicates that if the various energy conservation measures applicable are implemented, 59% reduction can be achieved compared to 1990. It also indicates that, forecasting residential CO2 emissions by region, the promotion of thermal insulation and improvement of heating system efficiency are effective in Hokkaido, and solar shading and improvement of cooling system efficiency are effective in Okinawa.
NTIS
Air Pollution; Carbon; Greenhouse Effect

20070026255 ADA-ES, Inc., Littleton, CO, USA
Low-Cost Options for Moderate Levels of Mercury Control
Sjostrom, S.; January 2006; 136 pp.; In English
Contract(s)/Grant(s): DE-FC26-05NT42307
Report No.(s): DE2007-899759; No Copyright; Avail.: National Technical Information Service (NTIS)

On March 15, 2005, EPA issued the Clean Air Mercury Rule, requiring phased-in reductions of mercury emissions from electric power generators. ADA-ES, Inc., with support from DOE/NETL and industry partners, is conducting evaluations of EPRIs TOXECON II process and of high-temperature reagents and sorbents to determine the capabilities of sorbent/reagent injection, including activated carbon, for mercury control on different coals and air emissions control equipment configurations. DOE/NETL targets for total mercury removal are =55% (lignite), =65% (subbituminous), and =80% (bituminous). Based on work done to date at various scales, meeting the removal targets appears feasible. However, work needs to progress to more thoroughly document and test these promising technologies at full scale. This is the final site report for tests conducted at MidAmericans Louisa Station, one of three sites evaluated in this DOE/NETL program. The other two sites in the program are MidAmericans Council Bluff Station and Entergys Independence Station. MidAmericans Louisa Station burns Powder River Basin (PRB) coal and employs hot-side electrostatic precipitators with flue gas conditioning for particulate control. This part of the testing program evaluated the effect of reagents used in the existing flue gas conditioning on mercury removal.
NTIS
Air Pollution; Electric Generators; Low Cost; Pollution Control

20070026306 North Carolina State Univ., Raleigh, NC USA
Operational Evaluation of Emissions and Fuel Use of B20 Versus Diesel Fueled Dump Trucks
Frey, H. C.; Kim, K.; Sep. 30, 2005; 374 pp.; In English
Report No.(s): PB2007-109845; No Copyright; Avail.: National Technical Information Service (NTIS)

Diesel vehicles contribute substantially to statewide emissions of NOx, an ozone precursor, and to particulate matter. NCDOT is conducting a pilot study to demonstrate the use of B20 biodiesel fuel on approximately 1,000 vehicles in selected areas of the state; there are plans to extend the use of B20 fuel to a much larger number of vehicles in all 100 counties in North Carolina. Real-world in-use on-road emissions of selected heavy duty diesel vehicles, including those fueled with B20 biodiesel and petroleum diesel, were measured during normal duty cycles using a portable emissions measurement system (PEMS). Four categories of dump trucks were selected for testing, including: (1) single rear axle with Tier 1 engines; (2) single rear axle with Tier 2 engines; (3) tandems with Tier 1 engines; and (4) tandems with Tier 2 engines. A total of 12 vehicles

were tested. Each vehicle was tested for one day on B20 biodiesel and for one day on petroleum diesel, for a total of 24 days of field measurements. The vehicles were operated by drivers assigned by NCDOT. Each test was conducted over the course of an entire workshift, and on average there were 4.5 duty cycles per shift. Each duty cycle is comprised of a uniquely weighted combination of nine operating modes (idle, three levels of acceleration, three levels of cruise, deceleration, and dumping). Average emission rates on a mass per time basis varied substantially among the operating modes.
NTIS
Diesel Fuels; Trucks; Emission

20070026342 Lawrence Livermore National Lab., Livermore, CA USA
Scientific Case for Large CO2 Storage Projects Worldwide. Where They Should Go, What They Should Look Like, and How Much They Should Cost
Friedmann, S. J.; May 18, 2006; 8 pp.; In English
Report No.(s): DE2007-895712; UCRL-CONF-221457; No Copyright; Avail.: Department of Energy Information Bridge

To achieve substantial GHG reductions through carbon capture and storage (CCS) requires 100s to 1000s of large volume injection facilities distributed globally with very low rates and volumes of leakage. Several large-scale projects exist (Weyburn, Sleipner, In-Salah) and each has revealed an important aspect of the geology that was not previously known. This reaffirms the notion that key geological thresholds in the earths crust are sensitive to the magnitude and rate of excursions, (e.g., pressure build-up, pH). Because commercial-scale CCS will reach these thresholds, a suite of largescale projects is needed to investigate the conditions for successful deployment. These projects must cover a range of geological and geographic settings and key plays. Moreover, they must be supported by a sufficiently large science and technology program to understand the key features, events, and processes in each case to address stakeholder concerns and develop operational guidelines for large-scale deployment.
NTIS
Carbon Dioxide; Costs; Greenhouse Effect; Injection

20070026349 Arizona State Univ., Tempe, AZ USA
Dual Phase Membrane for High Temperature CO(sub 2) Separation. Annual Technical Progress Report from September 1, 2005 to August 30, 2006
Lin, J. Y. S.; Anderson, M.; Jan. 2007; 11 pp.; In English
Contract(s)/Grant(s): DE-FG26-OONT41555
Report No.(s): DE2007-899865; No Copyright; Avail.: Department of Energy Information Bridge

Dual-phase membranes consisting of stainless steel supports infiltrated with molten carbonate have been shown to be selective to CO2 at high temperatures (400-650 C). However, over time at high temperatures, the formation of iron oxides on the surface of the stainless steel supports render the membranes ineffective. This report details synthesis and characteristics of dual-phase carbonate membrane with an oxidation resistant perovskite type ceramic (lanthanum-strontium- cobaltite-iron; LSCF) support. Porous LSCF supports were prepared from its powder synthesized by the citrate method. Both steady state permeation and mercury porosimetry confirmed that the LSCF membrane sintered at 900 degrees C has pores large enough to absorb molten carbonate, yet small enough to retain the molten carbonate under high pressure conditions. Results of XRD analysis have shown that LSCF and the molten carbonate mixture do not react with each other at temperatures below 700 degrees C. Fourpoint method conductivity tests indicate that the support material has sufficiently high electronic conductivity for this application. Li-Na-K carbonate was coated to the porous LSCF support by a liquid infiltration method. Helium permeance of the support before and after infiltration of molten carbonate are on the order of 10-6 and 10-10 moles/m2DTPaDTs respectively, indicating that the molten carbonateis able to sufficiently infiltrate the membrane. Preliminary high temperature permeation experiments indicate that the membrane does separate CO2 in the presence of O2, with a maximum flux of 0.623 ml/cm2DTmin obtained at 850DGC.
NTIS
Carbon Dioxide; High Temperature; Membranes

46
GEOPHYSICS

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

20070025209 NASA Johnson Space Center, Houston, TX, USA

Experimental Impacts into Chondritic Targets, Part 1, Disruption of an L6 Chondrite by Multiple Impacts

Cintala, Mark J.; Horz, Friedrich; [2007]; 51 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070025209

A fragment of an L6 chondrite (ALH 85017,13) with an initial mass (M(sub 0)) of 464.1 g was the target in a series of experimental impacts in which the largest remaining fragment (M(sub R)) after each shot was impacted by a 3.18-mm ceramic sphere at a nominal speed of 2 km/s. This continued until the mass of the largest remaining piece was less than half the mass of the target presented to that shot (M(sub S)). Two chunks of Bushveldt gabbro with similar initial masses were also impacted under the same conditions until M(sub R) was less than half M(sub 0). The two gabbro targets required a total of 1.51x10(exp 7) and 1.75x10(exp 7) erg/g to attain 0.27 and 0.33 M(sub R)/M(sub 0), respectively; the chondrite, however, was considerably tougher, reaching 0.40 and 0.21 M(sub R)/M(sub 0) only after receiving 2.37x10(exp 7) and 3.10x10(exp 7) erg g-1, respectively. The combined ejecta and spallation products from the gabbro impacts were coarser than those from the chondrite and in sufficient quantities that the new surface areas exceeded those from the meteorite until the fifth shot in the chondrite series, which was the number of impacts required to disrupt each gabbro target (i.e., MR/M0 = 0.5). Unlike the behavior shown in previous regolith-evolution series, neither gabbro target produced an enhancement in the size fraction reflecting the mean size of the crystals composing the rock (about 3 mm), an effect possibly related to the width of the shock pulse. The original chondrite was so fine-grained and fractured, and the variance in its grain-size distribution so large, that effects related to grain-size were relegated to the <63- m fraction. Impacts into ALH 85017 produced abundant, fine-grained debris, but otherwise the slopes of its size distributions were comparable to those from other experiments involving natural and fabricated terrestrial targets. The characteristic slopes of the chondrite's size distributions, however, were notably more constant over the entire nine-impact series than those from any of the terrestrial targets, a testament to the control over comminution apparently exerted by pre-existing fractures and other, microscopic damage in the meteorite. The enhancement in the finer fraction of debris from ALH 85017 indicates that ordinary chondrites in solar orbit would be very efficient contributors to the cosmic-dust complex. At the same time, the greater resistance to disruption displayed by ordinary chondrites relative to that exhibited by igneous rocks indicates that a selection effect could be operative between the annealed, ordinary-chondritic breccias and relatively weaker, differentiated meteorites. Preferential survival from their time in the regoliths of their parent bodies through their transit to Earth and passage through the atmosphere suggests that meteorite collections could be biased in favor of the ordinary chondrites.

Author

Chondrites; Regolith; Fractures (Materials); Size Distribution; Cosmic Dust; Ejecta; Meteorites; Igneous Rocks; Gabbro

20070025302 Columbia Univ., Palisades, NY USA

Discrepancies Between Prototype International Data Centre, International Seismological Centre & USGS Seismic Magnitudes

Richards, Paul G; Granville, John P; Kim, Won-Young; Mar 2007; 66 pp.; In English

Contract(s)/Grant(s): DTRA-01-00-C-0074; Proj-AE

Report No.(s): AD-A465652; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A discrepancy between body-wave magnitudes, from the Prototype International Data Centre (PIDC) and the U.S. Geological Survey (USGS), has persisted since 1995, and amounts to a few tenths of a magnitude unit. Since 1999 we have studied the discrepancy between magnitudes published by different agencies and this final report is comprised of two sections. The first, is a stand-alone paper (published in the 2002 November/December issue of the Seismological Society of America's Seismological Review Letters) comparing the PIDC magnitudes with values assigned by a method that as closely as possible reproduces the Veith-Clawson protocol for reporting seismic body wave magnitudes. That protocol is the most clearly specified, or many different body-wave magnitude scales. The second section here, is a report which documents in detail the actual discrepancies between magnitudes assigned by three key agencies - namely, the USGS, the PIDC, and the International Seismological Centre (ISC).

DTIC

Geological Surveys; Magnitude; Prototypes; Seismic Waves; Seismology

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20070025195 Meteorological Satellite Center, Tokyo, Japan
Monthly Report of the Meteorological Satellite Center: February 2007
February 2007; In English; Copyright; Avail.: Other Sources

The CD-ROM concerning the December 2006 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.
Author
Atmospheric Sounding; Meteorological Satellites; Satellite Observation; Satellite Sounding; Meteorological Parameters; Satellite Imagery

20070025196 Meteorological Satellite Center, Tokyo, Japan
Monthly Report of the Meteorological Satellite Center: March 2007
March 2007; In English; Copyright; Avail.: Other Sources

The CD-ROM concerning the December 2006 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.
CASI
Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery

20070025197 Meteorological Satellite Center, Tokyo, Japan
Monthly Report of the Meteorological Satellite Center: April 2007
April 2007; In English; Copyright; Avail.: Other Sources

The CD-ROM concerning the April 2007 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.
Derived from text
Atmospheric Sounding; Satellite Observation; Satellite Sounding; Japan; Meteorological Parameters

20070025204 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Activities of NASA's Global Modeling Initiative (GMI) in the Assessment of Subsonic Aircraft Impact
Rodriquez, J. M.; Logan, J. A.; Rotman, D. A.; Bergmann, D. J.; Baughcum, S. L.; Friedl, R. R.; Anderson, D. E.; [2004]; 8 pp.; In English; AAC-Conference, 30 Jun. - 3 Jul. 2003, Friedrichshafen, Germany; Original contains color illustrations
Contract(s)/Grant(s): NAG5-10725; Copyright; Avail.: Other Sources

The Intergovernmental Panel on Climate Change estimated a peak increase in ozone ranging from 7-12 ppbv (zonal and annual average, and relative to a baseline with no aircraft), due to the subsonic aircraft in the year 2015, corresponding to aircraft emissions of 1.3 TgN/year. This range of values presumably reflects differences in model input (e.g., chemical mechanism, ground emission fluxes, and meteorological fields), and algorithms. The model implemented by the Global

Modeling Initiative allows testing the impact of individual model components on the assessment calculations. We present results of the impact of doubling the 1995 aircraft emissions of NOx, corresponding to an extra 0.56 TgN/year, utilizing meteorological data from NASA's Data Assimilation Office (DAO), the Goddard Institute for Space Studies (GISS), and the Middle Atmosphere Community Climate Model, version 3 (MACCM3). Comparison of results to observations can be used to assess the model performance. Peak ozone perturbations ranging from 1.7 to 2.2 ppbv of ozone are calculated using the different fields. These correspond to increases in total tropospheric ozone ranging from 3.3 to 4.1 Tg/Os. These perturbations are consistent with the IPCC results, due to the difference in aircraft emissions. However, the range of values calculated is much smaller than in IPCC.
Author
Meteorological Parameters; Subsonic Speed; Man Environment Interactions; Atmospheric Models; Climate Models; Subsonic Aircraft

20070025205 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evaluating the Credibility of Transport Processes in Simulations of Ozone Recovery using the Global Modeling Initiative Three-dimensional Model
Strahan, Susan E.; Douglass, Anne R.; Journal of Geophysical Research; March 13, 2004; ISSN 0148-0227; Volume 109; 16 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-10725; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2003JD004238

The Global Modeling Initiative (GMI) has integrated two 36-year simulations of an ozone recovery scenario with an offline chemistry and transport model using two different meteorological inputs. Physically based diagnostics, derived from satellite and aircraft data sets, are described and then used to evaluate the realism of temperature and transport processes in the simulations. Processes evaluated include barrier formation in the subtropics and polar regions, and extratropical wave-driven transport. Some diagnostics are especially relevant to simulation of lower stratospheric ozone, but most are applicable to any stratospheric simulation. The global temperature evaluation, which is relevant to gas phase chemical reactions, showed that both sets of meteorological fields have near climatological values at all latitudes and seasons at 30 hPa and below. Both simulations showed weakness in upper stratospheric wave driving. The simulation using input from a general circulation model (GMI(GCM)) showed a very good residual circulation in the tropics and Northern Hemisphere. The simulation with input from a data assimilation system (GMI(DAS)) performed better in the midlatitudes than it did at high latitudes. Neither simulation forms a realistic barrier at the vortex edge, leading to uncertainty in the fate of ozone-depleted vortex air. Overall, tracer transport in the offline GML(GCM) has greater fidelity throughout the stratosphere than it does in the GMI(DAS)
Author
Gas Transport; Meteorological Parameters; Three Dimensional Models; Atmospheric Models; Horizontal Distribution; Ozone; Atmospheric Composition

20070025506 International Radiation Commission, Karisruhe, Germany
Support for Publication of the Proceedings of the 2004 International Radiation Commission
Fischer, H.; May 15, 2006; 12 pp.; In English
Contract(s)/Grant(s): DE-FG02-05ER63953
Report No.(s): DE2007-877951; DOE/ER/63953-1; No Copyright; Avail.: Department of Energy Information Bridge

The International Radiation Commission (IRC) is one of the ten commissions of IAMAS (International Association of Meteorology and Atmospheric Sciences). The IRC is composed of 41 members from 18 countries. Topics of current concern for the IRC include optical phenomena in the atmosphere, radiative properties of atmospheric constituents and the Earth surface, radiative transfer in atmospheres, radiant energy interaction with other features of the atmosphere (dynamics, climate etc.) and remote sensing of Earth and planetary atmospheres and surfaces. An important activity of IRC, the International Radiation Symposium (IRS) is held every four years to promote atmospheric radiation studies. The last IRS took place in 2004 in Busan/Korea.
NTIS
Atmospheric Circulation; Conferences; Radiation; Meteorology

20070025508 Colorado State Univ., Fort Collins, CO, USA
Formulation of Moist Dynamics and Physics for Future Climate Models. Final Report
Konor, C. S.; Jun. 01, 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-FG02-04ER63848
Report No.(s): DE2007-883007; No Copyright; Avail.: National Technical Information Service (NTIS)

In this project, one of our goals is to develop atmospheric models, in which innovative ideas on improving the quality of moisture predictions can be tested. Our other goal is to develop an explicit time integration scheme based on the multi-point differencing (MED) that does the same job as an implicit trapezoidal scheme but uses information only from limited number of grid points. Below we discuss the work performed at Colorado State University toward these goals during the funding period indicated above.
NTIS
Atmospheric Models; Climate Models; Weather Forecasting; Moisture

20070025556 North Dakota Univ., Grand Forks, ND, USA
Final Report of the Operation and Demonstration Test of Short-Range Weather Forecasting Decision Support within an Advanced Transportation Weather Information System
Apr. 2006; 70 pp.; In English
Report No.(s): PB2007-108958; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of the Advanced Transportation Weather Information System (ATWIS) was to provide en-route weather forecasts and road condition information to the traveling public across North Dakota and South Dakota. The ATWIS began development on June 30, 1995 at the University of North Dakota's Regional Weather Information Center (RWIC). While a number of activities were underway by other groups to operationally test and evaluate metro or urban traveler information systems in the 75 major transportation markets, ATWIS embarked to determine whether it was possible to provide a national standard for statewide or multi-state systems that addressed the long distance and commuter travelers needs across a wide variety of industries.
NTIS
Information Systems; Transportation; Weather Forecasting

20070025581 National Oceanic and Atmospheric Administration, Seattle, WA, USA; Joint Inst. for the Study of the Atmosphere and Ocean, Seattle, WA, USA
Tacoma, Washington, Tsunami Hazard Mapping Project: Modeling Tsunami Inundation From Tacoma and Seattle Fault Earthquakes
Venturato, A. J.; Arcas, D.; Mofjeld, H. O.; Chamberlin, C. C.; Gonzalez, F. I.; Jan. 2007; 28 pp.; In English
Report No.(s): PB2007-106465; NOAA/TM/OAR/PMEL-132; No Copyright; Avail.: National Technical Information Service (NTIS)

As part of a tsunami hazard mapping project funded by the National Tsunami Hazard Mitigation Program, the NOAA Center for Tsunami Research (formerly known as the NOAA Center for Tsunami Inundation Mapping Efforts) modeled tsunami inundation for the at-risk coastal community of Tacoma, Washington. Three tsunamigenic moments magnitude 7.3 earthquake source scenarios within the lower Puget Sound region were investigated: one along the Seattle Fault, and two along the Tacoma fault based on the most recent geophysical evidence. A high-resolution tsunami model was applied to estimate tsunami propagation in the southern Puget Sound region and inundation along the greater Tacoma area. These model results (Appendix A) were provided to the State of Washington for use in tsunami hazard maps to assist in the design of evacuation plans for the at-risk study area.
NTIS
Earthquakes; Hazards; Tsunami Waves; Geological Faults

20070026120 National Science Board, Arlington, VA, USA
Hurricane Warning: The Critical Need for a National Hurricane Research Initiative
Jan. 2007; 40 pp.; In English
Report No.(s): PB2007-110266; NSB-06-115; No Copyright; Avail.: CASI: A03, Hardcopy

The USA possesses the most capable research enterprise, the largest economy, and the most sophisticated societal infrastructure in the world, yet it remains notably vulnerable to catastrophic damage and loss of life from natural hazards. Among weather hazards, hurricanes account for over half of the total damage inflicted. Hurricane-induced economic losses

have increased steadily in the U.S. during the past 50 years, with estimated annual total losses (in constant 2006 dollars) averaging $1.3 billion from 1949-1989, $10.1 billion from 1990-1995, and $35.8 billion per year during the last 5 years. The 2005 season was exceptionally destructive, with Hurricane Katrina pushing annual damage loss over the $100 billion mark for the first time since records began. Added to this financial cost is the intolerable and unnecessary loss of life associated with hurricanes 196 individuals perished from 1986-1995 and approximately 1,450 were lost in the past 2 years alone. Of course, hurricane impacts are not confined to the U.S.; weather-related disasters worldwide have outnumbered their less predictable, but equally important, geophysical counterparts (e.g., earthquakes, tsunamis, volcanoes) nine to one during the past decade. To place the Nations vulnerability in perspective, 50 percent of the U.S. population lives within 50 miles of a coastline. The physical infrastructure in coastal regions has grown dramatically over the past few decades and in the late 1990s was worth about $3 trillion in the Gulf and Atlantic regions alone. Trillions of dollars in new seaboard infrastructure investment are expected over the next several decades. As our economy grows and the value of built-infrastructure continues to increase, the economic and societal impacts of hurricanes also can be expected to escalate. Although not all coastal regions are directly vulnerable to hurricanes, impacts from those regions that are affected can have national consequences, for example, via increased fuel prices and displaced citizens. Additionally, even though decaying tropical storms are an important source of fresh water for inland regions, associated flooding occurring hundreds of miles from the coast and days after storm landfall can be astonishingly destructive. Historically, flooding has claimed more lives in the U.S. than any other weather phenomenon and destructive tornadoes frequently accompany hurricanes.
NTIS
Disasters; Hurricanes

20070026279 Miami Univ., FL, USA
Parameterizations of Shortwave Radioactive Properties of Broken Clouds from Satellite and Ground-Based Measurements
Albrecht, B. A.; Jun. 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-FG02-03ER63520
Report No.(s): DE2007-897784; DOE/ER-63520-F; No Copyright; Avail.: Department of Energy Information Bridge
This study used DOE ARM data and facilities to: (1) study macroscopic properties of continental stratus clouds at SGP and the factors controlling these properties, (2) develop a scientific basis for understanding the pocesses responsible for the formation of boundary layer clouds using ARM observations in conjunction with simple parametric models and LES, and (3) evaluate cumulus cloud characteristics retrieved retrieved from the MMCR operating at TWP-Nauru. In addition we have used high resolution 94 GHz observations of boundary layer clouds and precipitation to: (1) develop techniques for using high temporal resolution Doppler velocities to study large-eddy circulations and turbulence in boundary layer clouds and estimate the limitations of using current and past MMCR data for boundary layer cloud studies, (2) evaluate the capability and limitation of the current MMCR data for estimating reflectivity, vertical velocities, and spectral under low-signal-to-noise conditions associated with weak non-precipitating clouds, (3) develop possible sampling modes for the new MMCR processors to allow for adequate sampling of boundary layer clouds, and (4) retrieve updraft and downdraft structures under precipitating conditions.
NTIS
Boundary Layers; Parameterization; Radioactivity; Satellite Observation

20070026303 North Carolina State Univ., Raleigh, NC, USA
Development of Methods to Determine Lateral Effect of Highway Drainage Systems on Wetland Hydrology
Skaggs, R. W.; Chescheir, G. M.; Phillips, B. D.; Jul. 31, 2006; 28 pp.; In English
Report No.(s): PB2007-109848; No Copyright; Avail.: CASI: A03, Hardcopy
A method was developed in the first phase of this project to predict the lateral effect of a drainage ditch on adjacent wetland hydrology. The method predicts the distance of influence of a single ditch constructed through a wetland, i.e. the width of a strip adjacent to the ditch that is drained such that it would no longer satisfy wetland hydrologic criteria, in terms of T25 values which are dependent on climatological conditions. Main objectives of the second phase were to complete determination of the T25values and to test the validity of the method.
NTIS
Drainage; Highways; Hydrology; Wetlands

20070026304 North Carolina State Univ., Raleigh, NC, USA

Development of Methods to Determine Lateral Effect of Highway Drainage Systems on Wetland Hydrology

Skaggs, R. W.; Chescheir, G. M.; Phillips, B. D.; Jan. 04, 2006; 33 pp.; In English

Report No.(s): PB2007-109847; No Copyright; Avail.: CASI: A03, Hardcopy

A method was developed to estimate the lateral effect of a single drainage ditch on wetland hydrology. The method can be used to calculate the distance of influence of a single ditch constructed through a wetland, where the distance of influence is defined as the width of a strip adjacent to the ditch that is drained such that it will no longer satisfy the wetland hydrologic criterion. Simulation analyses were conducted with DRAINMOD to define the minimum, or threshold, drainage intensity that would result in failure of a site to satisfy the wetland hydrologic criterion. Analyses were conducted for five hydric soils spanning a wide range of profile hydraulic transmissivities. DRAINMOD was used to predict water table fluctuations between parallel ditches for a 50-year period of climatologically record. For each soil, simulations were conducted for a range of ditch spacings and depths to determine the combinations that would result in the land midway between the ditches just barely satisfying the wetland hydrologic criterion. Analyses were conducted for climatological conditions for three locations in eastern North Carolina.

NTIS

Drainage; Highways; Hydrology; Wetlands

48
OCEANOGRAPHY

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

20070027283 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Comprehensive Plan for the Long-Term Calibration and Validation of Oceanic Biogeochemical Satellite Data

Hooker, Stanford B.; McClain, Charles R.; Mannino, Antonio; July 2007; 40 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/SP-2007-214152; Rept-2007-00805-0; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070027283

The primary objective of this planning document is to establish a long-term capability and validating oceanic biogeochemical satellite data. It is a pragmatic solution to a practical problem based primarily o the lessons learned from prior satellite missions. All of the plan's elements are seen to be interdependent, so a horizontal organizational scheme is anticipated wherein the overall leadership comes from the NASA Ocean Biology and Biogeochemistry (OBB) Program Manager and the entire enterprise is split into two components of equal sature: calibration and validation plus satellite data processing. The detailed elements of the activity are based on the basic tasks of the two main components plus the current objectives of the Carbon Cycle and Ecosystems Roadmap. The former is distinguished by an internal core set of responsibilities and the latter is facilitated through an external connecting-core ring of competed or contracted activities. The core elements for the calibration and validation component include a) publish protocols and performance metrics; b) verify uncertainty budgets; c) manage the development and evaluation of instrumentation; and d) coordinate international partnerships. The core elements for the satellite data processing component are e) process and reprocess multisensor data; f) acquire, distribute, and archive data products; and g) implement new data products. Both components have shared responsibilities for initializing and temporally monitoring satellite calibration. Connecting-core elements include (but are not restricted to) atmospheric correction and characterization, standards and traceability, instrument and analysis round robins, field campaigns and vicarious calibration sites, in situ database, bio-optical algorithm (and product) validation, satellite characterization and vicarious calibration, and image processing software. The plan also includes an accountability process, creating a Calibration and Validation Team (to help manage the activity), and a discussion of issues associated with the plan's scientific focus.

Author

Biogeochemistry; Calibrating; Oceans; Biosphere; MODIS (Radiometry); Data Processing; Satellite Imagery

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*.

20070025269 Naval War Coll., Newport, RI USA
Health Service Support for Detainees in Maritime Security Operations: What Is Required and What Is Right?
McDonald, Brian R; May 17, 2005; 23 pp.; In English
Report No.(s): AD-A464005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Navy plays a pivotal role in the ongoing Global War On Terrorism (GWOT) in the provision of Maritime Domain Awareness through the conduct of Maritime Security Operations (MSOs) that control the possible flow of contraband and terrorists across the seas. These operations range from permissive visitations to possible opposed boardings. It is imperative that operational planners ensure that adequate Health Service Support (HSS) is available not only for U.S. and Coalition personnel, but also for potential detainees. The range of HSS may vary from oversight of routine health and sanitation visits to the provision of afloat trauma care in the event of wounding or serious injury. To ensure uniform rules of care are provided, senior personnel provide guidance and oversight for operational commanders and the medical departments of units deployed to their areas of responsibility. Recent sentinel events referable to the provision of HSS for detainees in U.S. custody undermine U.S. instruments of 'soft power' in the pursuit of the National Security Strategy. A review of recent lessons learned indicates that while current guidance and oversight are effective, there is opportunity for process improvement. This paper examines current concerns regarding the provision of HSS for detainees in MSOs to distinguish between what is required according to the Geneva Conventions and what is right. The author concludes that greater focus on the training of deployed medical personnel, especially with regard to ethical issues, will be of benefit to operational commanders in reducing confusion about the applicability of the principles of the Geneva Conventions. The author recommends that standing rules of care address the provision of HSS for detainees in MSOs with as much detail as possible. Specific areas for focus include the provision of aeromedical evacuation to higher levels of care, and the promulgation of a code of conduct for medical personnel involved with detainees.
DTIC
Ethics; Health; International Law; Medical Services; Military Operations; Security

20070025270 Texas Univ. Health Science Center, San Antonio, TX USA
Dietary Fish Oil in Reducing Bone Metastasis of Breast Cancer
Ghosh-Choudhury, Nandini; Sep 2006; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0693
Report No.(s): AD-A464007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In a study of the mechanism behind the inhibitory effect of fish oil on the growth of breast cancer cells, the authors reported that fish oil, or w-3 polyunsaturated fatty acids (PUFAs), did the following: (1) increased the level of tumor suppressor protein PTEN; (2) inhibited the activity of PI 3 kinase, thus blocking a potent growth promoting signaling pathway; and (3) increased gene expression of BMP-2. In their final report, they show that a fish oil diet significantly increased the signals leading to breast cancer cell apoptosis. The tumors arising within the animals fed a fish oil diet have decreased expression of antiapoptotic Bcl-2 and BclXL, increased expression of cytochrome-c, and activation of caspase 3, indicating increased apoptosis. Results from their in vivo pilot study that used a nude mouse heart injection model suggest that a fish oil diet also can slow down bone metastasis of the breast cancer cells. Based on their previous report, they performed a pilot in vivo experiment to study the role of BMP-2 on bone metastasis. The data suggest that BMP-2 can inhibit bone metastasis. However, the in vivo data need to be verified using a larger animal pool and statistical analysis.
DTIC
Apoptosis; Bones; Breast; Cancer; Diets; Fatty Acids; Fishes; Mammary Glands; Metastasis; Oils; Proteins

20070025280 Wayne State Univ., Detroit, MI USA
Analysis of Ethnic Admixture in Prostate Cancer
Bock, Cathryn H; Dec 2006; 23 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0181
Report No.(s): AD-A465216; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Evidence for a genetic component to prostate cancer is strong however few genes have been identified and most of the

genetic risk remains undefined. To date multiple traditional genome scans and linkage analyses have been performed and several susceptibility loci and candidate genes have been identified. The goal of this research proposal is to use a novel approach to gene discovery admixture mapping to identify potential prostate cancer susceptibility genes in a group of African American men. Admixture mapping has greater power to detect genetic effects than traditional genome linkage scans. Recently Freedman et al. published results from an admixture mapping study of prostate cancer in 1597 African American men which detected a susceptibility region on chromosome 8q24. In the current study approximately 900 samples from 2 case-control study of prostate cancer are being genotyped for ancestry informative markers across the genome using a similar marker panel to that used by Freedman et al. Regions showing strong linkage using the admixture mapping approach will be followed by future studies using fine mapping with a denser set of informative markers in the regions of interest and candidate gene studies. After 12 months the project is on time with completion of the targeted tasks outlined in the Statement of Work for the project's first year, and is on track to complete all tasks within the next 12 months, as planned.
DTIC
Admixtures; Cancer; Ethnic Factors; Genes; Genetics; Prostate Gland

20070025287 Naval Research Lab., Stennis Space Center, MS USA
Biogeochemical Consequences of Infaunal Activities
Furukawa, Yoko; Jan 1, 2005; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465321; NRL/BC/7430-04-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Activities of sedimentary infauna have significant consequences on overall sedimentary diagenesis. Infauna directly participate in sedimentary processes by organic matter metabolization coupled to aerobic respiration and metabolite excretion. In addition, they indirectly influence the diagenetic pathways by changing the transport regimes of dissolved and particulate species as well as by modifying microbial habitats. The couplings between infaunal activities and their biogeochemical consequences have been studied in recent years, but many of the results and conclusions remain site and species-specific due to the diverse and highly intenrelated ways in which sedimentary infauna interact with the transport, reaction, and microbial regimes. A generalized understanding of infauna-influenced sedimentary systems will require (1) a systematic classification of the infauna-sediment interaction mechanisms and (2) a comprehensive model framework that incorporates all known effects of infauna-sediment interactions associated with transport, reaction, and microbial regimes.
DTIC
Biochemistry; Biogeochemistry; Microorganisms; Organic Materials

20070025297 General Accounting Office, Washington, DC USA
Defense Health Care. Improvements Needed in Occupational and Environmental Health Surveillance during Deployments to Address Immediate and Long-term Health Issues
Jul 2005; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465558; GAO-05-632; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Following the 1991 Persian Gulf War, research and investigations into the causes of servicemembers' unexplained illnesses were hampered by inadequate occupational and environmental exposure data. In 1997, the Department of Defense (DOD) developed a military-wide health surveillance framework that includes occupational and environmental health surveillance (OEHS)--the regular collection and reporting of occupational and environmental health hazard data by the military services. GAO is reporting on (1) how the deployed military services have implemented DOD's policies for collecting and reporting OEHS data for Operation Iraqi Freedom (OIF) and (2) the efforts under way to use OEHS reports to address both immediate and long-term health issues of servicemembers deployed in support of OIF. GAO recommends that the Secretary of Defense improve deployment OEHS data collection and reporting and evaluate OEHS risk management activities. GAO also recommends that the Secretaries of Defense and Veterans Affairs (VA) jointly develop a federal research plan to address long-term health effects of OIF deployment. DOD plans to take steps to meet the intent of our first recommendation and partially concurred with the other recommendations. VA concurred with our recommendation for a joint federal research plan.
DTIC
Deployment; Health; Medical Services; Military Personnel; Surveillance

20070025301 General Accounting Office, Washington, DC USA
Operation Desert Storm. Health Concerns of Selected Indiana Persian Gulf War Veterans
May 1995; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465604; GAO/HEHS-95-102; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Despite DOD and VA efforts to address the concerns of these and other Persian Gulf veterans, those we surveyed still

expressed concerns about their health and dissatisfaction with services from DOD and VA. Most respondents were still in the reserves and almost all reported that they had health problems they believed were caused by their service in the Persian Gulf. Most also reported that these problems limited their physical and social activities to some extent. Because all of the individuals we surveyed had already expressed some concern about their health, the fact that they reported having health problems after returning from the Persian Gulf is not surprising. Over half of the respondents had taken advantage of medical services, either the special examinations or other health care, available to them through VA or DOD. Many, however, were dissatisfied with the medical care they received or were unaware of services available. DOD and VA have undertaken a variety of efforts to address the concerns raised by Persian Gulf veterans, including expanding the health examinations available to them. Also, in response to recent legislation, both agencies are expanding outreach efforts to better ensure that veterans are aware of services available. Whether these efforts will satisfy these veterans concerns remains to be seen.
DTIC
Deserts; Health; Medical Services; Military Operations; Persian Gulf; Physical Examinations; Storms; Warfare

20070025304 Research Triangle Inst., Research Triangle Park, NC USA
2005 Department of Defense Survey of Health Related Behaviors among Active Duty Military Personnel
Bray, Robert M; Hourani, Laurel L; Rae Olmsted, Kristine L; Witt, Michael; Brown, Janice M; Pemberton, Michael R; Marsden, Mary Ellen; Marriott, Bernadette; Scheffler, Scott; Vandermaas-Peeler, Russ; Dec 2006; 346 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-2-0057
Report No.(s): AD-A465678; RTI/7841/106-FR; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents the primary results of the 2005 Department of Defense (DoD) Survey of Health-Related Behaviors among Active Duty Military Personnel. This study is the 9th in a series of surveys of active-duty military personnel conducted in 1980, 1982, 1985, 1988, 1992, 1995, 1998, 2002, and 2005 under the direction of the Office of the Assistant Secretary of Defense (Health Affairs). All of the surveys investigated the prevalence of alcohol use, illicit drug use, and tobacco use, as well as negative consequences associated with substance use. The 1985 through 1992 surveys also covered an expanded set of health behaviors and related issues. In 1995 and 1998, health behavior questions were revised and items were added to assess selected 'Healthy People 2000' objectives. In addition, questions were added to examine the mental health of the active force, specific health concerns of military women and military men, oral health, and gambling behaviors. The 2002 and 2005 surveys continued the general focus of the 1998 survey and expanded it to include 'Healthy People 2010' objectives. They also augmented the items on exercise, nutrition, and mental health and added new items on dietary supplement use, risk taking and impulsive behavior, job satisfaction, deployment, and religiosity/spirituality. The final sample consisted of 16,146 military personnel (3,639 Army, 4,627 Navy, 3,356 Marine Corps, and 4,524 Air Force) who completed self-administered questionnaires anonymously. Following an introductory chapter, chapters are as follows: (2) Methodology of the 2005 DoD Active Duty Survey; (3) Overview of Trends in Substance Use and 'Healthy People 2010' Objectives; (4) Alcohol Use; (5) Illicit Drug Use; (6) Tobacco Use; (7) Healthy Lifestyles and Disease Prevention; (8) Health Behavior and Health Promotion; (9) Stress and Mental Health; and (10) Other Health-Related Issues in the Military. The report includes 137 tables.
DTIC
Defense Program; Health; Military Personnel; Surveys

20070025322 Boston Univ., Boston, MA USA
Combined Telomerase Inhibition and Immunotherapy in the Prevention and Treatment of Mammary Carcinomas
Gong, Jianlin; Feb 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0264
Report No.(s): AD-A465840; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The MMT mice develop multiple mammary carcinomas between the ages of 65-108 days with 100% penetrance. The mammary carcinomas occur in multiple stages. In addition, the progressive malignant transformation is closely correlated with telomerase activity using telomeric repeat amplification protocol (TRAP), suggesting that telomerase may be involved in the development of mammary carcinomas. Furthermore, constitutive deletion of the RNA component of telomerase significantly delayed the appearance of tumor and reduced the tumor burden. In the present project, we aim to assess the immunotherapy of MMT mice with deficiency of telomerase. Vaccination of telomerase heterozygotes MMT mice (GO) and first generation of mTERC4-MMT mice with fusions of dendritic cells and tumor cells (FC/MUC1) induced CTL activity comparable to that

from MMT mice. In addition, the latent time required for tumor development was slight prolonged. Taken together, these results, although preliminary, suggest the feasibility of immunotherapy in the background of telomerase deletion.
DTIC
Cancer; Mammary Glands; Prevention

20070025323 Institute for Cancer Research, Philadelphia, PA USA
Identification of Protein Kinases Required for NF2 Signaling
Chernoff, Jonathan; Dec 2006; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0175
Report No.(s): AD-A465844; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this concept award grant is to uncover potential drug targets for treatment of Neurofibromatosis type 2 (NF2). We planned a synthetic lethal screen, using RNAi technology to uncover protein kinases and phosphatases that are specifically required for the survival of NF2-null cells. We obtained and reformatted a murine siRNA library against all known protein kinases and phosphatases. We also obtained NF2flox/flox mouse embryo fibroblasts and used Ore recombinase to convert these to a NF24- genotype. We then tested a large number of transfection procedures to determine the most effective and least toxic method for delivery of siRNA into these cells, and optimized this procedure for a high throughput assay. Having carefully established the conditions for the screen, we are carrying out the main, most important experiment: the large scale screen for synthetic lethality.
DTIC
Cancer; Proteins

20070025324 Vanderbilt Univ., Nashville, TN USA
The Role of Beta-Catenin in Androgen Receptor Signaling
Bhowmick, Neil A; Oct 2005; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0063
Report No.(s): AD-A465853; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Dr. Truica previously showed that the cell adhesion molecule beta-catenin forms a complex with the androgen receptor (AR) and modulate its transcription. The cross talk between beta- catenin and AR signaling can play an important role in AR transcriptional in prostate cancer progression. Our preliminary data seem indicate stromally derived paracrine Wnt family members activate the epithelial frizzled receptor to enable prostate epithelial survival in an androgen deficient environment. We will continue to test the original hypothesis that there is a direct molecular interaction between -catenin and the Cterminus region of AR involved in the mechanism of prostate androgen responsiveness. However, we will examine the repercussions of the interaction in both LNCaP (originally proposed) and primary cultures of mouse prostatic stromal cells. The physiologic response to androgen ablation (castration) differ significantly between the prostatic stroma and epithelia despite the common expression of -catenin and AR, as evidence for the different transcriptional cofactor interactions found in prostatic epithelial and stromal cells. The future work will adhere to the previously approved tasks and those detailed in the body of this report with the additional examination of prostatic stromal cells.
DTIC
Cancer; Hormones; Males; Prostate Gland

20070025325 California Univ., San Francisco, CA USA
Prognostic Value of Telomere DNA Content in Ductal Carcinoma in Situ
Fordyce, Colleen A; Jun 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0424
Report No.(s): AD-A465855; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Critically shortened telomeres cause genomic instability both in vivo and in vitro and thus drives changes in gene expression Reduced telomere DNA content (TC) is associated with reduced survival in breast and prostate cancers We hypothesized that TC could be a unique prognostic marker in DCIS The goals of this project were: I) determine if TC can be used to predict outcome in a retrospective study of DCIS, 2) determine if alterations in telomere homeostasis can induce changes in gene expression that could be the basis of novel prognostic markers TC has been determined in microdissected tissues enriched for DCIS or histologically normal adjacent tissues from a cohort of non-recurrent DCIS Efforts to obtain a recurrent DCIS samples are ongoing. A model system has been developed to examine gene expression changes in response to alterations in telomere homeostasis Telomere binding proteins TRF2, a dominant negative allele of TRF2, and hTERT were

expressed in primary human mammary epithelial cell populations from four donors Microarrays were performed on these cell populations Over-expression of TRF2wt and to a lesser extent, TRF2dn induces the expression of Cox 2 mRNA (p=0.05) and protein in an Activin A-dependent manner Activin A, a member of the TGF-beta superfamily, induces the phosphorylation and activation of both p38 MAPK and Smad2/3. Both these proteins can affect the level of Cox 2 mRNA= Exogenous activin A results in an increase in activated p3B and Cox 2. Treatment of cells with the p38 inhibitor SB203580 leads to a decrease in Cox 2 protein In vivo, high Cox 2 expression is associated with reduced TC in DCIS (p>O=0009).
DTIC
Cancer; Deoxyribonucleic Acid; Prostate Gland; Telomeres

20070025326 Alabama Univ., Birmingham, AL USA
Proteomic Analysis of Genistein Mammary Cancer Chemoprevention
Lamartiniere, Coral A; Jul 2006; 23 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0433
Report No.(s): AD-A465859; No Copyright; Avail.: Defense Technical Information Center (DTIC)
We have developed reproducible methodology for separation, biochemical and statistical analysis and identification of mammary gland proteins. We have discovered that GTP-CHI expression is significantly increased shortly following exposure at day 21 by genistein. At day 50, there was significant up-regulation of tyrosine hydroxylase and VEGF-R2. This and previous work suggests that early postnatal (prepubertal) exposure to genistein enhances cell proliferation and cell differentiation and gland maturation. This unique developmental maturation leads to a new biochemical 'blue-print' whereby the cells have reduced EGF-signaling and VEGFR2 that render the mature mammary gland less proliferative and susceptible to chemically-induced mammary cancer initiation, angiogenesis and for cancer progression. Our experiments in identifying protein biomarkers in interstitial fluid surrounding mammary glands in rats have been mucli more diEcult and not successful to-date. We have recently developed our own probes that should allow us to collect a higher yield of proteins and hopefully allow success.
DTIC
Breast; Cancer; Chemotherapy; Mammary Glands; Proteome

20070025328 Naval Health Research Center, San Diego, CA USA
Anthrax Vaccination in the Millennium Cohort. Validation and Measures of Health
Smith, Besa; Leard, Cynthia A; Smith, Tyler C; Reed, Robert J; Ryan, Margaret A; Jan 2007; 8 pp.; In English
Report No.(s): AD-A465873; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Between September 2005 and February 2006 self-reported anthrax vaccination was compared to electronic records for 67,018 participants enrolled in the Millennium Cohort Study between 2001 and 2003 using kappa statistics. Multivariable modeling investigated vaccination concordance as it pertains to subjective health (functional status) and objective health (hospitalization) metrics. Results: Greater than substantial agreement (kappa 0.80) was found between self-report and electronic recording of anthrax vaccination. Of all participants with electronic documentation of anthrax vaccination, 98% self-reported being vaccinated; and of all participants with no electronic record of vaccination, 90% self-reported not receiving a vaccination. There were no differences between vaccinated and unvaccinated participants in overall measures of health. Only the subset of participants who self-reported anthrax vaccination, but had no electronic confirmation, differed from others in the cohort, with consistently lower measures of health as indicated by Medical Outcomes Study 36-Item Short Form Health Survey for Veterans (SF-36V) scores. These results indicate that military members accurately recall their anthrax vaccinations. Results also suggest that anthrax vaccination among Millennium Cohort participants is not associated with self-reported health problems or broad measures of health problems severe enough to require hospitalization. Service members who self-report vaccination with no electronic documentation of vaccination, however, report lower measures of physical and mental health and deserve further research.
DTIC
Health; Immunology; Infectious Diseases; Military Personnel; Multivariate Statistical Analysis

20070025339 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA
Efficacy of 2-APB (2-Aminoethyldiphenylborate) in Rescuing Neurons After Soman-Induced Brain Injury
Ballough, Gerald P; Kan, Robert K; Nicholson, James D; Fath, Denise M; Tompkins, Christina P; Filbert, Margaret G; Aug 2005; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-91C
Report No.(s): AD-A465923; USAMRICD-TR-05-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Soman produces seizures and seizure-related brain damage (SRBD). It is well known that termination of seizures using

anticonvulsant drug therapy is the most effective means of preventing soman-induced SRBD. However, soman-induced seizures become refractive to anticonvulsant therapy within 40 minutes after their onset and the development of status epilepticus. Medical care for some battlefield casualties will likely be delayed beyond the therapeutic window of opportunity to terminate soman-induced seizures. Thus, there is a need for adjunct drug therapy that is neuroprotective when administered more than 40 minutes following soman exposure. Numerous evidence supports a pivotal role of sustained elevations in intracellular calcium (i.e., delayed calcium overload) in the development of brain damage resulting from seizures and status epilepticus. In addition, recent reports indicate that a sizable calcium influx occurs through transient receptor potential (TRP) channels, and this influx can be blocked by 2-aminoethyl diphenylborinate (2-APB; also called 2-aminoethoxy diphenylbroane and, misleadingly, 2-aminoethoxy diphenylborate). This study examined the possible neuroprotective effectiveness of 2-APB against soman-induced SRBD. Our results indicate that 2-APB (5.0 - 22.5 mg/kg in DMSO) was unable to ameliorate somaninduced SRBD. Moreover, we provide evidence that the DMSO vehicle (0.5 - 1.0 ml/kg) augmented temporal lobe lesions by soman.

DTIC

Brain Damage; Convulsions; Necrosis; Neurons

20070025340 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA

The Effects of Repeated Low-Level Sarin Exposure on Muscarinic M1 Receptor Binding, Amyloid Precursor Protein Levels and Neuropathology

Roberson, Melinda R; Penwell, Julia K; Reynolds, Mark R; Kan, Robert K; McDonough, John H; Aug 2005; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465925; USAMRICD-TR-05-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this study was to determine whether there are significant changes in muscarinic M1 receptors (m1AChR), levels of amyloid precursor protein (APP), and neuropathology following repeated exposure to low levels of sarin. Guinea pigs were exposed 5 days/week/two weeks to either saline or one of two sarin doses. Experimental parameters were assessed at five time points: exposure day 10 (E10) and at 3 (P3), 10 (P10), 30 (P30) and 100 (P100) days post-exposure. No difference was observed among groups in either receptor density (Bmax) or receptor affinity (Kd) following cortical m1AChR binding. Western blotting revealed increases in membrane-bound cortical APP levels in both sarin groups at P3, with an increase in only the 0.4 x LD50 group at P30. APP levels were equivalent across groups at P100. H&E staining revealed no brain lesions in either sarin group, and there were no cardiac abnormalities. MAP-2 staining was performed; no difference in staining intensity was observed in either sarin group. Current data suggests that the initial depression of acetylcholinesterase is not of sufficient magnitude and duration to result in persistent neurochemical or neuropathological changes, or in physiological, electroencephalographic, or behavioral alterations.

DTIC

Exposure; Proteins

20070025341 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA

Immunohistopathology in the Guinea Pig Following Chronic Low-Level Exposure to Chemical Warfare Agents

Kan, Robert K; Tompkins, Christina P; Fath, Denise M; Hamilton, Tracey A; Nov 2005; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-TC2

Report No.(s): AD-A465926; USAMRICD-TR-05-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Guinea pigs exposed repeatedly to low levels of chemical warfare nerve agents exhibit behavioral changes, but no histopathological changes using traditional hematoxylin/eosin staining. To observe mild cytopathology, this study utilizes more sensitive methodologies of MAP-2 immunohistochemistry and Fluoro-Jade histofluorescence. Diet-unrestricted Male Hartley guinea pigs were exposed to 0.4 and 0.5 LD50 VX, soman, or sarin for 2 weeks, three weeks, or four weeks. A second group of diet-restricted guinea pigs was injected with 0.1, 0.2, or 0.4 LD50 VX for 1 week, 2 weeks, or 2 weeks followed by 1 week of recovery. Animals were euthanized with sodium pentobarbital and perfused with formalin. Brain sections were stained with MAP-2 and Fluoro-Jade. No changes in MAP-2 or Fluoro- Jade labeling were observed in diet-unrestricted animals. Diet-restricted animals exposed to 0.1 and 0.2 LD50 VX showed no alterations in MAP-2. Exposure to 0.4 LD50 VX resulted in increased MAP-2, however increased MAP-2 was not observed in 0.4 LD50 VX groups allowed to recover for 1 week. Results suggest that increased MAP-2 immunoreactivity could be due to an acute phase of increased neuronal activity as part of compensatory and repair mechanisms. Diet restriction may increase resistance of neurons to irreversible damage and facilitate recovery.

DTIC

Chemical Warfare; Exposure; Guinea Pigs; Histology; Pathology

20070026352 NASA Johnson Space Center, Houston, TX, USA
U-937 Toxicity Testing of Lunar Dust Stimulant (JSC-1A-vf)
Bales, Kristyn; Hammond, Dianne; Wallace, William; Jeevarajan, Antony; July 24, 2007; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

With NASA planning to extend the human presence to the moon by 2020, the dangers of the lunar environment must be assessed and appropriate countermeasures must be developed. Possible toxic effects of the lunar dust are of particular importance to human health because of the dust's chemical composition, reactivity, and small size. This project focuses on the toxicity of lunar dust stimulant (JSC-1A-vf), in both its active and passive forms, using U-937 human monocyte cells. Simulant was mechanically activated from its passive form by grinding, and its ability to produce hydroxyl radicals was determined. To test for toxicity, active and passivated simulant was diluted in media and applied to the cells for various time periods. Toxicity was then estimated using flow cytometry on the Guava Personal Cell Analysis system. Preliminary results suggest that passivated stimulant is slightly toxic, with an increase in toxicity for activated stimulant. Toxicity results may be affected by cell lysing behavior and quenching of hydroxyl radical production by the cell media.
Author
Lunar Dust; Toxicity; Cultured Cells; Monocytes; Stimulants

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*.

20070028403 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Optical Radiation Transmittance of Aircraft Windscreens and Pilot Vision
Nakagawara, Van B.; Montgomery, Ron W.; Marshall, Wesley J.; July 2007; 17 pp.; In English; Original contains black and white illustrations
Report No.(s): DOT/FAA/AM-07/20; No Copyright; Avail.: CASI: A03, Hardcopy

Optical radiation can have acute and chronic effects on the tissues of the eye, especially if exposure levels exceed normal repair capabilities. In support of a Department of Homeland Security project, the transmittance properties of aircraft windscreens were measured at the FAA's Civil Aerospace Medical Institute (CAMI) for both visible and invisible optical radiation. This paper focuses on windscreen transmittance in the ultraviolet (UV) (< 380 nm) and visible (380-780 nm) portions of the optical spectrum. METHODS: Transmission measurements were performed on eight aircraft windscreens. Three windscreens were from large commercial jets (MD 88, Airbus A320, and Boeing 7271737); two from commercial, propeller-driven passenger planes (Fokker 27 and the ATR 42); one from a small private jet (Raytheon Aircraft Corporation Hawker Horizon); and two from small general aviation (GA), single-engine, propeller-driven planes (Beech Bonanza and Cessna 182). The two GA aircraft windscreens were plastic (polycarbonate); the others were multilayer (laminated) composite glass. RESULTS: UV transmittance for both glass and plastic windscreens was less than 1% for W-B (280-320 nm) radiation. In the UV-A portion (320-380 nm) of the spectrum, transmittance differences increased from 0.41% to 53.5%, with plastic attenuating more UV radiation than glass. For visible light, average transmittance from 400-600 nm (violet to orange) was similar (82.8% + 4.6%) for both windscreen materials, while from 625 to 775 nm (orange to red), the difference in average transmittance increased from 9.1 % to 40.0%, respectively, with plastic transmitting longer wavelengths more efficiently. CONCLUSIONS: Both types of windscreens blocked most of the more harmful UV-B radiation; however, glass laminate windscreens allowed higher levels of potentially damaging UV-A radiation to be transmitted than did plastic. Professional pilots who routinely fly at higher altitude for longer periods of time than private pilots should take special precautions to protect their eyes from UV exposure.
Author
Aerospace Medicine; Eye (Anatomy); Glass; Ultraviolet Radiation; Windshields

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20070025332 Space and Naval Warfare Systems Center, San Diego, CA USA
Modeling Team Performance in the Air Defense Warfare Domain
DiVita, Joseph; Osga, Glenn; Morris, Robert; Jun 2004; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465900; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A task centric approach to interface design entails an explicit representation, of actions tasks that need to be performed by the operator. The interface may represent tasks in the form of icons on a display screen that the system has determined actionable given the current tactical information and Rules of Engagement (ROE). The representation of work in terms of a task serves as a trace in the system that enables designers to track workload in addition to the task progress and flow of tasks among team members. Using Queueing Theory statistics, performance for two Air Defense Warfare Teams were analyzed. This analysis revealed that task allocation, work- flow and the internal dynamics of the two teams were very different. Interestingly, neither team allocated tasks to team members as envisioned by the system designers. Bottlenecks, unforeseen by the system designers, had been introduced by the dynamics of the team. These bottlenecks were more pronounced for one of the teams and led to quantifiable differences in the queuing statistics. In particular, substantial differences in the average life of a task and average number of outstanding tasks operators had to perform were observed.
DTIC
Air Defense; Human Performance; Performance Prediction; Teams; Warfare

20070025357 Aptima, Inc., Woburn, MA USA
A New Methodology for Design and Evaluation of Heterarchical Structures
Levchuk, Georgiy M; Yu, Feili; Levchuk, Yuri; Pattipati, Krishna R; Jun 2004; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465979; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Accomplishments: (1) Developed methodology to design inter-dependent organization sub-structures (command, observation, communication, information); (2) Utilize the benefits and constraints of hierarchical, heterarchical, and hybrid structures; (3) Integrated structure-strategy optimization. Applications: Will provide innovative strategy and structure solutions for various levels and nodes of the FORCEnet.
DTIC
Design Analysis; Hierarchies

20070025428 North Dakota State Univ., Fargo, ND USA
Evaluation of the Impact of Changes in the Hours of Service Regulations on Efficiency, Drivers and Safety. Implementation Guidance
Griffin, G.; Rodriguez, J.; Lantz, B.; Oct. 1992; 41 pp.; In English
Report No.(s): PB2007-108613; UGPTI-PUB-93; No Copyright; Avail.: CASI: A03, Hardcopy

Drivers, carriers, and society in general would appear to experience positive net gains from a change in the cumulative hours of service rules from the current 70-in-8 day rule to a 24-hour restart provision. These positive gains would consist of increased driver income, improved scheduling flexibility, a potential for increased time at home, increased economic efficiency, and improved safety, as well as gains in other areas.
NTIS
Regulations; Safety; Transportation

20070025466 Defence Research and Development Canada, Toronto, Ontario, Canada
Auditory and Visual Facilitation: Cross-Modal Fusion of Information in Multi-Modal Displays
Boyne, Stephen; Pavlovic, Nada; Kilgore, Ryan; Chignell, Mark H.; Visualisation and the Common Operational Picture; December 2005, pp. 19-1 - 19-4; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The modern battlefield is increasingly populated with vast amounts of electronic information. The plethora of data that can be delivered needs to be filtered, interpreted, and formatted in ways that are meaningful and useful for particular tasks and

situations. Cross-modal fusion of information should be helpful in optimizing battlespace interfaces to provide the maximum amount of data to the commander and in enhancing their operational picture while avoiding increasing working memory load. In our research, carried out by researchers at the University of Toronto and Defence Research and Development Canada, we are looking at fundamental questions concerning the cross-modal fusion of information. In particular, we are focussing on how visual spatial awareness can be facilitated by presentation of auditory cues or information, and how auditory spatial awareness can be facilitated by visual information. We shall refer to instances of such facilitation as auditory facilitation, and visual facilitation, respectively.
Derived from text
Display Devices; Auditory Perception; Human Factors Engineering; Audio Signals; Visual Perception

20070025482 NASA Johnson Space Center, Houston, TX, USA
RESOLVE - Starting Point for Partnerships in Lunar and Mars Resource Characterization
Sanders, Gerald B.; Rosenbaum, Bernard; Simon, Thomas; Larson, William E.; Luecke, Dale; Captain, Jainine; Sacksteder, Kurt; Johnson, Kenneth R.; Boucher, Dale; Taylor, Jeffrey; [2007]; 2 pp.; In English; ILEWG 9th International Conference and Exploration and Utilization of the Moon (ICEUM9/ILC2007), 22-26 Oct. 2007, Sorrento, Italy
Contract(s)/Grant(s): 387498.04.01.01.10; Copyright; Avail.: CASI: A01, Hardcopy

The mystery and controversy surrounding the possibility of finding water/ice at the lunar poles of the Moon based on the interpretation of neutron spectrometer data from Lunar Prospector and radar data from Clementine raises questions that both Science and the Human Exploration proponents want answered. From the Science perspective, the determination of lunar volatiles and in particular the increased hydrogen concentration detected at the lunar poles was identified as an important objectives for lunar exploration and understanding the history of the Moon, Sun, and the solar system. From the Human Exploration perspective, the potential for large concentrations of accessible water opens up possibilities for utilizing in-situ resources, known as In-Situ Resource Utilization (ISRU), to implement a sustained and affordable human exploration program of the Moon and beyond through production of propellants, fuel cell reagents, and life support consumables for lunar surface operations and mobility, and Earth-Moon transportation. Both the Science and Human Exploration proponents agree that a mission to the lunar poles to obtain ground truth data is the only means to conclusively answer the questions of whether water/ice exists, how much, what form, and where did it come from. In 2005, NASA initiated the Regolith and Environment Science & Oxygen and Lunar Volatiles Extraction (RESOLVE) project, and is currently developing hardware under the NASA Exploration Technology Development Program (ETDP). The purpose of the project was to begin developing technologies and operations that would answer the fundamental science questions, such as What resources are available on the Moon, where are they, what form, and where did they come from? as well as critical engineering questions, such as How will we mine these resources, what chemical extraction processes are the most practical and efficient, and what are the engineering challenges to be faced in this environment? .
Author
Lunar Exploration; Lunar Surface; Moon; In Situ Resource Utilization

20070025509 NASA Johnson Space Center, Houston, TX, USA; Hartford Univ., CT, USA
A New Method for Breath Capture Inside a Space Suit Helmet
Filburn, Tom; Dolder, Craig; Tufano, Brett; Paul, Heather L.; July 09, 2007; 5 pp.; In English; 37tn International Conference on Environmental Systems, 9-12 July 2007, Chicago, IL, USA; Original contains color and black and white illustrations
Report No.(s): ICES-2007-01-3248; Copyright; Avail.: CASI: A01, Hardcopy

This project investigates methods to capture an astronaut's exhaled carbon dioxide (CO2) before it becomes diluted with the high volumetric oxygen flow present within a space suit. Typical expired breath contains CO2 partial pressures (pCO2) in the range of 20-35 mm Hg. This research investigates methods to capture the concentrated CO2 gas stream prior to its dilution with the low pCO2 ventilation flow. Specifically this research is looking at potential designs for a collection cup for use inside the space suit helmet. The collection cup concept is not the same as a breathing mask typical of that worn by firefighters and pilots. It is well known that most members of the astronaut corps view a mask as a serious deficiency in any space suit helmet design. Instead, the collection cup is a non-contact device that will be designed using a detailed Computational Fluid Dynamic (CFD) analysis of the ventilation flow environment within the helmet. The CFD code, Fluent, provides modeling of the various gas species (CO2, water vapor, and oxygen (O2)) as they pass through a helmet. This same model will be used to numerically evaluate several different collection cup designs for this same CO2 segregation effort. A new test rig will be built to test the results of the CFD analyses and validate the collection cup designs. This paper outlines the initial results and future plans of this work.
Author
Carbon Dioxide Removal; Computational Fluid Dynamics; Helmets; Expired Air; Space Suits

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EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20070025594 Scripps Institution of Oceanography, San Diego, CA, USA
Mineral Time Capsules on Mars?
Schirber, Michael; ScienceNOW; May 2006; 3 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GQ41G; Copyright; Avail.: Other Sources
ONLINE: http://sciencenow.sciencemag.org/cgi/content/full/2006/501/1

Like dinosaur-age insects trapped in amber, biomolecules sequestered in million-year-old sulfate minerals could provide a glimpse into the past, say researchers who've recently analyzed such minerals from North America. The same minerals have recently been discovered on Mars, so they may be a good place to look for traces of past life on the red planet, the researchers say.
Derived from text
Life Detectors; Extraterrestrial Life; Mars Surface; Mars (Planet)

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*.

20070025526 Baum (Eric), Rancho Palos Verdes, CA, USA
Algorithm for Retrieval of Ocean Surface Temperature, Wind Speed and Wind Direction from Remote Microwave Radiometric Measurements
Baum, E., Inventor; 23 Apr 04; 3 pp.; In English
Patent Info.: Filed Filed 23 Apr 04; US-Patent-Appl-SN-10-830 619
Report No.(s): PB2007-104160; No Copyright; Avail.: CASI: A01, Hardcopy

This invention is an improved algorithm for retrieving the sea surface temperature, wind speed and wind direction from a suite of remote microwave radiometer measurements of the brightness temperature of a patch of ocean. Advantages of the method over the prior art are: (1) improved spatial resolution, (2) reduced measurement noise and, (3) removal of a source of error in the modeled wind-direction-dependence of the brightness temperature.
NTIS
Algorithms; Atmospheric Temperature; Microwave Radiometers; Remote Sensing; Sea Surface Temperature; Wind (Meteorology); Wind Direction; Wind Velocity

20070025563 Air Force Research Lab., Rome, NY, USA
Method for Networked Interactive Control of Displayed Information
Gnanamgari, S., Inventor; Smith, J. D., Inventor; 29 May 05; 19 pp.; In English
Patent Info.: Filed Filed 29 May 05; US-Patent-Appl-SN-11-094 550
Report No.(s): PB2007-104710; No Copyright; Avail.: CASI: A03, Hardcopy

One or more users may command their respective window applications on an interactive display networked to client computers using laser pointers and/or voice commands. Users' voices are associated with a particular laser pointer pattern. A sequence of computer decisions checks each laser pointer command so as to correctly associate respective users with their commands and application windows. The invention performs speech recognition of the user's voice command. If the command is recognized, the invention performs the speech-recognized command as a window operation. The location of all unique light patterns is broadcast to all networked client computers.
NTIS
Dials; Interactive Control; Lasers; Speech Recognition

20070025567 Chau (F.) and Associates, LLC, East Meadow, NY, USA
System and Method for Detecting Generalized Space-Time Clusters
Iyengar, V. S., Inventor; 12 Feb 04; 16 pp.; In English
Contract(s)/Grant(s): DARPA-F30602-01-C-0184
Patent Info.: Filed Filed 12 Feb 04; US-Patent-Appl-SN-10-777 548
Report No.(s): PB2007-104713; No Copyright; Avail.: CASI: A03, Hardcopy

A system for detecting clusters in space and time using input data on occurrences of a phenomenon and characteristics at a plurality of locations and times comprises an expectation generation module determining expected occurrences of a phenomena, and an occurrence modeling module determining actual occurrences of the phenomena. The system further comprises a search module searching the expected occurrences and the actual occurrences for a plurality of candidate solutions, wherein each solution is represented as a set of points in the three-dimensional space, and wherein each point corresponds to a location at a time. The system comprises a convex container module determining at least one solution corresponding to a selected convex container shape from the plurality of candidate solutions, and a solution evaluation module determining a strength metric for each solution determined by the convex container module, the search module selecting a dominant cluster in the input data.

NTIS
Cluster Analysis; Detection; Space-Time Functions

20070025568 Chau (F.) and Associates, Woodburgy, NY, USA; International Business Machines Corp., Armonk, NY, USA
Mention-Synchronous Entity Tracking System and Method for Chaining Mentions
Ittycheriah, A., Inventor; Jing, H., Inventor; Kambhatla, N., Inventor; Luo, X., Inventor; Roukos, S. E., Inventor; 27 Apr 04; 17 pp.; In English
Contract(s)/Grant(s): N66001-99-2-8916
Patent Info.: Filed Filed 27 Apr 04; US-Patent-Appl-SN-10-833 256
Report No.(s): PB2007-104176; No Copyright; Avail.: CASI: A03, Hardcopy

A Bell Tree data structure is provided to model the process of chaining the mentions, from one or more documents, into entities, tracking the entire process; where the data structure is used in an entity tracking process that produces multiple results ranked by a product of probability scores.

NTIS
Data Structures; Documents; Data Links

20070025576 Federal Bureau of Investigation, Washington, DC, USA
Internet Crime Complaint Center. 2006 Internet Fraud Crime Report: January 1, 2006-December 31, 2006
Dec. 2006; 27 pp.; In English
Report No.(s): PB2007-109513; No Copyright; Avail.: National Technical Information Service (NTIS)

In December 2003, the Internet Fraud Complaint Center (IFCC) was renamed the Internet Crime Complaint Center (IC3) to better reflect the broad character of such criminal matters having a cyber (Internet) nexus. The 2006 Internet Crime Report is the sixth annual compilation of information on complaints received and referred by the IC3 to law enforcement or regulatory agencies for appropriate action. From January 1, 2006 December 31, 2006, the IC3 website received 207,492 complaint submissions. This is a 10.4% decrease when compared to 2005 when 231,493 complaints were received. These filings were composed of fraudulent and non-fraudulent complaints primarily related to the Internet. In 2006, IC3 processed more than 200,481 complaints that support Internet crime investigations by law enforcement and regulatory agencies nationwide. These complaints were composed of many different fraud types such as auction fraud, non-delivery, and credit/debit card fraud, as well as non-fraudulent complaints, such as computer intrusions, spam/unsolicited e-mail, and child pornography. All of these complaints are accessible to federal, state, and local law enforcement to support active investigations, trend analysis, and public outreach and awareness efforts.

NTIS
Crime; Internets

20070025583 Air Force Research Lab., Rome, NY, USA
Method for Interactive User Control of Displayed Information by Registering Users
Gnanamgari, S., Inventor; Smith, J. D., Inventor; 29 Mar 05; 19 pp.; In English
Patent Info.: Filed Filed 29 Mar 05; US-Patent-Appl-SN-11-094 552
Report No.(s): PB2007-104730; No Copyright; Avail.: CASI: A03, Hardcopy

In a system that projects application windows onto an information display, one or more users command their respective window applications using laser pointers and/or voice. A registration program assigns a unique identification to each user and associates that user's voice and a particular laser pointer pattern. A sequence of computer decisions checks each laser pointer command so as to correctly associate respective users with their commands and their application windows. Users may speak voice commands. The invention performs speech recognition of the user's voice command. If the command is recognized, the invention performs the speech-recognized command as a window operation.
NTIS
Display Devices; Human-Computer Interface; Interactive Control

20070025586 California Univ., Los Angeles, CA, USA
California Travel Trends and Demographics Study
Crane, R.; Valenzuela, A.; Chatman, D.; Schweitzer, L.; Wong, P. J.; Dec. 2002; 206 pp.; In English
Contract(s)/Grant(s): CDOT-74A0034
Report No.(s): PB2007-108918; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of the Transportation Trend Analysis and Demographic Projection Study was to analyze past population and travel trends, and project future trends, in order to support the state infrastructure and development planning process. Tasks included: Projecting population to 2025 for the state of California at the tract level, including sociodemographic variables likely to influence travel choice and opportunity; Developing a spatial database so that the Department of Transportation and its planning partners can access and manipulate the projections; Implementing and testing an empirical model of travel demand using data from urban areas in California; Combining the results of the empirical model and population projections to forecast statewide travel trends at the Census tract level in 2015 and 2025; and Explaining how the projected population changes and travel demand trends can be used to inform the planning of the state transportation system.
NTIS
Demography; Populations; Transportation; Trends

20070025588 Executive Office of the President, Washington, DC, USA
Expanding E-Government. Making a Difference for the American People Using Information Technology
Dec. 2006; 12 pp.; In English
Report No.(s): PB2007-109524; No Copyright; Avail.: National Technical Information Service (NTIS)

The Federal Government continues to improve services and deliver results through the adoption and implementation of the Presidents E-Government (E-Gov) initiatives and government wide solutions. The departments and agencies made great improvements in the area of security with their implementation efforts underway for the requirements included in Homeland Security Presidential Directive-12 (HSPD-12) and the specific efforts for securing personally identifiable information. The USA Government continues to be one of the largest users and acquirers of data, information and supporting technology systems in the world, by investing approximately $65 billion annually on Information Technology (IT). The Federal Government has made improvements but continues to strive to be the worlds leader in managing technology and information to achieve the greatest gains of productivity, service and results. For the past five years, the Presidents Management Agenda (PMA) initiative to Expand E-Government has delivered significant results to the taxpayer and federal employees alike. The departments and agencies are determined to build upon past success and continue to apply the principles such as Earned Value Management (EVM) and complete implementation of government wide solutions to achieve greater savings, better results and improved customer service levels.
NTIS
United States; Governments; Electronic Commerce; Information Systems

20070025599 Regan (Christopher F.), ESQ, Orlando, FL, USA; Harris Corp., Melbourne, FL, USA
Cryptographic Device and Associated Methods
Kurdziel, M. T., Inventor; Dennis, G. R., Inventor; 18 Feb 04; 12 pp.; In English
Contract(s)/Grant(s): MDA-904-99-C-6511

Patent Info.: Filed Filed 18 Feb 04; US-Patent-Appl-SN-10-780 848
Report No.(s): PB2007-104677; No Copyright; Avail.: CASI: A03, Hardcopy

A cryptographic device includes an input stage receiving an input data block and a key data block made up of a plurality of sub-key data blocks, and generating a plurality of first signals therefrom. An intermediate stage is connected to the input stage and includes a plurality of substitution units. Each substitution unit substitutes data within a respective first signal. A diffuser is connected to the plurality of substitution units for mixing data to generate a diffused signal. An output stage is connected to the intermediate stage for repetitively looping back the diffused signal to the input stage for combination with a next sub-key data block. The output stage provides an output signal for the cryptographic device after the repetitively looping back is complete.

NTIS

Computer Information Security; Cryptography; Data Processing; Devices

20070026084 Swedish Defence Research Establishment, Linkoeping, Sweden

Interference Risks of Radiated Interference from Personal Computers Co-Located with Wireless Communication Systems

Stenumgaard, P.; Fors, K.; Nov. 2005; 26 pp.; In Swedish

Report No.(s): PB2007-105537; FOI-R-1829-SE; No Copyright; Avail.: National Technical Information Service (NTIS)

The increasing use of Commercial off the Shelf (COTS) products in the Swedish defense could cause increased problems with radiated interference against colocated wireless communication systems. This is due to that COTS-products generally radiate significantly higher levels of unintentional electromagnetic radiation than corresponding military specified products do. It is therefore important to have updated knowledge of typical interference levels in order to perform vulnerability analyses when COTS-products and wireless communication systems are colocated in different scenarios. Since personal computer (PC) is a type of system which is commonly used in defense applications the work has been focused on interference from such systems. In this document investigations of interference spectrum from modern PCs are reported. From these results an intersystem-interference analysis has been performed for collocation between COTS and two chosen system types of defense interest; the army combat radio Ra 180/480 and GPS (Global Positioning System). Measurements of radiated interference have been made by cooperation with the Swedish Research and Testing Institute (SP).

NTIS

Electromagnetic Radiation; Personal Computers; Risk; Telecommunication; Wireless Communication

20070026109 Sandia National Labs., Albuquerque, NM USA

GBL-2D Version 1.0: A 2D Geometry Boolean Library

McBride, C. L.; Yarbeery, V.; Schmidt, R. C.; Meyers, R. J.; Nov. 2006; 172 pp.; In English

Report No.(s): DE2007-899723; SAND2006-6829; No Copyright; Avail.: Department of Energy Information Bridge

This report describes version 1.0 of GBL-2D, a geometric Boolean library for 2D objects. The library is written in C++ and consists of a set of classes and routines. The classes primarily represent geometric data and relationships. Classes are provided for 2D points, lines, arcs, edge uses, loops, surfaces and mask sets. The routines contain algorithms for geometric Boolean operations and utility functions. Routines are provided that incorporate the Boolean operations: Union(OR), XOR, Intersection and Difference. A variety of additional analytical geometry routines and routines for importing and exporting the data in various file formats are also provided. The GBL-2D library was originally developed as a geometric modeling engine for use with a separate software tool, called SummitView, that manipulates the 2D mask sets created by designers of Micro-Electro-Mechanical Systems (MEMS). However, many other practical applications for this type of software can be envisioned because the need to perform 2D Boolean operations can arise in many contexts.

NTIS

Boolean Algebra; Libraries; Microelectromechanical Systems; Analytic Geometry

20070026125 Lawrence Livermore National Lab., Livermore, CA USA

Simple Common Plane Contact Detection Algorithm for FE/FD Methods

Vorobiev, O.; Aug. 07, 2006; 8 pp.; In English

Report No.(s): DE2007-900065; UCERL-CONF-223462; No Copyright; Avail.: Department of Energy Information Bridge

Common-plane (CP) algorithm is widely used in Discrete Element Method (DEM) to model contact forces between interacting particles or blocks. A new simple contact detection algorithm is proposed to model contacts in FE/FD methods which is similar to the CP algorithm. The CP is defined as a plane separating interacting faces of FE/FD mesh instead of blocks

or particles in the original CP method. The method does not require iterations. It is very robust and easy to implement both in 2D and 3D case.
NTIS
Algorithms; Computerized Simulation; Detection; Penetration

20070026142 Budapest Univ. of Technology and Economics, Budapest, Hungary
Filtering False Alarms: An Approach Based on Episode Mining
Bodon, F.; Hornak, Z.; Oct. 2005; 137 pp.; In English
Report No.(s): PB2007-110262; Copyright; Avail.: National Technical Information Service (NTIS)

The security of computer networks is a prime concern today. Various devices and methods have been developed to offer different kinds of protection (firewalls, IDSs, antiviruses, etc.). By centrally storing and processing the signals of these devices, it is possible to detect more cheats and attacks than simply by analysing the logs independently. The most difficult and still unsolved problem in centralized systems is that vast numbers of false alarms. If a harmless pattern, which caused by a safe operation is identified as an alarm, then it is a nuisance and requires human invention to be handled properly. In this paper we show how we can use data mining to discover the patterns that frequently causes false alarms. Due to the new requirements (events with many attributes, invertible parametric predicates) none of the previously published algorithms can be applied to our problem directly. We present the algorithm ABAMSEP, which discovers frequent alert-ended episodes. We prove that the algorithmis correct in the sense that it finds all episodes thatmeet the requirements of the specification.
NTIS
Algorithms; Computer Information Security; Data Mining; False Alarms; Mining

20070026145 Newcastle-upon-Tyne Univ., Newcastle, UK
Detecting Architectural Mismatches Between Web Services
Gamble, C.; Apr. 2007; 6 pp.; In English
Report No.(s): PB2007-109996; CS-TR-1019; Copyright; Avail.: National Technical Information Service (NTIS)

Given the advantages of building systems from pre-built and pre-tested components instead of building new ones each time, why then is this not the norm in software engineering. The answer appears to be that building systems this way currently requires a similar amount of effort to building one from scratch. This is because of the work required to successfully integrate components with differing assumptions into a single system. The work stems from faults in the system caused by these differing assumptions, such faults can be termed 'Architectural Mismatches'. In this paper we give a brief introduction to this concept and to that of 'architectural styles' which will form part of the proposed solution. We introduce web services, which we use throughout the work as our example components. Then we discuss the current state of our work on a web service architectural style and the collation of the set of architectural assumptions designers of web services might make. Finally we give an outline of work still to do and tool support needed to test and demonstrate our findings.
NTIS
Architecture (Computers); Detection; Languages; Web Services

20070026147 Newcastle-upon-Tyne Univ., Newcastle, UK
Generic Framework for the Engineering of Self-Adaptive and Self-Organising Systems
Di Marzo Serugendo, G.; Fitzgerald, J. S.; Romanovsky, A.; Guelfi, N.; Apr. 2007; 11 pp.; In English
Report No.(s): PB2007-109995; CS-TR-1018; Copyright; Avail.: National Technical Information Service (NTIS)

This paper provides a unifying view for the engineering of self-adaptive (SA) and self-organising (SO) systems. We first identify requirements for designing and building trustworthy self-adaptive and self-organising systems. Second, we propose a generic framework combining design-time and run-time features, which permit the definition and analysis at design-time of mechanisms that both ensure and constrain the run-time behaviour of an SA or SO system, thereby providing some assurance of its self-capabilities. We show how this framework applies to both an SA and an SO system, and discuss several current proof-of-concept studies on the enabling technologies.
NTIS
Adaptive Control; Self Organizing Systems

20070026151 Newcastle-upon-Tyne Univ., Newcastle, UK
Pret a Voter with Paillier Encryption
Ryan, P. Y. A.; Apr. 2007; 30 pp.; In English
Report No.(s): PB2007-109991; CS-TR-1014; Copyright; Avail.: National Technical Information Service (NTIS)

The Pret a Voter schemes allow voters to confirm that their vote is accurately counted whilst maintaining ballot secrecy.

An earlier version of Pret a Voter uses exponential ElGamal encryption enabling the use of re-encryption mixes in place of the decryption mixes. To render decryption tractable whilst avoiding the possibility of extreme values compromising ballot privacy, it was necessary to draw the seed values from a suitable statistical distribution, e.g., a binomial. In this paper we present a similar construction of the ballot forms but using Paillier encryption in place of ElGamal. The homomorphic properties of Paillier make it ideally suited to our construction and removes the need to constrain the distribution of seed values. As with the ElGamal version of the scheme, we have a distributed construction of encrypted ballot forms, though here we give an alternative construction that allows us to set an arbitrary collusion threshold for the leaking ballot information. This enables on-demand decryption and printing of the ballot forms and so eliminates the need to trust a single authority to keep this information secret and avoids chain of custody issues and chain voting style attacks. A number of further innovations are introduced, for example, providing the booth device with a share of the decryption key and transforming the receipt onions into a form directly decryptable in the booth, thus avoiding the need to have the tellers available during the voting period. This is a revised and extended version of TR 965.
NTIS
Cryptography; Voting

20070026153 Newcastle-upon-Tyne Univ., Newcastle, UK
Mobile Code for Coordination
Iliasov, A.; Apr. 2007; 20 pp.; In English
Report No.(s): PB2007-109990; CS-TR-1013; Copyright; Avail.: National Technical Information Service (NTIS)

An effective coordination mechanism is central to building large distributed systems. Overcoming limitations of a coordination language can be a major challenge for developers of distributed systems. This paper presents a novel coordination mechanism based on code mobility. In this mechanism coordination is realised by exchanging pieces of mobile code between coordinated entities. This approach overcomes constrains of a statically defined coordination language by allowing coordinated entities to dynamically redefine coordination rules and use all the power of a programming language to express such rules. This helps to implement sophisticated and efficient data retrieval and processing algorithms and also reduce network traffic. The paper also discusses a non-language based coordination framework specially developed to support coordination based on mobile code and a pragmatic solution to the problem of protecting hosts from potentially harmful mobile code. A proof of concept implementation demonstrates the feasibility and applicability of the proposal.
NTIS
Computer Networks; Coordination

20070026156 Newcastle-upon-Tyne Univ., Newcastle, UK
Experimenting with Exception Handling Mechanisms of Web Services Implemented using Different Development Kits
Gorbenko, A.; Mikaylichenko, A.; Kharchenko, V.; Romanovsky, A.; Mar. 2007; 40 pp.; In English
Report No.(s): PB2007-109988; CS-TR-1010; Copyright; Avail.: National Technical Information Service (NTIS)

Achieving high dependability and fault-tolerance in service-oriented architecture (SOA) is an open problem. Exception handling is one of the powerful means for improving the quality of SOA. The paper discusses the results of experimental analysis of the SOA-specific exceptions and factors affecting availability and faulttolerance of Web Services, implemented using two development kits: JAX-RPC implementation at Sun Microsystems and IBM WebSphere Software Developer Kit for Web Services. We specifically focus on the results of exception propagation and performance analysis. Finally, applications of different error recovery strategies including backward, forward and enhanced forward error recovery, in the context of SOA are briefly discussed.
NTIS
Architecture (Computers); Experimentation; Kits; Web Services

20070026173 Newcastle-upon-Tyne Univ., Newcastle, UK
Middleware Support for Non-Repudiable Business-to-Business Interactions
Cook, N.; Mar. 2007; 238 pp.; In English
Report No.(s): PB2007-109987; CS-TR-1009; Copyright; Avail.: National Technical Information Service (NTIS)

The wide variety of services and resources available over the Internet presents new opportunities for organisations to collaborate to reach common goals. For example, business partners wish to access each others services and share information along the supply chain in order to compete more successfully in the delivery of goods or services to the ultimate customer. This can lead to the investment of significant resources by business partners in the resulting collaboration. In the context of

such high value business-to-business (B2B) interactions it is desirable to regulate (monitor and control) the behaviour of business partners to ensure that they comply with agreements that govern their interactions. Achieving this regulation is challenging because, while wishing to collaborate, organisations remain autonomous and may not unguardedly trust each other. Two aspects must be addressed: (i) the need for high-level mechanisms to encode agreements (contracts) between the interacting parties such that they can be used for run-time monitoring and enforcement, and (ii) systematic support to monitor a given interaction for conformance with contract and to ensure accountability. This dissertation concerns the latter aspect the definition, design and implementation of underlying middleware support for the regulation of B2B interactions. To this end, two non-repudiation services are identified nonrepudiable service invocation and non-repudiable information sharing. A flexible non-repudiation protocol execution framework supports the delivery of the identified services. It is shown how the services can be used to regulate B2B interactions. The non-repudiation services provide for the accountability of the actions of participants; including the acknowledgement of actions, their run-time validation with respect to application-level constraints and logging for audit. The framework is realised in the context of interactions with and between components of a J2EE application server platform. However, the design is sufficiently flexible to apply to other common middleware platforms.
NTIS
Applications Programs (Computers); Commerce; Computer Programs; Interprocessor Communication

20070026174 Newcastle-upon-Tyne Univ., Newcastle, UK
Computer Ate My Vote
Ryan, P. Y. A.; Nov. 2006; 46 pp.; In English
Report No.(s): PB2007-109985; CS-TR-988; Copyright; Avail.: National Technical Information Service (NTIS)
The author describes the challenges involved in designing and evaluating high assurance, verifiable voting systems. I describe the Pret a Voter scheme that provides voter verifiablity with minimal trust in officials, software etc. I also describe a number of threats against voting schemes and the extent to which they apply to the basic Pret a Voter scheme. Some enhancements to the scheme designed to counter those threats to which Pret a Voter is potentially vulnerable are presented.
NTIS
Voting; Augmentation; Proving

20070026175 Newcastle-upon-Tyne Univ., Newcastle, UK
Adaptive SSL: Design, Implementation and Overhead Analysis
Lamprecht, C. J.; van Moorsel, A. P.; Mar. 2007; 7 pp.; In English
Report No.(s): PB2007-109986; CS-TR-1008; Copyright; Avail.: National Technical Information Service (NTIS)
Adaptive security is based on the observation that the security requirements of a system or service heavily depend on the environment in which they operate and should therefore be dynamically adjusted to best operate within that environment. In this paper we are concerned with adapting the choice of cryptographic algorithms applied to client-server interactions. To that end, we design and implement an adaptation controller for SSL (Secure Socket Layer), called Adaptive SSL.
NTIS
Adaptation; Computer Information Security; Joints (Junctions)

20070026217 National Aerospace Lab., Amsterdam, Netherlands
Transfer of Manual Flying Skills from PC-Based Simulation to Actual Flight - A Comparison of In-Flight Measured Data and Instructor Ratings
Roessingh, Jan Joris; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 14-1 - 14-22; In English; See also 20070026206; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document
Three groups of novice pilots received training to fly aerobatic maneuvers in a light aircraft. Trainees in the control group received in-flight instruction and were given the usual briefings before each flight. Trainees in the two experimental groups received extra training: each in-flight lesson was preceded by PC-based simulated flight. A total of 2053 maneuvers were analyzed on the basis of both flight-data recordings and instructor ratings. We hypothesized that complex manual flying skills, learned on the ground, transfer to the aircraft. The results provide no objective support for this hypothesis. There were no significant differences in flying skills between the three groups as measured by the flight-data recordings. However, both experimental (PC-) groups managed to fly significantly more maneuvers in the same amount of flight time in the aircraft.

Differences between flight-data recordings and instructor ratings are analyzed in detail. In the discussion, we compare the findings with published transfer-experiments with PC-based simulation.
Author
Simulation; Flight Time; Light Aircraft; Ratings; Education

20070026220 Military Univ. of Technology, Warsaw, Poland
Modelling and Simulation Process in the Polish Proposal of Early Warning System for DAT and Crisis Management
Najgebauer, Andrzej; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 2-1 - 2-19; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An approach to the Early Warning Systems building is proposed. The process of modelling the early identification processes is presented on the basis of MSG026 group experiences. The idea of the terrorist threat pattern acquisition is developed. Some data mining techniques including filtering, semantic nets, link analysis, neural networks, discriminant analysis in the process of threat recognition were discussed and modelled . The architecture of the Early Warning System was proposed in the three-layer J2EE approach - client layer, application layer and database system. One of the most interesting features of the proposed architecture there is possibility of dynamic functionality enhancement. Some experiments in the environment were conducted on the basis of training data set in the part of EWS - expert Corvid system and interactive simulator of terrorist attack against an infrastructure as the demonstrator tools of potential complex analysis and prediction. The expert system was build on the basis of terrorist attack scenario set.
Author
Expert Systems; Early Warning Systems; Discriminant Analysis (Statistics); Management Methods; Simulation; Neural Nets; Education

20070026222 Distributed Mission Operations Center, Albuquerque, NM, USA
The US Air Force Distributed Mission Operations - A Premier Application of Distributed Modeling and Simulation in 'Training The Way We Fight'
Szulinski, Jerry; Sorroche, Joseph; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 8-1 - 8-10; In English; See also 20070026206; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The U.S. Air Force Distributed Mission Operations (DMO) concept is one of the most successful applications of Modeling and Simulation (M&S) for warfighter training. The applications span virtually the full spectrum of aircrew training beyond individual pilot flight training. Applications concentrate on team, inter-team, large force, and theater-level sensor-to-shooter kill chain training. Individual flight simulators have been available for several decades, but it was not until the widespread application of distributed technologies that theater-level exercises in synthetic battlespaces, such as the Virtual Flag (VF), could take place. Virtual Flag exercises go far beyond simply training pilots to fly aircraft. These quarterly exercises, hosted by the U.S. Air Force (USAF) DMO Center (DMOC) at Kirtland Air Force Base in Albuquerque NM (USA), link hundreds of warfighters in realistic and robust scenarios. Virtual simulators, in which warfighters can practice force employment the same way they would with real weapon systems, represent most US Air Force airborne sensor, command and control, and shooter platforms. Many ground-based systems, as well as Joint and Coalition participants, add to the training realism and depth. DMO synthetic environments place warfighters in scenarios with simulated enemy forces reflective of those in the real-world theaters of operations. DMO also provides training for worst-case scenarios where warfighters encounter threats much more numerous, effective, and persistent than any real potential threat can currently generate.
Author
Military Operations; Pilot Training; Command and Control; Weapon Systems; Training Aircraft; Simulation; Flight Training; Flight Simulators; Education

20070026225 Norwegian Defence Research Establishment, Kjeller, Norway
Sustainability Simulations for Fighter Aircraft in Peace and at War
Graasvoll, Ottar; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 13-1 - 13-8; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Planning and operating fighter squadrons is a challenge. A number of important factors have been identified to influence the effectiveness of the squadron in terms of its ability to meet the annual training program and required sortie generation in

peace and at war. In order to get a better understanding of how these different factors influence the combat readiness of the air force, a computer simulation model called FLYT2 has been developed at the Norwegian Defence Research Establishment (FFI). The model simulates availability and sortie generation for fighter aircraft. A representation of each aircraft and pilot is made in the model and they are moved between different possible states according to the time expectancy for each state. The model also makes it possible to investigate how a deployment of a certain number of aircraft affects the combat readiness for the rest of the fleet. It has also been used to investigate how big the total fleet must be to successfully sustain a particular deployment. The model makes it possible to identify bottlenecks in the production and maintenance system and to obtain a better understanding of what is required to get an optimal use of the resources. The model makes it possible to test out the consequences in a short and long term perspective of different decisions, and how new policies impact the effectiveness. The findings from this research has been helping decision makers in Norway to get a better understanding and acceptance for the required number of fighter aircraft to support and sustain deployed aircraft. It has increased the awareness of the problems associated with keeping pilots and aircraft combat ready. FLYT2 has successfully been utilized as a 'learning tool' for offices for them to obtain insight and understanding of problems related to deployment.
Author
Computerized Simulation; Fighter Aircraft; Education; Warfare; Deployment

20070026232 Vosen (Steven R), Berkeley, CA, USA
Natural Gas Leak Mapper
Reichardt, T. A., Inventor; Luong, A. K., Inventor; Kulp, T. J., Inventor; Dedas, S., Inventor; 11 Mar 05; 25 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Patent Info.: Filed Filed 11 Mar 05; US-Patent-Appl-SN-11-078-527
Report No.(s): PB2007-101765; No Copyright; Avail.: CASI: A03, Hardcopy

A system is described that is suitable for use in determining the location of leaks of gases having a background concentration. The system is a point-wise backscatter absorption gas measurement system that measures absorption and distance to each point of an image. The absorption measurement provides an indication of the total amount of a gas of interest, and the distance provides an estimate of the background concentration of gas. The distance is measured from the time-of-flight of laser pulse that is generated along with the absorption measurement light. The measurements are formated into an image of the presence of gas in excess of the background. Alternatively, an image of the scene is superimosed on the image of the gas to aid in locating leaks. By further modeling excess gas as a plume having a known concentration profile, the present system provides an estimate of the maximum concentration of the gas of interest.
NTIS
Leakage; Natural Gas; Patent Applications; Position (Location)

20070026263 National Inst. of Justice, Washington, DC, USA
Adaptive Surveillance: A Novel Approach to Facial Surveillance for CCTV Systems. Final Progress Report
Feb. 09, 2001; 24 pp.; In English
Report No.(s): PB2007-109682; NCJ-186734; No Copyright; Avail.: CASI: A03, Hardcopy

We have developed a surveillance system that uses real-time face recognition technology to increase the utility of currently existing CCN-compatible surveillance software. The performance of the best existing surveillance system was dramatically improved by development of techniques for: (1) dynamic adjustment of video parameters in the region of the image containing a face and (2) tracking a face to acquire multiple images of it, across video frames. The outcome of this work is a state-of-the-art, automated facial recognition surveillance system capable of providing immense value to the law enforcement community. The automation of the attentionally-taxing duty of surveillance lowers overhead, and thus, frees up resources for performance of other tasks. Use of this system will allow law enforcement to perform surveillance duties to a level of efficiency and precision beyond that which is possible at present. Ultimately, fewer crimes may be perpetrated and arrests made on the basis of surveillance may lead to a greater probability of conviction.
NTIS
Closed Circuit Television; Surveillance; Television Systems

20070026268 Law Offices of Fortney (Andrew D), Fresno, CA, USA
Apparatus and Method for Allocating Bits Temporaly Between Frames in a Coding System
Lee, J., Inventor; 8 Apr 05; 11 pp.; In English
Contract(s)/Grant(s): NIST-70NANB5H178
Patent Info.: Filed Filed 8 Apr 05; US-Patent-Appl-SN-11-102-397
Report No.(s): PB2007-104588; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for temporally allocating bits between frames in a coding system such that temporal fluctuations are smoothed out. Namely, a picture quality is monitored on a frame by frame basis. An average distortion measure is derived from previous picture frames and that average is compared to the distortion measure of a current frame, where the result is used to effect bit budget allocation for each frame in an input image sequence.
NTIS
Coding; Image Processing; Patent Applications

20070026270 Government Accountability Office, Washington, DC, USA
Information Security: FBI Needs to Address Weaknesses in Critical Network
Apr. 2007; 30 pp.; In English
Report No.(s): PB2007-109850; GAO-07-368; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Bureau of Investigation (FBI) relies on a critical network to electronically communicate, capture, exchange, and access law enforcement and investigative information. Misuse or interruption of this critical network, or disclosure of the information traversing it, would impair FBI's ability to fulfill its missions. Effective information security controls are essential for ensuring that information technology resources and information are adequately protected from inadvertent or deliberate misuse, fraudulent use, disclosure, modification, or destruction. GAO was asked to assess information security controls for one of FBI's critical networks. To assess controls, GAO conducted a vulnerability assessment of the internal network and evaluated the bureau's information security program associated with the network operating environment. This report summarizes weaknesses in information security controls in one of FBI's critical networks.
NTIS
Computer Networks; Law (Jurisprudence); Security

20070026293 Office of Management and Budget, Washington, DC USA
Office of Management and Budget Report to Congress on Implementation of the E-Government Act of 2002, FY 2006
Mar. 01, 2007; 38 pp.; In English
Report No.(s): PB2007-109748; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Government is the largest single producer, collector, consumer, and disseminator of information in the USA. In fiscal year 2006, the Federal Government continued to use industry leading information technology to more effectively manage and deliver government information and services. As a result, Federal programs operate more transparently and effectively. Greater access to government information benefits our country by sustaining an informed citizenry, aiding government decision makers, and supporting our economy - fundamental to a healthy democracy. The Administrations electronic government (E-Government) promotes increased access to government information, improves services to the citizen with efficient and effective Federal programs, and helps agencies achieve their goals. E-Government helps agencies share information between Federal agencies, States, and local and Tribal governments to monitor the performance and results of Federal programs. The cost-effective use of information technology to provide consistent access to and dissemination of government information is essential to promote a more citizen-centered government.
NTIS
Congressional Reports; Governments

20070026294 National Inst. of Justice, Washington, DC, USA
Artificial Neural Network System for Classification of Offenders in Murder and Rape Cases. Executive Summary
Kangas, L.; Nov. 29, 2001; 6 pp.; In English
Report No.(s): PB2007-109704; NCJ-190983; No Copyright; Avail.: CASI: A02, Hardcopy

When a serial offender strikes, it usually means that the investigation is unprecedented for that police agency. The volume of incoming leads and pieces of information in the case(s) can be overwhelming as evidenced by the thousands of leads gathered in the Ted Bundy Murders, Atlanta Child Murders, and the Green River Murders. Serial cases can be long-term investigations in which the suspect remains unknown and continues to perpetrate crimes. With state and local murder

investigative systems beginning to crop up, it will become impohant to manage that information in a timely and efficient way by developing computer programs to assist in that task. One vital function will be to compare violent crime cases from different jurisdictions so investigators can approach the investigation knowing that similar cases exist. The Artificial Neural Network System for Classification of Offenders in Murder and Rape Cases project developed two software prototypes that demonstrate developed algorithms for analyzing and comparing large databases of crime data. The CATCH (Computer Aided Tracking and Characterization of Homicides) and CATCHRAPE software applications analyses homicide data and sexual assault data, respectively. Both applications are similar, although they analyze different databases. CATCH will from hereon refer to both applications.
NTIS
Classifications; Computer Techniques; Neural Nets; Crime

20070026296 New York State Div. of Criminal Justice Services, Albany, NY, USA
Automation of Local Police Functions, Summary of Findings: The Spectrum Justice System (SJS)
Aug. 03, 2001; 14 pp.; In English
Contract(s)/Grant(s): NCJRS-97-IJ-CX-K009
Report No.(s): PB2007-109684; No Copyright; Avail.: CASI: A03, Hardcopy

With the support of the National Institute of Justice (NIJ) and funding from an NIJ technology development grant, the New York State Division of Criminal Justice Services (DCJS) has undertaken an extensive redesign of the States Spectrum Justice System (SJS), a widely used law enforcement records management system originally developed by DCJS technical staff in 1990. As a result, hundreds of law enforcement agencies in New York have begun to use a powerful new data management resource to improve the efficiency and effective operation of their departments. DCJS has initiated the deployment of the new Windows based application to the existing SJS customer base of approximately 280 law enforcement agencies throughout New York State.
NTIS
Law (Jurisprudence); Police; Records Management; Spectra

20070026302 Government Accountability Office, Washington, DC, USA
DHS Privacy Office: Progress Made but Challenges Remain in Notifying and Reporting to the Public
Apr. 2007; 49 pp.; In English
Report No.(s): PB2007-109873; GAO-07-522; No Copyright; Avail.: CASI: A03, Hardcopy

The Department of Homeland Security (DHS) Privacy Office was established with the appointment of the first Chief Privacy Officer in April 2003, as required by the Homeland Security Act of 2002. The Privacy Office's major responsibilities include: (1) reviewing and approving privacy impact assessments (PIA)--analyses of how personal information is managed in a federal system, (2) integrating privacy considerations into DHS decision making, (3) ensuring compliance with the Privacy Act of 1974, and (4) preparing and issuing annual reports and reports on key privacy concerns. GAO's objective was to examine progress made by the Privacy Office in carrying out its statutory responsibilities. GAO did this by comparing statutory requirements with Privacy Office processes, documents, and activities.
NTIS
Privacy; Protection; Security

20070026334 Battle Command, Simulation and Experimentation Directorate, Washington, DC, USA
Analysis and Feedback
Little, Daniel; Integration of Modeling and Simulation; September 2006, pp. 8-1 - 8-2; In English; See also 20070026332; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

One of the things that dismays people unfamiliar with Modelling and Simulation or M&S is that we have no perfect solution. Instead, we ask copious questions to get as close as possible to the objectives sought. Analysis supporting ill-defined requirements can be equally disastrous for the same reasons. Like M&S, the raison d'etre of analysis is built upon knowing what you want to capture and pre-determining a methodology to gauge whether you are getting it or not. Developing a simulation and exercise collection plan therefore means two things where the training audience is concerned: the simulation plan is unseen but the presence of a collection plan is mildly evident. The dilemmas with collection plans begin at their initial inception. If physical observation is necessary, then there must be a focus since a prolonged presence interferes with a staff interacting within their habitat. This requires research. Unfortunately when an officer receives a task for this mission, a senior

personage or mentor has not even been appointed much less identified. This impacts critical planning and time management assuming that no professional organisation is dedicated for this purpose. Using an American figure of speech, having something 'fall in your lap' means that this is given to you whether you were expecting it or not. Assuming this is you, my recommendation is to look at the following critical areas: identify those receiving the initial taskings; look at the training objectives; look at the doctrine in relation to these objectives. What proves insightful is to compare what is being attempted with the overall training strategy of the exercising unit. Is this headquarters being asked to do something that it never prepared for? Further, by taking a look at the order from higher and comparing it with the headquarters order, there will be instances where the continuation of actions are not complete nor nuances from the senior command fully embraced. Before the appointment of a senior mentor, it is perfectly acceptable to record any potential discrepancies for future consumption. There is nothing wrong with looking at the time-sequence of certain events during the exercise and creating a draft prioritising the events to be observed. It is also acceptable to stake an early claim over observer space and configuration as well as stating requirements for the set-up of an After Action Review or facility. Ideally this results from a physical reconnaissance of the exercise facilities in advance.

Author

Feedback; Simulation; Collection; Reconnaissance; Physical Exercise; Measuring Instruments; Education

20070026335 Battle Command, Simulation and Experimentation Directorate, Washington, DC, USA

History and Basics of M&

Little, Daniel; Integration of Modeling and Simulation; September 2006, pp. 1-1 - 1-4; In English; See also 20070026332; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Everything has a history. What few realize is that Modelling and Simulation or M&S predates the computer. Many of you are familiar with the concepts of chess. What makes chess significant? For one it represents rules. It also contains a strategy with infinite possibilities. While today most regard it as a commonplace game, strategic prowess was taken very seriously in the ancient world where reputations, not to mention kingdoms were won and lost to military campaigns. Figurine warriors replicating the art of battle have been dated as far back as 2500 BC in Egypt. As best as can be determined, these figurines offer us the earliest known example of formation and manoeuvre. The Chinese were no exception. Sun Tzu, Chinese strategist and military philosopher wrote about the game Wei Hei or encirclement around 500 BC. India circa 700AD added pieces, moves and strengths to Shataranja, the closest predecessor to the chess we play today. We fast forward to the 1600 s to Germany where more military detail was added to a larger board and additional pieces. This larger board now sported rivers, forest and other terrain features. The enhanced version of war-gaming called K nigspiel or the King s Game advanced a notion that war can be reduced to distinct concepts and formal rules. In 1824, Prussian Baron von Reisswitz published a book called Kriegspiel or wargame. Instead of a flat board, another revolutionary addition was made in the form of three-dimensional terrain. Dice decides the outcomes of fires, introducing both abstraction and quantification. While K nigspiel fostered the concept of reductionism, Kriegspiel gave us in due time topographical maps and the stirrings of battle calculus. If the field of M&S can claim its rightful origin chronologically, it is the 1800s where the basic concepts of M&S as we recognize them become evident.

Author

Simulation; Histories; Calculus

20070026338 Battle Command, Simulation and Experimentation Directorate, Washington, DC, USA

Representation

Little, Daniel; Integration of Modeling and Simulation; September 2006, pp. 2-1 - 2-2; In English; See also 20070026332; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Representation is the most important yet underappreciated concepts of Modelling and Simulation (M&S). The reason this is so is due to hierarchies that we take for granted. By hierarchies I mean that there is a layer of representation of us as individuals, as military professional, as members of a military unit and as citizens of an entire nation. My purpose is to provide instances of this at every level and tie it into how all of this is represented on one form or another through history, psychology, organisational behaviour, sociology, political science and its significance to M&S. While this appears at first idealistic at best or unattainable at worst, here is why. First and foremost, we take ourselves for granted and do not realize how representation defines us. The best example is religion. Although many in the lecture hall wear a military uniform and exude common norms of professionalism, each one can walk down the streets of any city and feel different emotions when looking at houses of worship. All of us feel something different; for some absolutely nothing, for others familiarity or even a sense of kinship while

others feel pangs of contemptuousness. The psychologist Carl Jung noticed this about people.1 Of the Christian cross, Jung noted that it carried a much different significance (p.81) if found after one s name in a book signifying their death as opposed to its placement on a building. Jung researched early Christianity and discovered that the crossbeam of its Latin cross was purposefully moved higher than the equilateral orthodox one to signify the otherworldliness of heaven above earth (p.271). People either in uniform or out make snap judgments whether we realize it or not. In America for example, people still respond with Gesundheit when strangers sneeze yet do not speak German nor realize that the word means health. In the event you ever travel to America and people ask how you are, you can tell each one about your aches pains and worries but you will never get much done. I have teenaged children that ask me guess what? even I haven t a clue what I am supposed to guess about. This is how my children obtain parity or making the conversation more equal than when they were smaller children. Another curious phenomenon involves status. If we saw someone in a special suit opening the door of a luxury automobile for a female, we do not know if it is because of gender, her status or because she was merely a passenger. All of us might draw different conclusions.
Author
Simulation; Hierarchies; Emotions; Judgments; Psychology; Words (Language); Sociology

60
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*.

20070025318 Space and Naval Warfare Systems Command, San Diego, CA USA
Real-Time Online Communications: 'Chat' Use in Navy Operations
Heacox, Nancy J; Moore, Ronald A; Morrison, Jeffrey G; Yturralde, Rey F; Jun 2004; 13 pp.; In English
Report No.(s): AD-A465828; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The ability to conduct a real-time conversation online has become a ubiquitous component of today's communications environment. Commonly referred to as chat or instant messaging, this mode of communication provides users with a format that facilitates multi-tasking conversation with other duties. Chat has also become a critical tool in military command and control, as evidenced by its extensive use during both Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). A recent survey of fleet users during OIF provided detailed information and insights about chat usage patterns and warfighter requirements for chat tools. The results revealed positive and negative issues related to chat use in an operational environment. Issues included the need to monitor multiple chat rooms simultaneously; the lack of consistent business rules; requirements for chat rooms with different access privileges; and requirements for chat histories. The ability to work near real-time with peers is perceived to be a tremendous boost to productivity and greatly facilitates communication, cooperation, and coordination. This paper discusses the results of the survey and highlights areas where human factors and technology interventions may be able to facilitate chat use within US military command and control.
DTIC
Command and Control; Navy; On-Line Systems; Real Time Operation

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20070025275 Naval Research Lab., Washington, DC USA
Reliable Multicast Congestion Control (RMCC)
Macker, Joseph P; Adamson, R B; Jan 2000; 6 pp.; In English
Report No.(s): AD-A464925; XB-NRL/ITD/5500; No Copyright; Avail.: Defense Technical Information Center (DTIC)
At present, there are no standardized, Internet-based multicast transport protocols that provide effective, dynamic congestion control methods for safe, wide scale deployment of end-to-end rate adaptive applications (e.g., file transfer). Recent research and standardization efforts are beginning to address these issues. This paper describes ongoing research and development related to network congestion control mechanisms for multicast data transport. We concentrate on the design issues for reliable multicast protocols in particular and we describe our approach for adding dynamic congestion control to

a negative acknowledgement oriented protocol. We also present simulation and modeling results demonstrating prototype system performance, including analysis of Transport Control Protocol (TCP) fairness and router congestion indicators. We also relate our work to other ongoing research and standards development efforts.
DTIC
Congestion; Network Analysis; Protocol (Computers)

20070025279 Naval Research Lab., Washington, DC USA
CAPSL Interface for the NRL Protocol Analyzer
Brackin, Stephen; Meadows, Catherine; Millen, Jonathan; Jan 1999; 11 pp.; In English
Report No.(s): AD-A464994; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Common Authentication Protocol Specification Language (CAPSL) is a high-level language for applying formal methods to the security analysis of cryptographic protocols. Its goal is to permit a protocol to be specified once in a form that is usable as an interface to any type of analysis tool or technique, given appropriate translation software. This paper describes the first operational CAPSL translator to the language used by the NRL Protocol Analyzer (NPA), a software tool developed specifically for the analysis of cryptographic protocols.
DTIC
Computer Information Security; Cryptography; Data Transmission; Protocol (Computers); Security

20070025299 Naval Research Lab., Washington, DC USA
High Assurance Computer Systems: A Research Agenda
McLean, John; Heitmeyer, Constance; Jan 1995; 11 pp.; In English
Report No.(s): AD-A465571; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As computers and their supporting communication networks have become increasingly enmeshed in our national technological fabric, we have become increasingly dependent on high assurance computer systems, i.e., computer systems for which compelling evidence is required that the system delivers its services in a manner that satisfies certain critical properties. Obvious examples of high assurance systems include military systems (e.g., weapon systems, C4I systems, etc), flight programs for both commercial and military aircraft, air traffic control systems, financial and commerce systems, medical systems (including medical databases and medical equipment), etc. Less obvious examples are the various components of the information infrastructure that supports such systems and their communications (e.g., the NII). These systems are extremely complicated and the science and engineering principles that underlie them are yet to be completely worked out. Nevertheless, our national well-being depends upon these systems satisfying certain critical properties including: * security properties, which prevent unauthorized disclosure, modification, and withholding of sensitive information, even when under attack by a hostile agent; * safety properties, which prevent unintended events that result in death, injury, illness, or damage to or loss of property;
DTIC
Computer Design; Computer Programs

20070025305 Anteon Corp., Fairfax, VA USA
Standards Based Collaboration. Allowing Better Utilization of Existing Client Applications
Schmidle, Paul; Brinker, Nathan; Jun 2004; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465689; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The military has invested millions of dollars in collaborative technologies to facilitate faster planning, better situation awareness and more seamless coordination among dispersed forces. Despite this investment there has been little reduction in the size of fleet staffs and the actual impact of collaboration on the conduct of military operations has proved hard to measure. There are a number of problems that keep the military from enjoying the full benefit from the collaborative information environment. These problems include not using industry standards to permit interaction among vender specific synchronous collaborative tools. This paper will focus on improving collaboration among operational forces by using established standards to interconnect collaboration client endpoints. These endpoints include tool suites such as Lotus SameTime, DCTS (Defense Collaborative Tool Suite), H323 endpoints (NetMeeting), and CISCO IP Phones. Without standards based tool suites the information flow within the military will continue to be hampered by vendor specific collaboration stovepipes. The findings in this paper are based on observations and analysis from Fleet Battle Experiments and Limited Objective Experiments conducted by the Navy Warfare Develop Command (NWDC).
DTIC
Client Server Systems; Software Development Tools

20070025308 Honeywell, Inc., Albuquerque, NM USA

Military Data Link Integration Application

Sturdy, James T; Jun 2004; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465745; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The military uses tactical data link radios to send and receive digital voice, data, and video between vehicles and command and control facilities. These data link radios are interfaced to various mission computers and display systems. As outlined in the Joint Tactical Data Link Management Plan, a wide range of legacy military platforms will be upgraded to incorporate new data link radios through 2015 and beyond. The upgrade costs to do this will be enormous if traditional subsystem upgrade approaches are used. A need exists for a common, scalable and low cost military data link integration solution that can be used in multiple and disparate platform applications. The author will discuss such a design approach that can be used on each military platform application. The solution processes new and evolving messages with a database driven design so that the user can control message activation, deactivation, and processing instructions for each unique platform application. The database used for this capability is created by and maintained by the user. This allows a common design to work and to evolve on each unique platform without the need to modify the operational software.

DTIC

Data Links; Digital Systems; Display Devices

20070025343 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA

Adaptive Multilevel Middleware for Object Systems

Schantz, Richard E; Loyall, Joseph P; Rohloff, Kurt; Ye, Jianming; Manghwani, Prakash; Gabay, Yarom; Narasimhan, Priya; Paulos, Aaron; Gokhale, Aniruddha; Balasubramanian, Jaiganesh; Dec 2006; 205 pp.; In English

Contract(s)/Grant(s): NBCHC030119; Proj-Q53000

Report No.(s): AD-A465928; BBN-13029; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ARMS program researched and developed state-of-the-art technologies in dynamic quality of service and resource management, and applied them to the challenges of modern total ship Naval computing platforms. The program was organized in two phases, with Phase 1 concentrating on the research of underlying multi-layered resource management concepts and the design and prototyping of an integrated multi-layer resource management (MLRM) capability. Phase 2 then concentrated on additional research in areas building upon this MLRM capability, to develop significantly greater capabilities in the areas of resource and QoS management algorithms and MLRM fault tolerance, and to transition ARMS technologies to the Naval Program of Record (PoR). This report describes the research, development, and transition activities and results of the BBN Technologies project within the ARMS program.

DTIC

Applications Programs (Computers); Computers; Military Operations; Resources Management

20070025344 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD USA

Development of a Personal Digital Assistant Ergonomic Injury Assessment Tool

Chervak, Steven; Oct 2005; 33 pp.; In English

Contract(s)/Grant(s): MIPR-4EAAMM4062

Report No.(s): AD-A465936; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this study was to begin the development of a computer-based software tool to automate the survey and reporting functions for ergonomic assessments. Ten Department of Defense installations participated in the beta test. The program was tested for user acceptability in the areas of system design, checklist design and content, report design and content, and proficiency. The beta test showed that the tool developed is a good first step in the development of an ergonomic checklist tool. The beta test users responded that the tool met many of the requirements needed for an ergonomic survey checklist, and that with a little practice and effort the majority of users can become proficient with the system. This proficiency will allow users to maximize their time spent in ergonomic efforts. The beta test also showed that the tool needs further development relative to the reporting function before further implementation can proceed.

DTIC

Injuries; Portable Equipment; Software Development Tools

20070025351 Carnegie-Mellon Univ., Pittsburgh, PA USA

Understanding and Leveraging a Supplier's CMMI(Trademark) Efforts: A Guidebook for Acquirers

Elm, Joseph P; Dutton, Jeffery L; Ballagher, Brian P; Miluk, Gene; Nicol, Mike; Osiecki, Lawrence T; Phillips, Mike; Richter, Karen J; Rosa, Linda M; Wickless, Joe; Mar 2007; 89 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A465951; CMU/SEI-2007-TR-004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This guidebook is designed to help acquisition organizations benefit from their suppliers' use of CMMI for Development, which is a collection of best practices that addresses product development and maintenance activities throughout the product lifecycle. This guidebook also helps acquisition organizations avoid problems that can result from unrealistic expectations. High capability and maturity level ratings alone do not guarantee program success. This guidebook helps clarify what those ratings can and cannot do for a development program. It describes how acquirers can - interpret suppliers claims of achieving a CMMI rating - request, understand, interpret, and use supplier appraisal results, and - apply methods that leverage a supplier's process improvement initiatives.

DTIC

Acquisition; Handbooks

20070025356 Brown (M. J.) and Associates, San Diego, CA USA

Rapid Knowledge Formation in an Information Rich Environment

Brown, Jr, Martin J; Jun 2004; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465978; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper addresses the impact that increased availability of information has on decision making as an integral element of the command and control process and proposes a possible solution in the form of an Intelligent Assistant for Command and Control (IAC2). This IAC2 enhances current knowledge management technologies by emphasizing a dynamically responsive structure for information retrieval correlated to event recognition. The IAC2 employs technologies that are being investigated in connection with automated control of operations but limits their use to the search for information relevant to command decisions.

DTIC

Information Management; Information Systems

20070025362 Department of Defense, Washington, DC USA

Service-Oriented Architecture for Command and Control Systems with Dynamic Reconfiguration

Paul, Raymond A; Tsai, W T; Jun 2004; 50 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465985; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Command and Control (C2) systems are evolving as warfighting is changing. Modern warfighting needs a dynamic, adaptable and agile force supported by rapidly changing technology. Three important C2 system characteristics are: survivability, rapid development and evaluation, and interoperability. This paper proposes a Service-Oriented Architecture with Dynamic Reconfiguration (SOADR) for the DoD enterprise C2 system. The proposed SOADR is an extension of the existing Web Services (WS) architecture popularized by Microsoft's NET platform. In addition, the proposed SOADR includes a framework for the dynamic reconfiguration of services thus the C2 system can continue to operate in spite of attacks or service malfunction. With the dynamic reconfiguration framework, individual service can be added, removed, and replaced at runtime without interruption of the system operations. The dynamic reconfiguration policy is governed by the C2 policies that may be obtained through the real-time COIs at runtime based on the information collected by situation-aware monitoring agents. The services are specified with scenario/ACDATE model and policies are specified using a formal specification language PSEL. A variety of service constraints such as survivability, security and performance can be verified and enforced at runtime through the proposed SOADR dynamic reconfiguration framework. This framework is also based on the standard protocols.

DTIC

Command and Control; Computer Programming; Deployment; Service Oriented Architecture; Software Engineering

20070025363 Northwestern Univ., Evanston, IL USA

RoboTA: An Agent Colony Architecture for Supporting Education

Forbus, Kenneth D; Kuehne, Sven E; Jan 1998; 3 pp.; In English

Report No.(s): AD-A465991; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Resources in education and training are always limited, and instructors almost never have enough time to spend on the

problems of their students. We believe that using a distributed agent architecture to provide coaches that operate outside software installed on the student's machine can provide valuable advantages in education and training. This paper describes RoboTA, an architecture for a colony of distributed agents aimed at supporting instructional tasks.
DTIC
Colonies; Computer Programs; Education

20070026211 Thales Services Div., Cergy-Pontoise, France
SimEC3: An Innovative Simulation Based Acquisition Tool for France's Cooperative Fighting System
Wiart, Bruno; Peyronnet, Pascal; Moity, Nicolas; Pradeilles, Frederic; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 16-1 - 16-18; In English; See also 20070026206; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The SimEC3 programme is developed by a Thales GIAT consortium led by Thales for the French MOD Procurement Agency (Delegation Generale pour l'Armement DGA) in the frame of the future developments of network centric warfare (NCW) weapon systems, in particular the future Light Armored vehicle (EC3). The purpose of this system is to provide a complementary approach to traditional Systems Engineering activities, allowing placing models of future weapon systems in a variety of operationally sound contexts, for assessment of candidate architectures for the future Cooperative Fighting System (BOA). To supply the capability of modeling future architectures and weapon systems, the outstanding requirements for the design of SimEC3 were to provide: 1. an open and agile architecture based on simulation standards such as HLA and SEDRIS, to ensure that new models, either different or more detailed, could be easily added to the delivered system to extend its capabilities; 2. a preparation toolset to easily edit weapon systems, networks and CIS technical characteristics such as entity performances, doctrines, behavior rules, Order of Battle definitions, NCW operational scenario and metrics to be collected from the simulation for further analysis and assessment of the architecture under evaluation; 3. a simulation execution kernel based on a distributed architecture, making best use of both the DGA Escadre framework and the Thales ATMS framework; 4. simulation models defined with the experts from the Thales Group and GIAT as well as those from various departments of the DGA, and assessed by applying a dedicated VV&A process; 5. assessment tools based on a very innovative Multi-Criteria Decision Making (MCDM) technology which uses a sophisticated aggregation model based on fuzzy logic combined with the Choquet's Integral Mathematical Model. This provides on the one hand synthetic and detailed information on the forces efficiency related to their tactical performances, life cycle cost, human factors and programmatic aspects, and on the other hand recommendations to the analysts for further optimizations of the solution according to the main criteria being studied.
Author
Computerized Simulation; Systems Engineering; France; Architecture (Computers); Data Acquisition; Weapon Systems

20070026212 Industrieanlagen-Betriebsgesellschaft m.b.H., Germany
VIntEL: An Environment for Distributed Collaborative Simulation Integration and Application
Neugebauer, Eckehard; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 17-1 - 17-8; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

VIntEL stands for Verteilte Integrierte Erprobungs Landschaft (Distributed Integrated Testing Environment). VIntEL is part of the Simulation- and Test-Environment which will support the Transformation Process of the German Armed Forces. The first demonstration of VIntEL took place successfully in October 2004. In this experiment a constructive simulation system was federated with several virtual platform simulators and real systems in order to investigate the performance of different types of unmanned reconnaissance vehicles in a typical tactical environment. The systems were distributed over four locations (two sites in Meppen, one in Lichtenau and one in Greding). Federating of these systems by distributed working teams took only six weeks using the PSISA middleware to create the HLA interfaces of the HLA-federates and using two different RTIs (GERTICO and DMSO). A suitable subset of the RPR FOM was used. This first VIntEL experiment demonstrated the feasibility of an effective, distributed and collaborative development of a federation of different simulation systems and real systems. Further experiments using expanded simulation infrastructure functionalities are planned for 2005 and 2006.
Author
Distributed Processing; Systems Integration; Programming Environments; Systems Simulation; Applications Programs (Computers)

20070026213 QinetiQ Ltd., Farnborough, UK

A Critique of the Live Synthetic Trials Balance to Support the Smart Acquisition Cycle - Better Dead than Alive?

Kelly, Michael; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 15-1 - 15-10; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A recent project was carried out for UK MoD to assess the advantages and disadvantages of changing the balance of trials, exercising and experimentation versus modelling and simulation techniques (including Synthetic Environments (SEs)) used in support of the various stages of the smart equipment procurement regime. The findings from which have generated the debate presented here into the advantages and disadvantages of field trials over simulation techniques. Anecdotal and substantive evidence on the effectiveness of Synthetic Environments (SE) is presented, drawn from recent history of their use in significant modelling and simulation events. These events include the Synthetic Environment Coordination Office national capability demonstrator programmes, synthetic environment experiments, and Niteworks programmes among others. The modelling errors that can occur in SE s and the Verification, Validation and Accreditation issues are considered. A critique of field trials and experimentation is also presented highlighting experimental design limitations and human factor issues arising from them. The gathering of data (objective and subjective), the experimental designs and the cost issue of field trials are addressed. The two broad analytical domains (trials and SEs) are then compared and suggestions are made for selection of one technique over the other for the various phases of the CADMID cycle (Concept, Assessment Demonstration, Manufacture In-Service and Disposal). Recommendations are also made for modification to the UK defence equipment procurement business process to maximise the effective use of supporting trials of modelling techniques. The evidence presented suggests that the assumed superiority and frequent choice of field trial s over SE modelling techniques needs more careful and substantive consideration than it commonly receives.

Author

Coordination; Simulation; Experiment Design; Physical Exercise; Domains; Errors

20070026332 Research and Technology Organization, Neuilly-sur-Seine, France

Integration of Modeling and Simulation

September 2006; In English; NATO Integration of Modelling Simulation Group Lecture Series, 7-8 Nov. 2005, Stockholm, Sweden; See also 20070026333 - 20070026340

Report No.(s): RTO-EN-MSG-043; AC/323(MSG-043)TP/24; Copyright; Avail.: CASI: C01, CD-ROM

The charter of the NATO Modeling and Simulation Group (NMSG) is to promote cross-alliance awareness of trends, practices and principles within the field. The purpose of Lecture Series MSG-043 (Integration of Modeling and Simulation) therefore is to foster the sharing and exchange of information equally between local M&S practitioners and intergovernmental decision makers alike. Designed primarily with the novice in mind, these lectures also serve as a suitable refresher or update for those already attuned to the topical M&S issues within the alliance. Equally footed within both operational and technical constructs, the audience is exposed to the underpinnings driving M&S today in its current environment. As evident from previous iterations, this exchange of ideas amongst the participants further NMSG s aims to achieve cohesion and interoperability. As a continuation of the successful venues conducted November of 2005 at Stockholm, Sweden and Bucharest, Romania, three additional locations were added namely: Ljubljana, Slovenia from 9-10 October, 2006; Ankara, Turkey from 12-13 October, 2006 and Farnborough, UK from 16-17 October, 2006.

Author

Systems Integration; Computerized Simulation; Mathematical Models; Software Engineering; Architecture (Computers)

20070026333 Cranfield Univ., Cranfield, UK

General Interoperability Concepts

Searle, Jonathan; Integration of Modeling and Simulation; September 2006, pp. 3-1 - 3-8; In English; See also 20070026332; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Interoperability has long been the Holy Grail within defence communities world wide particularly of late with the increase in joint and coalition operations. The shift to an increased use of M&S for training and mission rehearsal has seen a transfer of similar issues across to the M&S realm. Interoperability of distributed simulation systems began wider use in the early

1980's and has seen steady increase ever since. The concept of reuse has also become more prominent as it is closely related to, and can facilitate, interoperability the primary question here is at what level does one focus reuse efforts. Benefits do not come without their challenges. Many technological issues have been addressed over the past two decades with a certain degree of success. One must also address non-technical challenges those challenges that have their roots in practical and conceptual level views of the problem domain. Finally, as the overlap between the M&S realm and the real world grows, more challenges will surface.
Author
Interoperability; Computerized Simulation; Models; Systems Engineering

20070026336 Battle Command, Simulation and Experimentation Directorate, Washington, DC, USA
Scenario Design
Little, Daniel; Integration of Modeling and Simulation; September 2006, pp. 7-1 - 7-8; In English; See also 20070026332; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The world of Modelling & Simulation remains an enigma to most, especially considering the level of technicality applied to the various sciences supporting its proliferation. Nowhere but this field does one see a confluence of algorithms, software programming, information systems, C4ISR and of late - web-based design. What is not fair however is to pigeonhole M&S professionals into laboratory clinicians because the activities are much broader than one realizes. Despite its technical connotations, M&S is also about people and processes within the context of organisational structures. It is based on these variables that M&S is also defined by issues addressing planning, operational application and satisfying those 'what if?' questions in analysis. All of the advanced technologies in this field are for naught if the insights to better staff processes and command decisions are not attained or far worse, not pursued. To do this, I need to initiate you into the world of scenario development in relation to supporting an exercise or mission rehearsal. One of the misnomers in scenarios involves what we call 'training objectives.' Training objectives are preconceived constructs addressing the degree of preparation and practice necessary to execute the mission in real life. The problem with training objectives per se is that they exist at the macro level and cannot influence events without precursor activities or 'building blocks' to achieve that end. These activities or building blocks are what I call 'themes.' What is significant about themes is the fact that one of them can on occasion apply to one or more training objectives. Take for instance activities found in Crisis Response Operations or CRO.1 Attaching security to an NGO food delivery stabilizes a humanitarian situation plus it keeps belligerent elements intent on robbery or pilferage in check. As a solitary event, this is for many staffs very manageable - reality however dictates otherwise. A competent military staff must not only prioritize but also matrix the energies of its forces in the right proportion based on situational awareness. That is why I disdain efforts by some who feel that noise is essential in keeping the staffs fully occupied in training and education environments. For those that have served in theatre, initial reports supporting real-life themes or training objectives are complex enough without the negative training variable of noise to sort through.
Author
Software Engineering; Design; Information Systems; Computer Systems Design; Simulation; Situational Awareness

20070026337 Battle Command, Simulation and Experimentation Directorate, Washington, DC, USA
Locating M&S Information
Little, Daniel; Integration of Modeling and Simulation; September 2006, pp. 5-1 - 5-4; In English; See also 20070026332; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper presents information on how and where to find Modelling and Simulation (M and S) resources. The contents include: 1) Learning Objectives; 2) Knowing the Answers Before You Ask; 3) What is the role and purpose of NATO RTO & NMSG?; 4) What Publications are Available from NATO?; 5) What Publications are Available from the US?; 6) Where can I Find an On-line Glossary for M&S Terms?; 7) What are the International Standards in M&S?; 8) How Does One Model the Environment?; 9) How Do I Talk About Modelling Domestic Resilience?; 10) Where are the Simulation Centres of Excellence?; and 11) Where can I Send my Country Representative for a Postgraduate M&S Degree?
CASI
Computerized Simulation; Models; Information Dissemination; Defense Program

20070026339 Cranfield Univ., Cranfield, UK

Simulation Components

Searle, Jonathan; Brennan, John; Integration of Modeling and Simulation; September 2006, pp. 6-1 - 6-12; In English; See also 20070026332; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The fundamental concept of simulation dates back thousands of years to the ancient Egyptians and the famous Chinese war strategist SunTzu. Notwithstanding these initial attempts at replicating ancient battlefields, current day machine-based modelling and simulation (M&S) found its roots in the early 20th Century. During this dawning era, the majority of M&S efforts were carried out in isolation. One may not find this so surprising when one considers the fundamental definition of a model: a representation of an element of the real world for a specific purpose. Working in isolated domains on specific applications, M&S developers created bespoke solutions to precise problems. Modelling and simulation has undergone a significant maturation process over the past few decades. Early on, the M&S realm represented only a very small portion of the real world. Systems such as flight simulators, SimNet1 and operational analysis (OA) models, although based on real world requirements, had no direct physical connection to the real world domains. Technology growth led to an expansion within the M&S realm, allowing practitioners to address a larger subset of real world applications with more comprehensive and complex representations. Today, the M&S realm has achieved an overlap with the real world wherein simulation information is viewed coincident with the real world. The advances and growth referred to above has resulted in a virtual explosion in the elements and components associated with simulation. These components can be divided into two categories: those associated with the science and technology of simulation itself; and those more closely related to the human and cultural aspects of the M&S community. The first section of this paper introduces the concept of synthetic environments as a means of establishing some common ground for further discussion. The remainder of the paper will take a closer look at some of the technical and non-technical components of simulation.

Derived from text

Computerized Simulation; Models; Systems Engineering; Components; Operations Research

20070026340 Cranfield Univ., Cranfield, UK

Interoperability Architectures

Searle, Jonathan; Brennan, John; Integration of Modeling and Simulation; September 2006, pp. 4-1 - 4-8; In English; See also 20070026332; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The first paper in this series addressed the general concepts of interoperability within the modelling and simulation (M&S) realm. The next stage, within the context of the lecture series as a whole, is to examine interoperability from an integration perspective. To accomplish this, one must look at the manner in which simulations (and their components) can be bolted together. Furthermore, to ensure a complete assessment is conducted one must consider more than just the technical aspects of interoperability and integration; it is critical that one gives due attention to the organisational, cultural and economic aspects of integration as well. As such, one can state that the main challenges of interoperability and integration within the M&S realm are composed of a mix of engineering, technical and conceptual issues. The primary aim of this paper is to consider the integration and interoperability of M&S with particular emphasis on federated and distributed simulations. To address this aim it is important for one to begin with a basic understanding of the significant terms within the statement, in the context of M&S. First of all, the term interoperability is meant to imply the ability of a given system to exchange data or information, and perform its required functions in concert with other distinctly separate systems. The term integration refers to the induction or amalgamation of M&S systems into existing programmes or studies such as training and acquisition. Therefore, in simulation speak, interoperability relates to the creation of federations whereas integration relates to the application of the federations. Finally, one must also explore the issues of composability and architectures two fundamental elements underpinning interoperability and integration within the synthetic environment realm.

Derived from text

Interoperability; Architecture (Computers); Computerized Simulation; Systems Integration; Models; Distributed Interactive Simulation

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.

20070025277 Naval Research Lab., Washington, DC USA
Private Web Browsing
Syverson, Paul F; Reed, Michael G; Goldschlag, David M; Jun 2, 1997; 14 pp.; In English
Report No.(s): AD-A464972; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes a communications primitive, anonymous connections, that supports bidirectional and near real-time channels that are resistant to both eavesdropping and traffic analysis. The connections are made anonymous, although communication need not be. These anonymous connections are versatile and support private use of many different Internet services. For our purposes, privacy means maintaining the confidentiality of both the data stream and the identity of communicating parties. These are both kept confidential from network elements as well as external observers. Private Web browsing is achieved by unmodified Web browsers using anonymous connections by means of HTTP proxies. Private Web browsing may be made anonymous too by a specialized proxy that removes identifying information from the HTTP data stream. This article specifies anonymous connections, describes our implementation, and discusses its application to Web browsing via HTTP proxies.
DTIC
Cryptography; Internets; Security

20070025283 RSA Labs., Bedford, MA USA
High-Power Proxies for Enhancing RFID Privacy and Utility
Juels, Ari; Syverson, Paul; Bailey, Dan; Jan 2005; 19 pp.; In English
Report No.(s): AD-A465254; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A basic radio-frequency identification (RFID) tag is a small and inexpensive microchip that emits a static identifier in response to a query from a nearby reader. Basic tags of the smart-label variety are likely to serve as a next-generation replacement for barcodes. This would introduce a strong potential for various forms of privacy infringement, such as invasive physical tracking and inventorying of individuals. Researchers have proposed several types of external devices of moderate-to-high computational ability that interact with RFID devices with the aim of protecting user privacy. In this paper, we propose a new design principle for a personal RFID-privacy device. We refer to such a device as a REP (RFID Enhancer Proxy). Briefly stated, a REP assumes the identities of tags and simulates them by proxy. By merit of its greater computing power, the REP can enforce more sophisticated privacy policies than those available in tags. (As a side benefit, it can also provide more flexible and reliable communications in RFID systems.) Previous, similar systems have been vulnerable to a serious attack, namely malicious exchange of data between RFID tags. An important contribution of our proposal is a technique that helps prevent this attack, even when tags do not have access-control features.
DTIC
Consumers; Data Transmission; Privacy; Radio Frequencies; Security

20070025286 Naval Research Lab., Washington, DC USA
A Framework for MLS Interoperability
Kang, Myong H; Froscher, Judith N; Moskowitz, Ira S; Jan 1996; 9 pp.; In English
Report No.(s): AD-A465306; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Distributed object-oriented computing (DOC) is a new computing paradigm that promotes component-based development, location independence, scalability, software reuse, etc. Users of multilevel security (MLS) technology want to take advantage of these new technologies. However, the process of incorporating new technologies into MLS products is slower than the analogous process for non-secure commercial products because MLS products must go through rigorous evaluation/certification procedures. We propose an architectural framework that speeds up the process of introducing new technologies to MLS users. We examine the drawbacks of traditional MLS approaches and take a fresh look at the requirements of MLS users. We then introduce security-critical components that can enable MLS solutions and an MLS

architectural framework that can accommodate not only legacy systems but also new technologies, including DOC, without jeopardizing system security. Our framework separates security critical components/functions from the rest of the system because these components must go through rigorous evaluation/certification processes. This approach enables the secure use of new technologies for MLS users.
DTIC
Interoperability; Microwave Landing Systems; Security

20070025291 Naval Research Lab., Washington, DC USA
Group Principals and the Formalization of Anonymity
Syverson, Paul F; Stubblebine, Stuart G; Sep 1999; 21 pp.; In English
Report No.(s): AD-A465533; No Copyright; Avail.: Defense Technical Information Center (DTIC)
We introduce the concept of a group principal and present a number of different classes of group principals, including threshold-group-principals. These appear to be naturally useful concepts for looking at security. We provide an associated epistemic language and logic and use it to reason about anonymity protocols and anonymity services, where protection properties are formulated from the intruder's knowledge of group principals. Using our language, we give an epistemic characterization of anonymity properties. We also present a specification of a simple anonymizing system using our theory.
DTIC
Computers; Logic Design; Security

20070025292 SRI International Corp., Menlo Park, CA USA
Fail-Stop Protocols: An Approach to Designing Secure Protocols (Preprint)
Gong, Li; Syverson, Paul; Sep 1995; 13 pp.; In English
Report No.(s): AD-A465535; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)
We present a methodology to facilitate the design and analysis of secure cryptographic protocols. We advocate the general approach, and a new avenue for research, of restricting protocol designs to well-defined practices, instead of ever increasing the complexity of protocol security analysis mechanisms to deal with every newly discovered attack and the endless variations in protocol construction. In particular, we propose a novel notion of a fail-stop protocol, which automatically halts in response to any active attack that interferes with protocol execution, thus reducing protocol security analysis to that of passive attacks only. We suggest types of protocols that are fail-stop, outline some proof techniques for them, and use examples to illustrate how the notion of a fail-stop protocol can make protocol design easier and can provide a more solid basis for some available protocol analysis methods.
DTIC
Failure; Interprocessor Communication; Protocol (Computers); Security

20070025293 Naval Research Lab., Washington, DC USA
Determining Security Requirements for Complex Systems with the Orange Book
Landwehr, Carl E; Lubbes, H O; Jan 1985; 13 pp.; In English
Report No.(s): AD-A465540; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The DoD Trusted Computer System Evaluation Criteria define requirements corresponding to specified levels of security functions and assurance. They do not, however, help determine what level system is required for a specific environment. A simplistic technique has been proposed for this purpose that takes into account only the classification of the most sensitive information processed by a system, the clearance of its least-cleared user, and the environment in which it was developed. This paper offers a straightforward but richer technique a developer can use to map a specific system architecture and application environment to a particular requirement level as defined in the Criteria. It accounts for differences in functions provided to different users and the ways users can invoke those functions, as well as for users' clearances and the sensitivity of data. This technique is applicable throughout the system life cycle, so that security requirements can be updated as changes to system structure and function occur.
DTIC
Clearances; Complex Systems; Requirements; Security; Warning Systems

20070025300 Naval Research Lab., Washington, DC USA

Multicast Tree Construction in Directed Networks

Klinker, J E; Jan 1996; 6 pp.; In English

Report No.(s): AD-A465573; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Significant interest exists within the military in moving towards an integrated services environment where traditional network services such as ftp, telnet, and e-mail can co-exist with real-time services such as voice, video, and satellite imagery. Multicast routing is an effective means of providing the efficient utilization of network resources required to realize such an environment. Traditional multicast routing algorithms assume a symmetric network topology. Many military communication assets are either asymmetric in their load or asymmetric in capacity (a good example is Direct Broadcast Satellite). In addition, many military communication assets are bandwidth constrained, and routing symmetrically may further contribute to congestion. Therefore, multicast tree construction which tolerates network asymmetry is desirable for many military communication environments. This paper proposes an algorithm for constructing shared multicast distribution trees in networks with asymmetric link capacities or loads. The algorithm tolerates asymmetry by building distinct, loop-free, sender and receiver paths onto a shared delivery tree. Additionally, the algorithm exhibits desirable security properties. Simulation results are presented that demonstrate the lower tree cost and better load balancing characteristics of the resultant trees over shortest path trees, with only a modest increase in path length.

DTIC

Construction; Internets; Military Technology; Protocol (Computers)

20070025313 Collaborx, Inc., Colorado Springs, CO USA

SYNAPSE: 'Poly-Genetic Quantum Architecture for Command, Control, and Execution (C2E)' [Preprint]

Oppelaar, Samuel R; Jun 2004; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465816; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Operations in future crisis and conflict will rely on superior networked information that will enable the warfighter to have decision superiority over the adversary, while shifting power to the edge of warfighting units. The creation of coherent effects on the global battlespace will also be dependent on the full integration and coherent application of all instruments of national power. The Synapse architecture is a visionary concept that will enable this free flow of information across the military forces, inter-agencies, and multi-national partners. The Synapse architecture has two main conceptual components. First, the development and application of quantum computing and mechanics forms the backplane for the operation of the system. This revolution in computing technology gives the system its overwhelming speed, connectivity, and interoperability with all participants. Information will be instantaneously available throughout the network. And second, the concept of polydiscipline construction of the Synapse network joins together in a real-time collaborative architecture, all of the instruments of national power. Human machine interface capabilities such as Visual Focus Directive (VFD) and Full Voice Control (FVC), will give the warfighter in the field unparalleled interface with the Synapse terminal. The result of exploring and prototyping the Synapse could be a wholesale re-innovation of a collaborative information environment .

DTIC

Command and Control; Genetics

20070026098 Naval Research Lab., Washington, DC USA

A Network Pump

Kang, Myong H; Moskowitz, Ira S; Lee, Daniel C; May 1996; 11 pp.; In English

Report No.(s): AD-A465278; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A designer of reliable multi-level secure (MLS) networks must consider covert channels and denial of service attacks in addition to traditional network Performance measures such as throughput, fairness, and reliability. In this paper we show how to extend the NRL data Pump to a certain MLS network architecture in order to balance the requirements of congestion control, fairness, good performance, and reliability against those of minimal threats from covert channels and denial of service attacks. We back up our claims with simulation results.

DTIC

Architecture (Computers); Computer Networks

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*.

20070025230 Lawrence Livermore National Lab., Livermore, CA USA
State of the Art in Graph-Based Pattern Matching
Gallagher, B.; Mar. 31, 2006; 16 pp.; In English
Report No.(s): DE2007-895418; UCRL-TR-220300; No Copyright; Avail.: Department of Energy Information Bridge

The task of searching for patterns in graph-structured data has applications in such diverse areas as computer vision, biology, electronics, computer aided design, social networks, and intelligence analysis. As such, work on graph-based pattern matching spans a wide range of research communities. Due to variations in graph characteristics and problem requirements, graph-based pattern matching is not a single problem, but a set of related problems. This paper presents a survey of existing work on graph-based pattern matching, describing variations among graph matching problems, general and specific solution approaches, evaluation techniques, and directions for further research. An emphasis is given to techniques that apply to general graphs with semantic characteristics. The survey also discusses techniques for graph mining, an extension of the graph matching problem.
NTIS
Pattern Recognition; Graphs (Charts); Image Processing; Image Analysis

20070025424 Santa Ana Police Depart., Santa Ana, CA, USA
Algorithmic Image Matching (AIM): Project Analysis for Santa Ana Police Department
Apr. 19, 2000; 17 pp.; In English
Contract(s)/Grant(s): NCJRS-97-IJ-CX-K011
Report No.(s): PB2007-108985; No Copyright; Avail.: CASI: A03, Hardcopy

Many organizations throughout the USA have adopted an electronic mug imaging system. These systems have proved to be a reliable source for storing and retrieving biographical and image information. Most have restrictions on the physical descriptions and types of searches available. Pacer Infotec Inc. partnered with the Santa Ana Police Department to develop, integrate, implement, test, and evaluate a mug identification imaging system that exceeds the current generation of mug imaging systems. During this partnership, Pacer Infotec Inc. seamlessly integrated an algorithmic face-recognition engine into its existing MugMatch identification-imaging product. In addition to searching for suspects based on physical characteristics, Santa Ana Police Department can use photographs, composite drawings, and video surveillance clips as the template image and sort the resulting images into similar and dissimilar images. This technology assists investigators in identifying suspects by focusing on the most probable set of images.
NTIS
Algorithms; Image Analysis; Imaging Techniques; Police; Pattern Recognition; Face (Anatomy)

20070025470 Morgan, Lewis, and Bockius, Washington, DC, USA
Sensory Ego-Sphere: A Mediating Interface between Sensors and Cognition
Peters, Richard Alan, II, Inventor; 6 Oct. 2005; 25 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 30 Dec. 2004; US-Patent-Appl-11/025768; US 2005/0223176
Report No.(s): PB2007-105856; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025470

A Sensory Ego-Sphere (SES) is an interface for a robot that serves to mediate information between sensors and cognition. The SES can be visualized as a sphere centered on the coordinate frame of the robot, spatially indexed by polar and azimuthal angles. Internally, the SES is a graph with a fixed number of edges that partitions surrounding space and contains localized sensor information from the robot.
Official Gazette of the U.S. Patent and Trademark Office
Cognition; Mediation; Patent Applications; Robots; Spheres

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20070025288 New Mexico Univ., Albuquerque, NM USA
Calibration and Compensation of Instrumental Errors in Imaging Polarimeters
Tyo, J S; Hayat, Majeed M; Apr 1, 2007; 62 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0090
Report No.(s): AD-A465399; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The measurement and exploitation of polarization information has become a high priority in a variety of Air Force and DoD remote sensing missions. Polarization provides a useful dimension of information that helps to characterize shape and surface characteristics of interesting targets in optical imagery from the UV through the LWIR and beyond. There are a number of ongoing efforts that are developing specific instruments to quantitatively measure polarization information across a scene. We have discovered that polarization is important, but it can also be quite difficult to measure accurately. Optical systems designed to respond to polarization information are usually more complex than those that respond to spectral information. In addition, most polarimeters require linear combinations of multiple looks at a single pixel in order to infer the polarization parameters. In contrast, most spectral imagers (certain Fourier transform devices excepted) can form the spectrum at a pixel in a single integration time without comparing measurements from different sensors. Because polarization imagers are more complex, uncalibrated instrumental errors can be even more damaging to the quality of the final imagery. This research project was focused on understanding the instrumental effects on imaging polarimeters and compensating for them in the final imagery.
DTIC
Calibrating; Detection; Errors; Imaging Techniques; Infrared Imagery; Polarimeters; Remote Sensing

20070025290 Naval Research Lab., Washington, DC USA
A Model of Computation for the NRL Protocol Analyzer
Meadows, Catherine; Jan 1994; 7 pp.; In English
Report No.(s): AD-A465465; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper we develop a model of computation for the NRL Protocol Analyzer by modifying and extending the model of computation for Burroughs, Abadi, and Needham (BAN) logic developed by Abadi and Tuttle. We use the results to point out the similarities and differences between the NRL Protocol Analyzer and BAN logic, and discuss the issues this raises with respect to the possible integration of the two.
DTIC
Analyzers; Computation; Cryptography; Protocol (Computers)

20070025303 Kansas Univ., Lawrence, KS USA
kappa-Version of Finite Element Method: A New Mathematical and Computational Framework for BVP and IVP
Surana, Karan S; Reddy, J N; TenPas, Peter W; Jan 2007; 138 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0298; F49620-03-1-0201
Report No.(s): AD-A465662; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Work performed during the third year of the Grant: (1) Preliminary research on fluid-solid interaction, development of mathematical models, computational methodology in hpk framework. (2) Preliminary research towards development of concepts for a priori and a posteriori error estimation in hpk mathematical and computational framework. (3) Re-discretizations, moving meshes and solution mapping strategies and associated computational infrastructures for BVPs and IVPs in hpk framework (Appendix A contains technical report on this work).
DTIC
Boundary Value Problems; Finite Element Method; Mathematical Models

20070025310 Pennsylvania State Univ., University Park, PA USA
Sound Radiation from an Enclosure
Fahnline, J B; Campbell, R L; Hambric, S A; Sep 5, 2002; 78 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465761; PSU/ARL-TR-02-018; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of the analysis is to demonstrate that the noise radiated from an existing enclosure can be predicted using finite

elements or experimental measurements for the structural vibrations and boundary elements for the acoustic analysis. Because the acoustic analysis proceeds straightforwardly once the structural vibrations have been determined, the finite element analysis is the main obstacle to making the predictions. Standard 'modal assurance criteria' (MAC) analyses are used to directly compare experimental measurements and finite element results and assess the accuracy of the finite element models. Methods for modeling rib-stiffened components are discussed extensively because of their importance in transmitting forces from the enclosure's shelves to its outer skin. The general conclusion is that this type of analysis is very useful for better understanding basic radiation mechanisms, but presently is not accurate enough for precisely predicting radiated noise levels. DTIC

Boundary Element Method; Enclosure; Finite Element Method; Sound Waves; Structural Vibration

20070025346 Illinois Univ., Urbana, IL USA

Development and Implementation of Practical Optimal LES Models

Moser, R D; Adrian, R J; Mar 31, 2007; 75 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-04-1-0032

Report No.(s): AD-A465938; No Copyright; Avail.: Defense Technical Information Center (DTIC)

One of the most promising techniques for the prediction of turbulent flows is that of Large Eddy Simulation (LES), in which an under-resolved representation of the turbulence is simulated numerically by modeling the effects of the unresolved small-scales on the simulation. Such simulations have been applied in several flows with reasonable success. However, there are several outstanding problems that need to be addressed before LES can fulfill its promise as a tool for turbulence prediction in engineering flows. The most serious problems limiting the usefulness of LES is the representation of turbulence near walls and other strong inhomogeneities and the dependence of models on the filter and/or numerical discretization. The optimal LES formulation provides a rigorous framework in which to address these issues and to develop and analyze LES models and simulations. Optimal LES modeling has been found to produce accurate LES simulations when based on reliable statistical information, so the primary thrust of the current research is to reduce or eliminate the need for empirical statistical input through theory and modeling of turbulence statistics. When small-scale isotropy is a valid assumption, the Kolmogorov theory and isotropy can provide much information. However, when inhomogeneity and anisotropy are strong, or the Reynolds number is not too large, more information will be required, and models for this are being developed, particularly for near-wall turbulence. Theoretical models for the turbulence multi-point correlations allow optimal LES models to be implemented relatively simply in production CFD codes, and preliminary implementations in FDL3DI at AFRL have been pursued. DTIC

Large Eddy Simulation; Simulation; Turbulent Flow

20070027745 NASA Langley Research Center, Hampton, VA, USA

Blurring the Inputs: A Natural Language Approach to Sensitivity Analysis

Kleb, William L.; Thompson, Richard A.; Johnston, Christopher O.; June 25, 2007; 12 pp.; In English; 18th AIAA Computational Fluid Dynamics Conference, 25-28 Jun. 2007, Miami, FL, USA; Original contains color and black and white illustrations

Report No.(s): AIAA Paper-2007-4206; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070027745

To document model parameter uncertainties and to automate sensitivity analyses for numerical simulation codes, a natural-language-based method to specify tolerances has been developed. With this new method, uncertainties are expressed in a natural manner, i.e., as one would on an engineering drawing, namely, 5.25 +/- 0.01. This approach is robust and readily adapted to various application domains because it does not rely on parsing the particular structure of input file formats. Instead, tolerances of a standard format are added to existing fields within an input file. As a demonstration of the power of this simple, natural language approach, a Monte Carlo sensitivity analysis is performed for three disparate simulation codes: fluid dynamics (LAURA), radiation (HARA), and ablation (FIAT). Effort required to harness each code for sensitivity analysis was recorded to demonstrate the generality and flexibility of this new approach. Author

Monte Carlo Method; Natural Language (Computers); Sensitivity Analysis; Direct Numerical Simulation; Mathematical Models; Computational Fluid Dynamics

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20070025282 Naval Postgraduate School, Monterey, CA USA

An Analytical Model That Provides Insights into Various C2 Issues

Taylor, James G; Neta, Beny; Shugart, Peter A; Jun 2004; 59 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465243; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper develops an analytical model that can very simply provide important insights into the consequences (in terms of combat outcomes) generated by different command and control (C2) architectures for information processing. A Lanchester-type model of force-on-force combat that reflects C2 architecture at the platform level is developed through a detailed analysis of the target-engagement cycle for a single typical firer in modern tank combat. The most significant new aspect of this model is the consideration of so-called parallel acquisition of targets (i.e., new targets can be acquired while a previously acquired target is being engaged). Computational results show that being able to effect parallel acquisition of targets will not only significantly increase a tank force's infliction of casualties on an enemy tank force, but also significantly reduce the number of casualties that are suffered. The model presented here is developed using Taylor's new methodology for Lanchester attrition-rate coefficients under conditions of stochastic line of sight. This methodology allows greater micro-combat detail than has ever been possible in Lanchester-type models. Hence, it has opened up new vistas for the mathematical modeling of force-on-force combat. Twenty-one briefing charts summarize the presentation.

DTIC

Combat; Command and Control; Line of Sight; Markov Processes; Mathematical Models; Simulation; Target Acquisition; Targets; Warfare

20070025289 Stanford Univ., Stanford, CA USA

Architectures for Secure and Robust Distributed Infrastructures

Lall, Sanjay; Beck, Carolyn; Boyd, Stephen; Doyle, John; Dullerud, Geir; Hadjicostis, Chris; Medard, Muriel; Prabhakar, Balaji; Srikant, Rayadurgam; Verghese, George; Apr 2, 2007; 35 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0365; Proj-5094

Report No.(s): AD-A465427; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The major barrier constraining the successful management and design of large-scale distributed infrastructures is the conspicuous lack of knowledge about their dynamical features and behaviors. Up until very recently analysis of systems such as the Internet, or the national electricity distribution system, have primarily relied on the use of non-dynamical models, which neglect their complex, and frequently subtle, inherent dynamical properties. These traditional approaches have enjoyed considerable success while systems are run in predominantly cooperative environments, and provided that their performance boundaries are not approached. With the current proliferation of applications using and relying on such infrastructures, these infrastructures are becoming increasingly stressed, and as a result the incentives for malicious attacks are heightening. The stunning fact is that the fundamental assumptions under which significant large-scale distributed infrastructures have been constructed and analyzed no longer hold; the invalidity of these non-dynamical assumptions is witnessed with the greater frequency of catastrophic failures in major infrastructures such as the Internet, the power grid, the air traffic system, and national-scale telecommunications systems. This project is about network reliability and robustness in large-scale systems. To address the challenges posed by dynamical behavior of large-scale network infrastructures we bring to bear the tools and techniques of control theory together with those from communication networks and queuing theory. In particular, the algorithms and analytical approaches of control used for developing control strategies and logic are combined with protocol design methods to construct new, secure architectures for distributed networks.

DTIC

Communication Networks; Computer Networks; Security

20070025306 Clemson Univ., SC USA

Adaptive Tracking Control of On-Line Path Planners: Velocity Fields and Navigation Functions

McIntyre, M L; Dixon, W E; Dawson, D M; Xian, B; Jan 2004; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-99-1-0589

Report No.(s): AD-A465704; CU/CRB/8/20/04/ 1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Traditionally, robot control research has focused on the position tracking problem where the objective is to force the

robot's end-effector to follow an a priori known desired time dependent trajectory. Motivated by task objectives that are more effectively described by on-line, state-dependent trajectories, two adaptive tracking controllers are developed in this paper that accommodate on-line path planning objective. An example adaptive controller is first modified to achieve velocity field tracking in the presence of parametric uncertainty in the robot dynamics. The development aims to relax the typical assumption that the integral of the velocity field is bounded by incorporating a norm- squared gradient term in the control design so that the boundedness of all signals can be proven. An extension is then provided that targets the trajectory planning problem where the task objective can be described as the desire to move to a goal configuration while avoiding known obstacles. Specifically, an adaptive navigation function based controller is designed to provide a path from an initial condition inside the free configuration space of the robot manipulator to the goal configuration. Experimental results for each controller are provided to illustrate proof of validation of the approaches.
DTIC
Adaptive Control; Navigation; On-Line Systems; Robots; Trajectory Planning; Velocity Distribution

20070025331 Norwegian Defence Research Establishment, Oslo, Norway
Guiding Experimentation Efforts in Support of Transformation
Aas, Johan; Bergene, Trond; Jun 2004; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465895; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the context of transforming military forces, activities in Concept Development & Experimentation (CD&E) are increasingly seen as important with respect to the realization of needed capabilities in areas where there are no established solutions. Limited funding leads to a need for prioritization of proposed experiments. This paper describes a methodology that helps prioritize experimental activities on the basis of operational values, costs and risk profiles. The methodology has been developed in the project METEX (METhod for EXperimentation) conducted by Norwegian Defense Research Establishment (FFI) and Teleplan AS in Norway. The paper describes a decision support tool for prioritization of experimental activities based on operational need, operational value and the estimated cost and risk. For, assessing operational value, a network centric representation of the force structure is applied. The use of properties and gaps in this representation of the force structure is crucial in the methodology. The paper also briefly describes a web-based process framework, in which the assessment tool is incorporated. The web based framework serves as a guide through the experimentation process. The Norwegian Armed Forces plan to implement the methodology and associated process within this year (2004) to support the CD&E process.
DTIC
Military Technology; Research and Development; Research Management

20070025347 Carnegie-Mellon Univ., Pittsburgh, PA USA
Risk Management Considerations for Interoperable Acquisition
Meyers, B C; Aug 2006; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A465941; CMU/SEI-2006-TN-032; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report addresses interoperable risk management: the interoperability of organizations that engage in risk management in the context of a system of systems. The state of risk management practice -- the specification of standards and the methodologies to implement them -- is addressed and examined with respect to the needs of system-of-systems interoperability. The current practice is found to be insufficient to achieve interoperability with regard to risk management. A number of research questions are raised to associate this topic with the needs of the larger context of interoperable acquisition.
DTIC
Acquisition; Computer Programming; Interoperability; Management Planning; Organizations; Risk; Software Engineering

20070025349 Carnegie-Mellon Univ., Pittsburgh, PA USA
Schedule Considerations for Interoperable Acquisition
Meyers, B C; Sledge, Carol A; Nov 2006; 63 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A465943; CMU/SEI-2006-TN-035; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The role of schedule is fundamental to the acquisition of a particular system. This topic is of even more importance to

acquisition in a system-of-systems environment. This report examines the issue of schedule considerations for interoperable acquisition. First, a Gedanken red team project is used to explore concerns about schedule in interoperable acquisition. Then, those concerns are examined in light of current requirements regarding schedule. From that examination, several research questions are proposed.
DTIC
Acquisition; Computer Programming; Interoperability; Management Planning; Organizations; Schedules; Scheduling; Software Engineering

20070025437 Research and Technology Organization, Neuilly-sur-Seine, France
Visualisation and the Common Operational Picture
December 2005; In English; RTO Information Systems Technology Panel (IST) Workshop, 14-17 Sep. 2004, Toronto, Canada; See also 20070025438 - 20070025467; CD-ROM contains multi-media files.
Report No.(s): RTO-MP-IST-043; AC/323(IST-043)TP/29; Copyright; Avail.: CASI: C01, CD-ROM

This workshop brought together those who use COP systems, those who develop them, and those who make systems more usable and effective. The core objective was to have users talk with developers and researchers. The workshop was a forum for commanders and staff officers to describe the pros and cons of current tactical systems, which should help guide future military visualisation and COP research and development. The aim was to be multidisciplinary since both technological and human factors innovation collaborate in improving visualisation systems. The workshop identified problems and potential solutions to outstanding problems in visualizing the COP.
Author
Human Factors Engineering; Scientific Visualization; Systems Analysis; Systems Engineering; Information Systems

20070025438 European Aeronautic Defence and Space Co., France
COP Application: Dangers and Guidelines
dePeufeilhous, Oliver; Visualisation and the Common Operational Picture; December 2005, pp. 9-1 - 9-4; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Based on the experience of several years in development of C3I systems at joint and tactical levels in many countries, the paper presents the main dangers to avoid and some guidelines to follow for the design of Common Operational Picture application.
Author
Decision Making; Photographs; Models; Architecture (Computers)

20070025439 York Univ., Toronto, Ontario, Canada
GT Globe: A Web-Based Interoperable 3D Visualization Tool for Collaborative Common Operational Picture
Tao, Vincent; Stachniak, Szymon; Visualisation and the Common Operational Picture; December 2005, pp. 10-1 - 10-4; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

GT Globe is a true breakthrough solution for distributing and visualizing 3D spatial information over the web. Built on cutting-edge streaming technology, GT Globe is capable of working with data sets of unlimited size. Map and image data, 3D models and terrain data can be delivered to a wide variety of clients over distributed networks. The military needs distribution and visualization systems for handling large spatial data sets. Mission planning and scenario analysis requires sharing of large image, terrain data and 3D models. Simulation and analysis of modeled points of interest are no longer a luxury, they are a necessity. Modern planing and analysis requires that visualization of multi-resolution spatial data sets be done as quickly and as easily as possible. 2D methods for displaying such data exist, however they are not suited for displaying terrain surfaces which require 3D displays to analyze correctly. Today's 3D visualization systems suffer for various reasons. Many are not network based, making it impossible for personnel to share and update incoming data to multiple stations or field units. Many 3D systems are not multi-resolution, making analysis of a point of interest at both global and a local scales tedious, if not impossible. Systems currently in use that are both network ready, and multi-resolution suffer some of the greatest flaws, a lack of interoperability. To provide high performance visualization, these systems must rely on proprietary data storage formats, making their data hard to manage, update, and share with other existing Geographic Information Systems (GIS) currently in use by the military.
Author
Interoperability; Three Dimensional Models; World Wide Web; Computer Networks; Scientific Visualization

20070025440 Research and Technology Organization, Neuilly-sur-Seine, France
Network-Centric Warfare? Homeland Security?
Chipman, Susan; Cunningham, Bill; Horeczy, Christopher; Iaboni, Daniel; Jungert, Erland; Shoemaker, Garth; Taylor, Vincent; Visualisation and the Common Operational Picture; December 2005, pp. WG2-1 - WG2-4; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Computer, logistics and local social networks are all critical within the context of National Defence and Homeland Security. Each type of network is a potential target for adversaries not only in times of heightened tension but also when the perceived threat level is low. An undetected compromise of a network, affecting the ability of the network to function as expected could have disastrous consequences. Attacks that are detected but whose impact is not understood are equally dangerous. An undetected failure of a network element can be just as catastrophic. Either comprehend the network fully or eventually it will not work.
Author
Computer Networks; Computer Information Security; Logistics; Electronic Warfare

20070025441 Defence Research and Development Canada, Toronto, Ontario, Canada
Modeling 3D Frames of Reference for the Common Operational Picture
Hollands, Justin G.; Lamb, Matthew; Keillor, Jocelyn; Visualisation and the Common Operational Picture; December 2005, pp. 14-1 - 14-2; In English; See also 20070025437; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The intent of the common operational picture (COP) is to provide a shared understanding of the battlespace to improve responsiveness and provide decision dominance. A fundamental problem for this shared understanding is the co-ordination of views on an information/knowledge space. We argue that this problem is related to the frame of reference concept and present a framework for that concept that classifies those factors that improve or degrade performance when coordinating information across views of spatial data. We also consider similar display concepts from information visualization (depicting file structures, networks, the web, windows and other interface elements) and from display design guidelines from other domains (e.g., process control, medical imaging), and note the fundamental similarities. The relevant literatures underline a recurring need for depicting both global context and local content, which leads to the need for multiple displays, and methods for helping a user transition across multiple displays.
Author
Three Dimensional Models; Human-Computer Interface; Scientific Visualization; Imaging Techniques

20070025442 Naval Research Lab., Washington, DC, USA
Uncertainty and Spatial Transformations in Complex Visualizations
Trafton, Greg; Visualisation and the Common Operational Picture; December 2005, pp. 11-1 - 11-2; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Imagine a meteorologist preparing a weather forecast. In addition to years of experience and a vast store of domain knowledge, the forecaster has access to satellite images, to computer generated weather models and programs to display them in a variety of ways, and to an assortment of special-purpose tools that provide additional task-relevant data. There is no shortage of data, yet despite this array of resources, the task remains very challenging. One source of complexity is the uncertainty inherent in these data, uncertainty that takes many forms. Why are two weather models making different predictions? Are the models based on many observations or just a few? Are there enough observations in the model to trust it? Is one model more reliable than another in certain circumstances, and if so, what are they? Which one, if either, should he believe? How long ago were these data collected? How have things changed since the data were originally displayed? What is the real location of this front, and how is it affected by other changing variables, such as wind direction and speed, which may also have changed? To complicate matters further, the uncertainty in the data is not explicitly represented; rather, the visualizations indicate that the data are exactly as they appear. Figure 1 shows an example of the problem. The visualizations shows the output of a computational weather model that attempts to predict what the weather will be sometime in the future. The model data itself is highly uncertain, yet it is displayed as if it were certain. The visualization thus invites the forecaster to map uncertain data to certain values, yet to do so would most likely lead to erroneous predictions. How does he manage this incongruity, in order to develop the most accurate forecast possible? I suggest that in order to understand these complex visualizations, experts use spatial transformations (cognitive operations that a person performs on an internal representation (e.g., a mental image) or an external visualization (e.g., a computer-generated image)) to add their own understanding of

uncertainty. For example, a forecaster may mentally move around the location of a front and play with different scenarios in conditions of uncertainty. I have gathered data on two different domains that use complex visualizations: METOC (Meteorological and Oceanographic) forecasting and fMRI (functional Magnetic Resonance Imagery) and explore how the process of spatial transformations reduces the amount of internal uncertainty for experts in these domains. Importantly, I will show a variety of different methods that can be used from in vivo protocol analysis to afteraction interviews.
Author
Spatial Resolution; Scientific Visualization; Transformations; Weather Forecasting; Complexity

20070025443 Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany
A Knowledge-Based Human-Machine Interface for Future Naval Combat Direction Systems
Grandt, Moren; Distelmaier, Helmut; Pfendler, Claudius; Visualisation and the Common Operational Picture; December 2005, pp. 21-1 - 21-14; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Future command and control systems for naval ships must particularly meet the specific requirements emerged from the shift from blue-water scenarios of the past towards multinational peacekeeping missions, joined and combined operations and littoral warfare. Rapidly changing situations found especially in the Anti-Air warfare require decisions to be made in high dynamic and complex, i.e. mixed, environments. Since a support of operators by human personnel is out of discussion for financial reasons and is associated with questionable prospects of success, an essential basis for operator performance and situation awareness is an ergonomically optimized and operator-adaptive human-machine interface that facilitates all aspects of human handling. Supporting the cognitive phase of decision-making by means of computer-based assistance in the form of decision-support systems is another important aspect of future combat direction systems. This paper introduces a concept for an enhanced knowledge-based, humanmachine interface for future combat direction systems of naval ships, including the underlying models, techniques, and presumptions. The concept has been realized to some extend so that examples for the transformation from theory to practice can be given.
Author
Human Factors Engineering; Human-Computer Interface; Command and Control; Knowledge Based Systems; Combat; Navy

20070025444 Defence Research and Development Canada, Valcartier, Quebec, Canada
Novel Concepts for the COP of the Future
Gouin, Denis; Bergeron-Guyard, Alexandre; Visualisation and the Common Operational Picture; December 2005, pp. 2-1 - 2-12; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The US DoD has undertaken a significant transformation to implement Net-Centric Warfare. The new interoperability foundation is Net-Centric Enterprise Services (NCES). Rather than sharing the same applications (e.g. GCCS), the US DoD organizations and Allied countries would interoperate using their own applications but adhering to the same sets of Information Technology standards and sharing common services. The COP 21 Portal is a Situation Awareness Knowledge Portal, in line with NCES. COP 21 has a number of COP capabilities that contribute to improve situation awareness: 1) Single point of access to multiple information sources; 2) Filtering and categorizing information using Portfolio views; 3) Dissemination of information using Portfolios; 4) View of several documents together; 5) Contextual search services; 6) Web-Based Geographic Information System; and 7) Integration of application services in the portal. The COP 21 Portal has been tried out during JWID 04 with great success, allowing the validation of the current capabilities and the identification of improved COP capabilities.
Derived from text
Scientific Visualization; Data Integration; Display Devices; Operations Research; Defense Program

20070025445 IDELIX Software, Inc., Vancouver, British Columbia, Canada
Pliable Display Technology for the Common Operational Picture
Baar, David; Shoemaker, Garth; Visualisation and the Common Operational Picture; December 2005, pp. 13-1 - 13-4; In English; See also 20070025437; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The need to present an effective Common Operational Picture to international and joint forces is clear. However, the preponderance of data that is available from multiple geo-spatial and imagery intelligence sources, stove-piped applications,

plus other critical sources such as human and signals intelligence, presents significant problems. Time is of the essence, and accuracy is crucial, first in identifying threats and hazards, and second, in communicating key information to first responders and warfighters within a location context. We introduce the use of Pliable Display Technology for the presentation of data on computer displays to support the Common Operational Picture.
Author
Display Devices; Technology Utilization; Scientific Visualization; Multisensor Fusion

20070025446 Lockheed Martin Canada, Montreal, Quebec, Canada
Visualisation Issues in the Context of Information Fusion
Fiset, Jean-Yves; Duquet, Jean-Remi; l'Heureux, Helene; Visualisation and the Common Operational Picture; December 2005, pp. 6-1 - 6-8; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent advances in information technologies have allowed military Command and Control systems to absorb and distribute large amounts of data that often exceed the information processing capabilities of human beings. One of the technology enabler that can be used to address this issue is data fusion, which can be defined as the process of combining data to refine state estimates and predictions. Data fusion aims at reducing the complexity of the problem space by bringing together independent pieces of data to build higher level and more meaningful entities. Automated data fusion can produce several direct benefits, by optimizing the processing (in terms of speed, amount of information processed and quality of the fusion products) and freeing the operator from tedious, repetitive and error-prone tasks so he can focus on situation analysis. However, the association, correlation and combination processes rarely result in a clear, unambiguous statement; more typically, the combination of uncertain, incomplete and even contradictory information will produce a large tree of hypothesis with various levels of uncertainty and likelihood. This applies to position and velocity estimates, and also to identity estimation and higher-level inferences (e.g. situation and impact assessment). The system designer then faces the issue of how to present the fused products to the operator. Between the two extreme options of presenting the entire hypothesis tree or displaying only the most likely hypothesis, there is potentially a range of solutions that can be more beneficial to the operator in terms of understanding the operational picture. It has been said that ...the chief problem for information visualisation is often finding an effective mapping between abstract entities and a spatial representation.... However, visualisation must be considered in the context of the overall human-machine interface (HMI), as it constitutes one of its many components; it is thus necessary to consider them simultaneously. In this paper, we first review the generic data fusion process and describe issues related to the visualisation of its results. Then, a brief summary of Tagci, a novel HMI design method is provided, with justification for its potential use for data fusion applications. In particular, one building block of Tagci is described in more details as it is especially relevant to the monitoring of complex processes such as data fusion. Then, research issues that need to be addressed to further customize Tagci for data fusion applications are identified.
Derived from text
Scientific Visualization; Multisensor Fusion; Data Processing; Human-Computer Interface

20070025447 Wave Technologies, Inc., Chantilly, VA, USA
Information Fusion for Common Operational Understanding
Vanderbilt, K. C. S.; Desourdis, Robert I., Jr.; Visualisation and the Common Operational Picture; December 2005, pp. 7-1 - 7-4; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper discusses Hybrid Nonmonotonic Reasoning techniques and architectures for information fusion and Common Operational Understanding. We give an example of an application developed for Incident Commanders that uses these techniques along with specialized visualizations to give commanders understanding of their situation as well as course of action suggestions.
Author
Multisensor Fusion; Decision Making; Situational Awareness; Scientific Visualization; Human Factors Engineering

20070025448 Norwegian Defence Research Establishment, Horten, Norway
Map Generalization of Road Networks
Bjorke, Jan Terje; Visualisation and the Common Operational Picture; December 2005, pp. 17-1 - 17-8; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The present paper introduces a new algorithm for the elimination of arcs in road maps. The algorithm is based on

information theory. A case study illustrates how the algorithm works. The perceptual properties of the map reader and the resolution of the display unit are brought into the algorithm by a similarity function.
Author
Algorithms; Information Theory; Topology; Mapping; Roads

20070025449 Waterloo Univ., Ontario, Canada
Designing Virtual Trailblazing for Battlespace Visualisation
MacGregor, Carolyn G.; Iaboni, Daniel; Visualisation and the Common Operational Picture; December 2005, pp. 15-1 - 15-4; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In order to maximize the Common Operational Picture, interactive displays of large-scale complex computer rendered environments must allow for effective navigational techniques. This is no small challenge, given the current state of virtual environment technology, 3D input devices, and limited knowledge regarding human factors-based best practices for human way-finding and navigation. In theory, integrating 3D computer renderings of the real world allows command personnel to plan and simulate battlespace tactics from the perspective of both ground and air. However, change in viewpoints without proper reference points or landmarks can lead to disorientation for the human user. Human factors issues pertaining to navigation in virtual environments and the need to extend the scientific knowledge base concerning ways of effectively improving human navigation in complex or landmark-sparse environments are discussed. In addition, conceptual designs for virtual trailblazing techniques are proposed.
Author
Virtual Reality; Scientific Visualization; Human Factors Engineering; Systems Engineering; Warfare

20070025450 Thales Raytheon Systems, Massy, France
Comparison and Awareness of Situation (COMPAS)
Faye, Jean-Pierre; Visualisation and the Common Operational Picture; December 2005, pp. 1-1 - 1-10; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since the French COP demonstration at JWID '01, the concept of decisional COP has been illustrated. This concept was based on the extrapolation of the current situation from the operational situation using the operational plan. In 2001, this demonstration was incomplete due to the lack of available planning tools. Since the end of 2003, the NATO new planning capabilities offered with TOPFAS make possible the implementation of some initial decisional COP capabilities, as demonstrated during JWID '04. The JWID '04 FR COP demonstrator (COMPAS) compares the current operational situation with the planned situation. The current operational situation is obtained through standard AdatP-3 messages. The tasks of operation are extracted from the TOPFAS task tree. Associated units are identified through the Troop to Task Rules elements. Task view filtering allows to show the units per task and associated graphical layers. The units real location provided by the operational situation is displayed, as well as the opposing forces location, in order to compare the current and planned situations. This demonstrator was experimented on the Lillehammer NATO site and on the Celar-Bruz French site during the June 2004 exercise. The test trial has been conducted with NATO, Germany, Italy, Norway, Romania, Turkey and USA. Lessons learned from these experiments are the foundation of a spiral development process. The decisional COP implemented in the COMPAS demonstrator for JWID '04 is a first step toward an integrated visualization environment where commander and staff have the capability to control the operation issues by anticipation of the battlefield events and the consequences of these events.
Author
Situational Awareness; Flat Panel Displays; Military Operations; Military Technology; Decision Support Systems

20070025451 Research and Technology Organization, Neuilly-sur-Seine, France
Working Group 1 Report: Towards a Structured Approach for the Development of a Purpose Driven COP System
Agar, Dan; Atoyan, Hasmik; Guyard, Alexandre Bergeron; Faye, Jean-Pierre; Rasmussen, Lisbeth; Silvervarg, Karin; Taylor, Martin; Treurniet, Willem; Visualisation and the Common Operational Picture; December 2005, pp. WG1-1 - WG1-6; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A COP System is a system that facilitates the development of a 'Common Operational Picture.' The purpose of this report is to address the requirements demanded of any such system, and to suggest an approach to satisfying those requirements. The

notion of a COP has three components: 'Common', which implies that there are at least two collaborating partners; 'Operational', which implies that there is a real-time element involving action involving the partners; and 'Picture', which implies that each partner has some kind of vision of the situation in which the action takes place. This report addresses the first two of these components. The 'Picture' aspect involves for the most part issues that do not change between displays intended for one user and displays intended to facilitate the development of a vision common to two or more partners.
Author
Display Devices; Scientific Visualization; Systems Engineering; Data Integration

20070025452 Malardalen Univ., Eskilstuna, Sweden
Visualizing the Decision Space of a Ship's Maneuverability in a Real-Time 3-D Nautical Chart
Porathe, Thomas; Visualisation and the Common Operational Picture; December 2005, pp. 23-1 - 23-10; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In an information design project at Malardalen University in Sweden a computer based 3-D chart system is designed based on human factors principles of more intuitive navigation in high speeds. This has earlier been presented at the IST-036/RWS-005 Massive Military Data Fusion and Visualisation workshop in Halden, Norway, 2002. In this paper, a way of visualizing the decision space of a ship's maneuverability a few minutes into the future is suggested. Known methods for calculating a vessels future position based on knowledge of present position, direction, speed and acceleration as well as internal and external forces acting on the system is used. Such a visualization tool will be best put to use on huge ships of great mass such as for example large oil tankers.
Author
Maneuverability; Nautical Charts; Real Time Operation; Decision Support Systems; Three Dimensional Models; Ships

20070025453 State Univ. of New York, Buffalo, NY, USA
Automated Dynamic Symbology for Visualization of Level 2 and 3 Fusion
Kesavadas, Thenkurussi; Kim, Youngseok; Visualisation and the Common Operational Picture; December 2005, pp. 5-1 - 5-8; In English; See also 20070025437; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0371; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Symbols play an important role in identifying informative objects and are widely used in geo-spatial decision support systems and applications. In high-level fusion applications, however, simply placing symbols often lead to information over load problem; symbols quickly grow fast in many applications, such as the post disaster monitoring system we are interested in. This leads to cluttered and overlapped icons. With today s advanced technologies, new visual effects can lead to better visualization systems where iconic overload may be perceived as a problem. Therefore, conventional method of storage-indexing-retrieval of large sets of prepared icon images is not flexible enough for the visualization of higher fusion levels. Instead, we propose a dynamic symbology, which automatically generates symbols from parameterized components in a three-dimensional space. The extension to tactical graphics can provide better situation awareness from simplified and abstract visualization.
Author
Decision Support Systems; Automatic Control; Scientific Visualization; Symbols; Multisensor Fusion

20070025454 Research and Technology Organization, Neuilly-sur-Seine, France
Generic Network Visualization: Applications for NATO
Beaudoin, Luc; Bjoerke, Jan; Bouchard, Alain; Boyne, Stephen; Jacobson, Zack; Kaster, Annette; Truong, Bob; Verissimo, Jose; Visualisation and the Common Operational Picture; December 2005, pp. WG5-1 - WG5-6; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our syndicate began to construct a set of two taxonomies: 1) The sorts of network of use to NATO; and 2) The set of tasks to be accomplished with/by network visualizations of each. Of the first, we noted three subtypes: 1) Physical networks [railroad, air transport, human blood system]; 2) Logical networks [electronic networks viz the Internet, banking transactions, human central nervous system]; and 3) Conceptual networks [between references or concepts in technical literature, human immune system.]. Of the tasks to be done by network visualization aids, we noted so many and varied tasks useful to NATO that we determined instead to conceptualize a framework to be broadly illuminating across as much of the NATO-useful-task

domain as possible. This rapidly led us to define networks technically and to begin to list the properties we need to be ready to include in network-visualization aids concerning the links, nodes, and agents operating within networks of interest. We also noted, importantly, that networks intersect in many ways physically and conceptually that will be critically important in many situations. In a major event involving the rail system, its points of intersection with other infrastructure networks electric, water, road, others will be critical. A concept map of this domain follows overleaf.
Derived from text
Scientific Visualization; North Atlantic Treaty Organization (NATO); Network Analysis; Computer Information Security; Applications Programs (Computers)

20070025455 Naval Research Lab., Stennis Space Center, MS, USA
Automated Change Detection and Classification System
Lohrenz, Maura C.; Gendron, Marlin L.; Visualisation and the Common Operational Picture; December 2005, pp. 8-1 - 8-4; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes an Automated Change Detection and Classification (ACDC) system being developed by the Naval Research Laboratory (NRL) for the Mine Warfare group at the Naval Oceanographic Office (NAVOCEANO). ACDC autonomously detects features in sidescan imagery, classifies the features, searches through historical and dynamic databases of previously detected features and performs change detection (i.e., determines whether the feature is new or pre-existing, relative to earlier surveys). The system also clusters the detected features and performs area matching to minimize false detections. NRL is investigating other applications, such as augmented cognition systems, warning and alert systems, and autonomous declutter mechanisms for electronic displays, which could leverage one or more components of ACDC. The NRL ACDC system is comprised of five key components: Computer-Aided Detection (CAD), Computer-Aided Classification (CAC), historical and dynamic databases, Feature Matching (FM), and Area Matching (AM), summarized in this paper.
Author (revised)
Autonomy; Change Detection; Classifications; Warfare; Computer Aided Design

20070025456 Oculus Info, Inc., Toronto, Ontario, Canada
GeoTime Visualization for Peace Support Operations
Wright, William; Kapler, Thomas; Visualisation and the Common Operational Picture; December 2005, pp. 12-1 - 12-8; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Visualization display techniques allow people to see, use and interact with large amounts of multidimensional data in a natural and easy manner, particularly in complex, time sensitive situations. Information visualization techniques amplify cognition by increasing human mental resources, reducing search times, improving recognition of patterns, increasing inference making, and increasing monitoring scope. These benefits translate into significant system and task related performance objectives. As more information is available, from more sources, commanders with advanced visualization capabilities will be able to make the most of this data without being overwhelmed. Operational and planning tasks are both amenable to visualization support. Previous work with DARPA s Command Post of the Future program has shown the importance of multiple, shared, tailored views rather than one common operational picture, and has demonstrated significant progress for Force-on-Force scenarios [3, 7]. There is an opportunity to explore potential high payoff, leap ahead tailored visualization techniques suitable for the unique demands of Peace Support Operations (PSO) and that build on the success to date. This paper reports on one new concept for geo-temporal visualization conceived during a research project sponsored by DRDC in 2002. The term Operations Other than War (OOTW) covers a wide range of activities, for example domestic operations in Canada (Ice Storm 98), humanitarian assistance abroad (Honduran earthquake), or peace support operations (Bosnia). In order to focus the initial work, the investigation and analysis was confined to peace support operations. However, it is believed that the conclusions and concepts developed here for PSO would also apply to other types of OOTW. The work also focuses on visualization as a tool for commanders. These capabilities would be used by subordinates and staff too.
Derived from text
Display Devices; Scientific Visualization; Geographic Distribution; Peacetime; Decision Support Systems

20070025457 Swedish Defence Research Establishment, Linkoeping, Sweden
Visual Specification of Spatial/Temporal Queries for Information Support of a Common Operational Picture
Silvervarg, Karin; Jungert, Erland; Visualisation and the Common Operational Picture; December 2005, pp. 3-1 - 3-2; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Modern query languages will in many cases be concerned with a large variety of heterogeneous data sources, of which most will correspond to different sensors and where the input data, in particular, may be of spatial/temporal type. This requires not only structures for analysis, manipulation, data fusion and storage of such data but also methods for specification of the queries as well as visualization of the query result. Spatial/temporal queries become especially complex since they have to deal with multiple dimensions. For this reason, means to support inexperienced end-users in defining spatial/temporal queries must be developed. In this work, a visual method for the specification of this type of queries is proposed for an environment where the input data sources basically are sensors of various types and where the output is intended for visualization in a COP as a part of a command and control system.
Derived from text
Query Languages; Scientific Visualization; Multisensor Fusion; Temporal Resolution; Spatial Resolution

20070025458 Research and Technology Organization, Neuilly-sur-Seine, France
COP Issues
Gouin, Denis; Johansen, Tom; Trafton, Greg; Chignell, Mark; Grandt, Morten; Tao, Vincent; Wright, Bill; Peufeilhoux, Olivier; Visualisation and the Common Operational Picture; December 2005, pp. WG3-1 - WG3-2; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A viewgraph presentation on Common Operational Picture (COP) issues is shown. The contents include: 1) Generating enhanced reality displays from sensor nets; 2) Sensor Issues; 3) User-Centric Issues; 4) Basic Framework; 5) Perceptual Cycle; 6) COP Task Cycle; 7) Sensor Management; and 8) Improve Decision-Making Under Stress.
CASI
Scientific Visualization; Data Integration; Human-Computer Interface; Display Devices

20070025459 Research and Technology Organization, Neuilly-sur-Seine, France
Visualizing Uncertainty in the Common Operating Picture: Proposed Research Program
Baar, David; Hollands, Justin; Lapinski, Liesa; MacGregor, Carolyn; Pvlovic, Nada; Porathe, Thomas; Smallman, Harvey; Stanchniak, Szymon; Visualisation and the Common Operational Picture; December 2005, pp. WG4-1 - WG4-3; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Data fusion has been identified as key to creating a common operating picture. Attempts to integrate data from various sources will invariably include underlying assumptions (i.e. built in by the system designers) and error inherent to the sources of data (e.g. sensor resolution and accuracy). There is danger in allowing the operator to believe that the data presented is ground truth as all data will have some level of associated uncertainty. Decision-makers need to know what is not known as much as what is known in order to take appropriate action. To help the operator visualise the most accurate operating picture, it is important to understand the role that uncertainty plays on task performance so as to provide design principles that should be followed for building displays to convey uncertainty in COP.
Author
Scientific Visualization; Display Devices; Decision Making; Data Integration; Operator Performance

20070025460 Joint Forces Capabilities, Ottawa, Ontario, Canada
'The Fourth Wish'
Knight, D. W.; Visualisation and the Common Operational Picture; December 2005, pp. KN1-1 - KN1-10; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Strategy 2020 is a well-articulated and prescient document that portrays how the Canadian Forces must be developed to operate in the new millennium. With the requisite effort by all members of the defence team, this ambitious vision can be made reality. As with all large undertakings, Strategy 2020 must be broken down into constituent parts and accomplished one piece at a time. One of the foundation pieces, or enablers of Strategy 2020, is the concept of situational awareness, the age-old

problem of understanding the operating environment so that timely and effective decisions can be made on the employment of military force in operations ranging from disaster relief to high intensity combat. Leveraging on the command and control 2 technology advantages enjoyed by western military forces, the Canadian military needs the ability to generate situational awareness for domestic operations, peacekeeping, and coalition operations with allies, especially the USA. Those with a superficial knowledge of military command and control might believe that the challenge of attaining situational awareness has already been met. Those that have been intimately involved in operations in Kosovo, East Timor, Bosnia, Africa, and the Persian Gulf would say otherwise. As operators involved in these conflicts have struggled to push and pull essential operational information through a multitude of networks, changing data formats and crossing security domains along the way, the result has been anything but situational awareness. If these operators had a fourth technological wish, what would it be? As a literary device, the parable of the operator and the techie serves to describe, in simplistic terms, the many torturous and difficult years that have been dedicated to the development of the military's command and control architecture. While the accomplishments have been magnificent, the details would be too lengthy and dull to recount. The salient point is that information technology and the people that know how to build it, the techies, have delivered an outstanding command and control capability to the operators of Canadian military but something is still missing. The missing piece, the one that will join the command and control capabilities to the broader vision of situational awareness required for Strategy 2020, is a clear and workable concept for managing the operational information made available by the command and control systems. As military professionals, our fourth wish should be for such a concept. Of course in the real world, military forces do not achieve their objectives by making wishes. Thus the aim of this essay is to outline a conceptual action plan for the management of operational information as a stepping stone to 'situational awareness'
Derived from text
Canada; Military Operations; Situational Awareness; Command and Control; Scientific Visualization

20070025461 Johansen (Tom), Fredrikstad, Norway
Requirements for a Future COP-Display Based on Operational Experience
Johansen, Tom; Visualisation and the Common Operational Picture; December 2005, pp. KN2-1 - KN2-4; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

My personal experience from recent military operations tells that today's and future COP-displays need to give the commander and decision-makers in general a much quicker and much better mental picture of the situation than from current display systems. This is due to the increased speed and complexity of military operations and the demands for very low own losses and collateral damage. Also, the increasing supervision from politicians and involvement of non-military decision-makers require COP-displays easy to understand. A key is to show the world as it looks. This implies a big display-surface with very high resolution. A table where a team of decision-makers gather around, will support the communication process towards a shared understanding. The Common Operational Decision System (CODS) developed by the Norwegian Battle Lab & Experimentation (NOBLE) complies with such ideas. It consists of high-resolution flat screens horizontally arranged by 3x3 to 5x5, and is able to transparently display maps, ortho-photos, and satellite images superimposed over maps. It can receive track-info and other data from a number of existing operational systems. CODS has participated in international military exercises, included the last JWIDS in Great Britain 2004
Author
Flat Panel Displays; Military Technology; Decision Support Systems; Military Operations

20070025462 Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany
Visualisation Concept for Operational Parameter Settings of Dependent Processes on Naval Vessels
Kaster, Annette; Witt, Oliver; Visualisation and the Common Operational Picture; December 2005, pp. 22-1 - 22-8; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Common Operational Picture (COP) serves as support for commanders in collaborative planning and mission execution, i.e. laid out for strategic tasks. While a common display of relevant information shared by more than one command is inevitable to successfully operate during war and OOTW (operations other than war), the picture to be displayed to the operator performing tactical tasks is important in order for him to confidently execute commands or make own decisions. In order to foster military users in all echelons monitoring and control tasks at strategic as well as at tactical levels have to be supported. They ought to address all stages of information processing in order to enable the human operator to handle huge amount of information and to achieve high situation awareness. Furthermore, consistent functionality as well as consistent

representation are required in order to meet ergonomic design criteria (ISO 9241-10, 1996) for either picture. In this contribution, a hierarchical web-based interface is introduced considering as example the manual conditioning of the combat system of the frigate F124 of the German Navy. Although an explicit example is described, it is suggested to regard it as a conceptual method for designing human machine interfaces (HMIs) that are to support users in monitoring and control tasks which deal with a high amount of data in complex context.
Derived from text
Parameterization; Scientific Visualization; Navy; Ships; Operator Performance

20070025463 Physics and Electronics Lab. TNO, The Hague, Netherlands
Towards Providing a Netherlands National COP
Treurniet, Willem; Lasschuyt, Eddie; vanHekken, Marcel C.; Visualisation and the Common Operational Picture; December 2005, pp. 4-1 - 4-2; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The year 2004 will see the replacement of the current Netherlands Defence Crisis Management Centre (DCBC) by the Defence Operations Centre (DOC), which carrying more authority and responsibilities will have to perform more comprehensive tasks than ever before. The organization of DOC is in line with the customary J-structure utilized world-wide. DOC is to be a joint organisation, and will become the main 24/7 Netherlands operational staff for planning and management of the national contribution to international (peace) operations as well as with some limited exceptions the national deployment of troops. The operational planning and management activities of DOC are referred to as the Operational Process Defence Operations Centre (OP-DOC). These involve both the Dutch cabinet and the Armed Forces and, for every individual operation, consist of the following separate phases: start, orientation, concept development, plan development, deployment and termination of operations. Situational awareness is one of the key success factors of the OP-DOC execution. In order to maintain a sufficient level of situational awareness, the DOC functionaries must timely, accurately and securely be provided with information tailored to their individual needs.
Derived from text
Netherlands; Situational Awareness; Operations Research; Armed Forces (Foreign)

20070025464 Pacific Science and Engineering Group, Inc., San Diego, CA, USA
Limits of Display Realism: Human Factors Issues in Visualizing the Common Operational Picture
Smallman, Harvey S.; SaintJohn, Mark; Cowen, Michael B.; Visualisation and the Common Operational Picture; December 2005, pp. 16-1 - 16-18; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The vision for the US military's future common operational picture (COP) is to create a display that integrates data from all service arms to promote situation awareness (SA) and coordination. This tactical display must visualize the locations of a variety of blue forces and other assets overlaid and integrated with a variety of amplifying information (planning, weather, etc). Display designers are faced with the task of visualizing this complex situation in an intuitive and useful fashion that promotes SA. A popular approach is to maximize the realism of the display, on the assumption that realism will promote natural, intuitive, and easy human interaction. To this end, technological advances have enabled designers to create real-time, realistic 3-D perspective views of the tactical picture for at a glance SA. However, in a series of empirical studies conducted over the last five years for the US Navy, we have found that realistic 3-D views are only appropriate for specific tasks and generally do not enhance SA. Rather, they are misperceived and promote errors. This approach to display design of maximizing realism also assumes that realistic, real-time displays will provide adequate support for detecting significant changes to a situation. However, a wealth of psychological studies have documented the tremendous human susceptibility to miss changes in natural scenes. Why would designers create, and users prefer, displays that do not serve them well? Apparently, users harbour a Naive Realism a misplaced faith in their ability to extract information from natural scenes that translates into a desire for realistic displays. It is paradoxical and worrying that at a time when basic perceptual science is revealing just how flawed and sparse is our visual representation of natural scenes that display designers are striving towards photo-realistic naturalism. In this talk, we review this troubling trend and layout a set of human factors guidelines and display concepts for the COP that, though sometimes counter to Naive Realism, are likely to promote superior performance.
Author
Display Devices; Human Factors Engineering; Data Integration; Scientific Visualization

20070025465 Defence Research and Development Canada, Ottawa, Ontario, Canada

Visualisation for Network Situational Awareness in Computer Network Defence

Gregoire, Marc; Beaudoin, Luc; Visualisation and the Common Operational Picture; December 2005, pp. 20-1 - 20-6; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This document presents some of the requirements and challenges associated with the visualisation for network situational awareness in computer network defence. It raises fundamental questions pertaining to the integration of information and its presentation to the user. Situational awareness is essential for decision makers to efficiently manage their resources. Situational awareness has historically been associated with aviation security applications, such as air traffic control (ATC), fighter missions, and missile defence. However, the number of studies in the field of situational awareness for new applications has grown significantly in the past fifteen years. The concept of situational awareness involves both a person with his cognitive processes, as well as a situation with various information types and statuses. In a complex environment, which is often the result of growing technology, strong situational awareness can greatly improve the rate and the quality of human decision-making. The cyber domain is one such complex technological environment. However, time and space, as traditionally used in situational awareness, must be presented to the network defence decision maker with new paradigms.
Author

Computer Networks; Situational Awareness; Scientific Visualization; Computer Information Security

20070025467 Lockheed Martin Canada, Montreal, Quebec, Canada

Fusion and Automation: Human Cognitive and Visualization Issues

Duquet, Jean-Remi; Gregoire, Marc; Lohrenz, Maura; Kesavadas, Kesh; Shahbazian, Elisa; Smestad, Tore; Vanderbilt, Amy; Varga, Margaret; Visualisation and the Common Operational Picture; December 2005, pp. WG6-1 - WG6-8; In English; See also 20070025437; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The purpose of this paper is to report the discussions of Working Group #6 at the NATO VizCOP Workshop, on the topic of Visualization issues in the areas of Data Fusion and Automation. More specifically, this group was interested in discussing visualisation issues that are intrinsic to the introduction of automated processes as part of a Command and Control System. To focus on visualisation issues, this discussion started with the assumption that suitable fusion tools and components pre-exist that can satisfy the system's requirements in terms of automated decision aids. The structure of this paper follows the sequence of the Working Group s discussions. In Section 1, we describe what an ideal Fusion baseline would be prior to developing a Common Operational Picture (COP) visualization system. In Section 2, we identify a number of visualization issues related to the automation of COP fusion capabilities. In Section 3, we apply an existing system design process to one of the issues previously identified, namely the representation of uncertainty.
Author

Multisensor Fusion; Decision Support Systems; Command and Control; Flat Panel Displays

20070026215 Boeing Co., Mesa, AZ, USA

Assessing the Training Potential of MTDS in Exercise First Wave

Gehr, Sara Elizabeth; Schurig, Margaret; Jacobs, Lesley; vanderPal, Jelke; Bennet, Winston, Jr.; Schreiber, Brian; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 11-1 - 11-16; In English; See also 20070026206; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Exercise First WAVE (EFW) was conducted in November 2004 and was the first large-scale NATO MTDS event that focused on investigating and providing COMAO training for warfighters and mission support staff in a distributed synthetic environment. To assess the training potential of EFW, the NATO partners of the seven countries participating in EFW developed a competency-based approach to training needs assessment and evaluation. The approach, which is derived from the Mission Essential Competencies process, is designed to determine training and rehearsal needs and gaps, and to assess the effectiveness of distributed mission training exercises. This paper starts with a description of the development and application of a comprehensive set of training evaluation and performance assessment instruments and methods, which were based on identified requirements and gaps in other recent training research events. These methods were further adapted to the requirements of EFW and include both subjective and objective data collection and tracking of training events. The overall EFW assessment results will be presented and data and experiences from the Netherlands will be discussed with a focus on the lessons learned from an operational point of view. The usefulness of the chosen assessment approach, with respect to the assessment and evaluation of the training potential of Mission Training through Distributed Simulation (MTDS) will be

discussed. Implications from EFW for broader, international implementation of a competency-based assessment approach for high fidelity, distributed simulation training will conclude this paper.
Author
Education; Training Evaluation; Physical Exercise; Plasma Waves; Data Acquisition; Simulation

20070026218 Research and Technology Organization, Neuilly-sur-Seine, France
Effectiveness by Reusability, MSG-042 First Findings
SanJoseMartin, Angel; MartinezReif, Bernardo; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 10-1 - 10-12; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many people think that experience is the best way to learn a skill. Unfortunately, it is not always possible to get practical training or perform real experiments due to economic, time, safety or resources constraints. This kind of problems is the main reason why Modelling & Simulation is being used. In a few words, it saves a lot of money, it produces results faster, it is more flexible than real life and it makes possible to repeat the experiments as many times as you want. Furthermore, in the specific case of military operations, there is the additional advantage that simulation experiments and training are less dangerous for human beings. In many cases the user s needs are urgent and Modelling and Simulation development work should be ready for yesterday . The only way to solve this problem is to be ready in advance and reuse components that were previously developed and simply reconfigure and assemble them according to the current needs. Therefore, effectiveness of M&S is directly related to the level of reusability of M&S resources. MSG-042 is focused on fostering simulation resource reusability within NATO and PfP countries through the study and analysis of the factors that can enable a shared and common framework in which reuse of modelling and simulation assets will be supported. This paper presents and discusses the first findings of the MSG-042 and the conclusions drawn from the workshop that has been held in The Hague (10-12 May 05) on 'Simulation reusability challenge within NATO'
Author
Simulation; User Requirements; Education; Military Operations

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*.

20070025505 Reeves and Sons, LLP, Richland, WA, USA
Device to Measure Low Levels of Radioactive Contaminants in Ultra Clean Materials
Reeves, J. H.; Kauer, M. B.; Mar. 17, 2006; 9 pp.; In English
Contract(s)/Grant(s): DE-FG02-04ER84061-1
Report No.(s): DE2007-877414; DOE-ER-84061-1; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this research was to develop a radiation detection device so sensitive that a decay rate of only one atom per 11.57 days per kilogram of material could be detected. Such a detector is needed for screening materials that will be used in exotic high energy physics experiments currently being planned for the near future. The research was performed deep underground at the Underground Mine State Park in Soudan, Minnesota. The overburden there is approx. 1800 meters water equivalent. The reason for performing the research at such depth was to vastly reduce the effects of cosmic radiation. The flux of muons and fast neutrons is about 100,000 times lower than at the surface. A small clean room quality lab building was constructed so that work could be performed in such a manner that radioactive contamination could be kept at a minimum. Glove boxes filled with dry nitrogen gas were used to further reduce contamination from dirt and also help reduce the concentration of the radioactive gas 222Ra and daughter radionuclides which are normally present in air.
NTIS
Radiation Detectors; Radioactive Contaminants; Radioactive Materials

20070025507 Texas A&M Univ., College Station, TX, USA
1+-n+ Ecr Ion Source Development Test Stand
May, D. P.; Apr. 01, 2006; 4 pp.; In English
Contract(s)/Grant(s): FG02-04ER41249
Report No.(s): DE2007-878679; DOE/ER/41249-1; No Copyright; Avail.: Department of Energy Information Bridge

A test stand for the investigation of 1+-n+ charge boosting using an ECR ion sources is currently being assembled at the Texas A&M Cyclotron Institute. The ultimate goal is to relate the charge-boosting of ions of stable species to possible charge-boosting of ions of radioactive species extracted from the diverse, low-charge-state ion sources developed for radioactive ion beams.
NTIS
Cyclotron Resonance; Ion Sources; Test Stands

20070025511 Michigan Univ., Ann Arbor, MI, USA
Electromagnetic and hadron Calorimeters in the MIPP Experiment
Nigmanov, T. S.; Gustafson, H. R.; Longo, M. J.; Rajaram, D.; Oct. 01, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-FG52-06NA26182
Report No.(s): DE2007-886048; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of the MIPP experiment is to study the inclusive production of photons, pions, kaons, and nucleons produced in p, K, and p interactions on various targets using beams from the Main Injector at Fermilab. The purpose of the calorimeters is to measure the production of forward-going photons and neutrons. The electromagnetic calorimeter consists of 10 lead plates interspersed with proportional chambers followed by the hadron calorimeter with 64 steel plates interspersed with scintillator. We collected data with a variety of targets with beam energies from 5 GeV/c up to 120 GeV/c. The energy calibration of both calorimeters with electrons, pions, kaons and protons is discussed. The performance of the calorimeters was tested on a neutron sample.
NTIS
Calorimeters; Hadrons; Radiography; Electromagnetism

20070025519 Temple Univ., Philadelphia, PA, USA
Spin Duality on the Neutron (3He)
Sovignon, P.; Feb. 01, 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC05-84ER40150
Report No.(s): DE2007-899824; JLAB-PHY-05-488; No Copyright; Avail.: Department of Energy Information Bridge

Thomas Jefferson National Accelerator Facility experiment E01-012 measured the 3He spin structure functions and virtual photon asymmetries in the resonance region in the momentum transfer range 1.0<Q(2)<4.0(GeV/c(2)). Our data, when compared with existing deep inelastic scattering data, can be used to test quark-hadron duality in gl and A1 for 3He and the neutron. Preliminary results for A(1)(3)He are presented, as well as some details about the experiment.
NTIS
Neutrons; Duality Theorem; Helium Isotopes; Particle Spin

20070025533 Istituto Nazionale di Fisica Nucleare, Genoa, Italy
Nucleon Spin Physics with CLAS at JLab
Ripani, M.; Feb. 01, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC05-84ER40150
Report No.(s): DE2007-899727; JLAB-PHY-07-614; DOE/ER/40150-4217; No Copyright; Avail.: Department of Energy Information Bridge

The spin structure of the nucleon has been investigated for now more than three decades using lepton and photon beams. Measurements of the spin-dependent structure functions g1 and g2 have been performed at large Q2 (Deep Inelastic Scattering or DIS region) at SLAC, CERN, and DESY, providing information for the understanding of nucleon structure in terms of elementary constituents of QCD, quarks and gluons. On the contrary much less was known in the low momentum transfer region (Q2 < 1-2 GeV2), where perturbative QCD cannot be applied and non-perturbative phenomena as nucleon resonances play a dominant role. Lattice gauge theories will hopefully provide the connections between composite hadrons and fundamental constituents in this regime. However presently phenomenological models are still the main tool for the description of the hadron properties. The very low momentum transfer region (Q2 < 0.05 - 0.1 GeV2) is described by Chiral

Perturbation Theory (xPT), an effective representation of QCD in the low energy limit. Testing xPT is clearly very important to identify the relevant degrees of freedom in this kinematic domain. A broad program to measure the inclusive spin structure of the nucleon via polarized electron scattering off a polarized target was conducted between 1998 and 2006 with the CLAS detector in Hall B at Jefferson Lab and the most recent data are the subject of this report.
NTIS
Nucleons; Particle Spin; Chirality; Quantum Chromodynamics

20070025538 Kentucky Univ., Lexington, KY, USA
Tests of Duality in the Spin-Structure Function g(sub1)
Korsch, W.; January 2006; 5 pp.; In English
Report No.(s): DE2007-896486; No Copyright; Avail.: National Technical Information Service (NTIS)
Although quark-hadron duality is well established for the spin-independent structure function, F(sub 2)(sup p), hardly any information is available on the low Q(sup 2) scaling behavior of spin-structure functions. Recent experiments at Jefferson Lab measured the spin-structure function g1 in the nucleon resonance region for variety of targets. Global and local duality was observed for Q(sup 2) values above (approx.) 2 (GeV/c)(sup 2).
NTIS
Hadrons; Quarks; Duality Theorem

20070025539 Old Dominion Univ., Norfolk, VA, USA
Neutron Structure - New Results with CLAS at Jefferson Lab
Kuhn, S. E.; January 2006; 4 pp.; In English
Report No.(s): DE2007-896487; No Copyright; Avail.: National Technical Information Service (NTIS)
New measurements using the 6 GeV continuous electron beam and the CEBAF Large Acceptance Spectrometer (CLAS) at Jefferson Lab have collected information on the form factors and the unpolarized structure functions of the neutron, with minimal uncertainty from nuclear binding effects. One experiment has also tried to measure these binding effects more directly, using the method of 'spectator tagging'. These experiments are forerunners for an extensive program with the energy-upgraded 12 GeV accelerator at Jefferson Lab.
NTIS
Neutrons; Nuclear Physics; Linear Accelerators

20070025541 South Carolina Univ., Columbia, SC, USA
Meson Production Experiments at CLAS
Strauch, S.; January 2006; 4 pp.; In English
Report No.(s): DE2007-896489; No Copyright; Avail.: Department of Energy Information Bridge
Electromagnetic meson production is an important tool in the investigation of the structure of the nucleon. Consequently, a series of meson photo- and electroproduction experiments have been performed with the CLAS detector at Jefferson Lab. In this overview the author will report on measurements of cross sections, as well as recent and upcoming measurements of single- and double-polarization observables in meson photoproduction. The data will greatly constrain partial-wave analyses and reduce model-dependent uncertainties in the extraction of nucleon resonance properties.
NTIS
Mesons; Photoproduction

20070025542 Stanford Linear Accelerator Center, Stanford, CA, USA; Argonne National Lab., IL USA
Intelligent Detector Design
Graf, N.; Magil, S.; Kuhlmann, S.; Cassell, R.; Johnson, T.; Feb. 13, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-899571; SLAC-PUB-12351; No Copyright; Avail.: National Technical Information Service (NTIS)
At a future e(sup +)e(sup -) linear collider, precision measurements of jets will be required in order to understand physics at and beyond the electroweak scale. Calorimetry will be used with other detectors in an optimal way to reconstruct particle

4-vectors with unprecedented precision. This Particle Flow Algorithm (PFA) approach is seen as the best way to achieve particle mass resolutions from dijet measurements in the range of approx. 30%/(square root of)E, resulting in innovative methods for choosing the calorimeter technology and optimizing the detector design.
NTIS
Linearity; Detectors; Particle Theory; Algorithms

20070025543 Istituto Nazionale di Fisica Nucleare, Genoa, Italy
Proton Form Factor and Related Processes in BaBar by ISR
Ferroli, R. B.; Feb. 12, 2007; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-899572; SLAC-PUB-12347; No Copyright; Avail.: Department of Energy Information Bridge
BaBar has measured with unprecedented accuracy e(sup +)e(sup -) --> pp-bar from the threshold up to Q2 pp-bar approx. 20 GeV(sup 2)/c(sup 4), finding out an unexpected cross section, with plateaux and drops. In particular it is well established a sharp drop near threshold, where evidence for structures in multihadronic channels has also been found. Other unexpected and spectacular features of the Nucleon form factors are reminded, the behaviour of space-like G(sup P)(sub E)/G(sup P)(sub M) and the neutron time-like form factors.
NTIS
Form Factors; Nucleons; Protons; Radiation

20070025544 Brookhaven National Lab., Upton, NY USA
Transition Temperature in QCD with Physical Light and Strange Quark Masses
Karsch, F.; Nov. 14, 2006; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-899617; BNL-77488-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge
The author presents results from a calculation of the transition temperature in QCD with two light (up, down) and one heavier (strange) quark mass as well as for QCD with three degenerate quark masses. Furthermore, we discuss first results from an ongoing calculation of the QCD equation of state with almost realistic light and strange quark masses.
NTIS
Quantum Chromodynamics; Quarks; Transition Temperature

20070025545 Brookhaven National Lab., Upton, NY USA; Iowa State Univ., Ames, IA, USA
Nuclear Modification to Parton Distribution Functions and Parton Saturation
Qiu, J. W.; Nov. 14, 2006; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-899618; BNL-77490-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge
The authors introduce a generalized definition of parton distribution functions (PDFs) for a more consistent all-order treatment of power corrections. We present a new set of modified DGLAP evolution equations for nuclear PDFs, and show that the resummed alpha(sub s)A(sup 1/3)/Q(sup 2)-type of leading nuclear size enhanced power corrections significantly slow down the growth of gluon density at small-x. We discuss the relation between the calculated power corrections and the saturation phenomena.
NTIS
Distribution Functions; Gluons; Partons; Quantum Chromodynamics

20070025547 Brookhaven National Lab., Upton, NY, USA
Temperature-Dependence of Quarkonia Correlators
Mocsy, A.; Mar. 11, 2006; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-899619; BNL-77491-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge
Here the author reviews the temperature-dependence of heavy quarkonia correlators in potential models with three

different screened potentials, and compare these to the results from lattice QCD. None of the potentials investigated yield results consistent with the lattice data, indicating that screening is likely not the mechanism for heavy quarkonia suppression. I also discuss a simple toy model, not based on temperature-dependent screening, that can reproduce the lattice results.
NTIS
Correlators; Temperature Dependence; Quantum Chromodynamics; Quarks

20070025549 Brookhaven National Lab., Upton, NY, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Ground State Quarkonium Spectral Functions Above Deconfinement
Mocsy, A.; Petreczky, P.; Solana, J. C.; Jun. 09, 2006; 6 pp.; In English
Report No.(s): DE2007-899620; BNL-77492-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge
The authors discuss the temperature-dependence of S-wave quarkonium spectral functions in a nonrelativistic Greens function approach and compare these to lattice QCD results.
NTIS
Ground State; Spectra; Temperature Dependence; Quarks

20070025550 Brookhaven National Lab., Upton, NY, USA
Heavy Quarkonia Above Deconfinement
Mocsy, A.; May 01, 2006; 10 pp.; In English
Report No.(s): DE2007-899621; BNL-77566-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge
In this talk the author summarizes their current understanding of quarkonium states above deconfinement based on phenomenological and lattice QCD studies.
NTIS
Quarks; Confinement; Quantum Chromodynamics

20070025552 Fermi National Accelerator Lab., Batavia, IL, USA
20 - 50 GeV Muon Storage Rings for a Neutrino Facility
Rees, G. H.; Johnstone, C.; Meot, F.; Jun. 01, 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH00300
Report No.(s): DE2007-899703; FERMILAB-CONF-06-189-AD; No Copyright; Avail.: National Technical Information Service (NTIS)
Muon decay rings are under study as part of an International Scoping Study (ISS) for a future Neutrino Factory. Both isosceles triangle- and racetrack-shaped rings are being considered for a 20 GeV muon energy, but with upgrade potentials of 40 or 50 GeV. Both rings are designed with long straights to optimize directional muon decay. The neutrinos from muon decay pass to one or two distant detectors; the racetrack ring has one very long production straight aligned with one detector while the triangular ring has two straights which can be aligned with two detectors. Decay ring specifications and lattice studies are the primary topic of this paper. Injection, collimation, and the RF system are covered in a second contribution to these proceedings.
NTIS
Muons; Neutrinos; Storage Rings (Particle Accelerators); Particle Decay

20070025554 Los Alamos National Lab., NM USA
MiniBooNE Experiment
Ray, H.; Jan. 01, 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-899710; FERMILAB-CONF-07-016-E; No Copyright; Avail.: National Technical Information Service (NTIS)
The MiniBooNE experiment relies on a 250,000-gallon tank filled with mineral oil, which is clearer than water from a faucet. Light-sensitive devices (PMTs) mounted inside the tank are capable of detecting collisions between neutrinos and carbon nuclei of oil molecules.
NTIS
Elementary Particles; Neutrinos; Mineral Oils; Molecules

20070025555 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Recent Developments Concerning the Role of Strangeness in the Nucleon
Thomas, A. W.; Youn, R. D.; Feb. 01, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC05-84ER40150
Report No.(s): DE2007-899725; JLAB-THY-07-614; DOE/ER/40150-4212; No Copyright; Avail.: Department of Energy Information Bridge

The contributions of strange quarks to the electric and magnetic form factors of the nucleon provide unique insights into the nature of nonperturbative QCD. We present recent results on both the theoretical understanding and the experimental determination of the contribution of strangeness to the low momentum form factors.
NTIS
Nucleons; Quantum Chromodynamics; Strangeness; Particle Theory

20070025584 ICF International, Inc., Fairfax, VA, USA
Mercury Transport and Fate Through a Watershed
Jan. 2006; 42 pp.; In English
Contract(s)/Grant(s): EPA-68-C-03-137
Report No.(s): PB2007-108904; No Copyright; Avail.: CASI: A03, Hardcopy

The U.S. Environmental Protection Agencys (EPAs) Science to Achieve Results (STAR) research grants program, managed by the National Center for Environmental Research, has funded significant research on the fate, transport, and transformation of mercury in aquatic and terrestrial environments. This report summarizes the research and findings generated through nine grants awarded under the 1999 Request for Applications (RFA) entitled Mercury: Transport and Fate through a Watershed and two other closely related STAR grants. The important scientific findings from these grants, data gaps, and additional research needs on this topic are described in this synthesis report.
NTIS
Environment Protection; Watersheds; Mercury (Metal)

20070025585 ICF Consulting, Fairfax, VA, USA
Catalog of Guidelines and Standards for the Handling and Management of Sulfur Hexafluoride (SF6)
Jan. 2002; 23 pp.; In English
Contract(s)/Grant(s): EPA-68-W5-0068
Report No.(s): PB2007-108907; No Copyright; Avail.: CASI: A03, Hardcopy

This catalog lists more than 65 references that address topics related to guidelines and standards for the handling and management of sulfur hexafluoride (SF6). The catalog is divided into five summary tables corresponding to four industry categories and an other industries category followed by the complete and more detailed list of all references. Each table includes the organization/author, title, date, and topics addressed for each reference related to a given industry (i.e., electric utilities, magnesium processing industry, semiconductor industry, use of SF6 as a tracer gas, or other industries). The complete table provides more detailed information (e.g., description, document length, and ordering information) about all of the documents included in the summary tables. Documents are listed alphabetically by organization/author and then by date (most recent documents first).
NTIS
Catalogs (Publications); Sulfur Hexafluoride; Standards

20070025592 Gauthier and Connors, LLP, Boston, MA, USA
System and Method for Maskless Lithography Using and Array of Sources and an Array of Focusing Elements
Gil, D., Inventor; Mnon, R., Inventor; Carter, D., Inventor; Smith, H. I., Inventor; Barbastathis, G., Inventor; 16 Mar 05; 6 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0330
Patent Info.: Filed Filed 16 Mar 05; US-Patent-Appl-SN-11-082 629
Report No.(s): PB2007-104696; No Copyright; Avail.: CASI: A02, Hardcopy

A maskless lithography system is disclosed that includes an array of focusing elements, each of which focuses an energy beam from an array of sources into an array of focal spots in order to create a permanent pattern on an adjacent substrate.
NTIS
Lithography; Arrays

20070025597 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Oakland, CA, USA
Compact Accelerator
Caporaso, G. J., Inventor; Sampayan, S. E., Inventor; Kirbie, H. C., Inventor; 14 Jan 05; 13 pp.; In English
Contract(s)/Grant(s): DE-W7405-ENG-48
Patent Info.: Filed Filed 14 Jan 05; US-Patent-Appl-SN-11-036 431
Report No.(s): PB2007-104732; No Copyright; Avail.: CASI: A03, Hardcopy

A compact linear accelerator having at least one strip-shaped Blumlein module which guides a propagating wavefront between first and second ends and controls the output pulse at the second end. Each Blumlein module has first, second, and third planar conductor strips, with a first dielectric strip between the first and second conductor strips, and a second dielectric strip between the second and third conductor strips. Additionally, the compact linear accelerator includes a high voltage power supply connected to charge the second conductor strip to a high potential, and a switch for switching the high potential in the second conductor strip to at least one of the first and third conductor strips so as to initiate a propagating reverse polarity wavefront(s) in the corresponding dielectric strip(s).
NTIS
Linear Accelerators; Particle Accelerators; Dielectrics

20070025601 National Inst. for Occupational Safety and Health, Cincinnati, OH USA
Progress Toward Safe Nanotechnology in the Workplace: A Report from the NIOSH Nanotechnology Research Center
Feb. 2007; 198 pp.; In English
Report No.(s): PB2007-108919; DHHS/PUB/NISOH-2007-123; No Copyright; Avail.: National Technical Information Service (NTIS)

As with any new technology, the earliest and most extensive exposures to engineered nanoparticles are most likely to occur in the workplace. Workers are currently producing and using nanoparticles. Society requires assessment of whether these exposures present any threat to workers. The National Institute for Occupational Safety and Health (NIOSH) is mandated by law to conduct research and develop guidance on worker safety and health. NIOSH, in collaboration with partners in other government agencies, countries, academia, industry, labor, and non-governmental organizations, has been conducting research and developing guidance to address the occupational safety and health of workers exposed to nanomaterials. This document is a report of the progress of the NIOSH Nanotechnology Research Center (NTRC) since its inception in 2004 through 2006. Using only internally redirected resources, the NTRC has begun to make contributions to all the steps in the continuum from hazard identification to risk management.
NTIS
Exposure; Health; Nanoparticles; Nanotechnology; Personnel; Safety

20070025602 Environmental Protection Agency, Washington, DC USA
U.S. Environmental Protection Agency Nanotechnology White Paper
Feb. 2007; 132 pp.; In English
Report No.(s): PB2007-108925; EPA/100/B-07/001; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this paper is to inform EPA management of the science needs associated with nanotechnology, to support related EPA program office needs, and to communicate these nanotechnology science issues to stakeholders and the public. The paper begins with an introduction that describes what nanotechnology is, why EPA is interested in it, and what opportunities and challenges exist regarding nanotechnology and the environment. It then moves to a discussion of the potential environmental benefits of nanotechnology, describing environmental technologies as well as other applications that can foster sustainable use of resources. The paper next provides an overview of existing information on nanomaterials regarding components needed to conduct a risk assessment. Following that there is a brief section on responsible development and the Agencys statutory mandates. The paper then provides an extensive review of research needs for both environmental applications and implications of nanotechnology. To help EPA focus on priorities for the near term, the paper concludes with staff recommendations for addressing science issues and research needs, and includes prioritized research needs within most risk assessment topic areas (e.g., human health effects research, fate and transport research).
NTIS
Environment Protection; Nanotechnology

20070025604 National Network for Environmental Management Studies, Washington, DC, USA
Emerging Nanotechnologies for Site Remediation and Wastewater Treatment
Aug. 2005; 55 pp.; In English
Report No.(s): PB2007-108930; No Copyright; Avail.: National Technical Information Service (NTIS)

The impacts of nanotechnology are increasingly evident in all areas of science and technology, including the field of environmental studies and treatment. Experts anticipate the development and implementation of environmentally beneficial nanotechnologies in the categories of sensing and detecting, pollution prevention, and treatment and remediation. Of the three, the category of treatment and remediation has seemingly experienced the most growth in recent years. In terms of site remediation, the development and deployment of nanotechnology for contaminant destruction has already taken place. Nanoscale iron particles and the subsequent derivatives (bimetallic iron particles and emulsified iron) represent a viable commercially available nanotechnology for remediation. Currently, over 15 academic and commercial field scale tests involving nano-iron particles are underway or have reached completion. Many more sites have scheduled field studies and consequently the number of vendors supplying this product continues to grow. In addition, a multitude of nanotechnology applications for site remediation and wastewater treatment are currently in the research and development stages. From dendritic polymers to functionalized ceramics, the technologies poised to impact the treatment field are considerably diverse.
NTIS
Environment Protection; Nanotechnology; Waste Water; Water Treatment

20070026106 Sandia National Labs., Albuquerque, NM USA
Two Dimensional Unstable Scar Statistics
Warne, L. K.; Jorgensen, R. E.; Kotulski, J. D.; Lee, K. S. H.; Dec. 2006; 289 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-899719; SAND2006-7511; No Copyright; Avail.: National Technical Information Service (NTIS)

This report examines the localization of time harmonic high frequency modal fields in two dimensional cavities along periodic paths between opposing sides of the cavity. The cases where these orbits lead to unstable localized modes are known as scars. This paper examines the enhancements for these unstable orbits when the opposing mirrors are both convex and concave. In the latter case the construction includes the treatment of interior foci.
NTIS
Statistical Analysis; Orbits; Stability

20070026113 Brookhaven National Lab., Upton, NY, USA
Dibaryon Amplitudes for the Low-Energy Neutron-Proton Electromagnetic Interaction
Hackenburg, R. W.; Jan. 2007; 12 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-899615; BNL-77482-2007-IR; No Copyright; Avail.: Department of Energy Information Bridge

This report is a collection of detailed calculations that employ dibaryon propagators and vertex operators to obtain various electromagnetic amplitudes in the low-energy np/d system.
NTIS
Baryons; Electromagnetic Interactions; Neutrons; Protons

20070026117 Stanford Linear Accelerator Center, CA, USA
Measurement of Angle beta with Time-Dependent CP Asymmetry in B(sup O) yields K(sup +)K(sup -)K(sup O) Decays
Di Marco, E.; Feb. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-899558; SLAC-PUB-12323; No Copyright; Avail.: National Technical Information Service (NTIS)

We present recent results on CP violation, and the determination of CKM angle beta, with the decay B0->K+K-K0, with BABAR and Belle detectors.
NTIS
Asymmetry; CP Violation; Time Dependence; Particle Decay

20070026123 Lawrence Livermore National Lab., Livermore, CA USA
Generalization of Richardson-Gaudin Models to Rank-2 Algebras
Errea, B.; Lerma, S.; Dukelsky, J.; Dimitrova, S. S.; Pittel, S.; Jul. 27, 2006; 12 pp.; In English
Report No.(s): DE2007-900070; UCRL-PROC-223212; No Copyright; Avail.: National Technical Information Service (NTIS)

A generalization of Richardson-Gaudin models to the rank-2 SO(5) and SO(3,2) algebras is used to describe systems of two kinds of fermions or bosons interacting through a pairing force. They are applied to the protonneutron isovector pairing model and to the Interacting Boson Model 2, in the transition from vibration to gamma-soft nuclei, respectively. In both cases, the integrals of motion and their eigenvalues are obtained.
NTIS
Algebra; Bosons; Fermions

20070026128 Lawrence Livermore National Lab., Livermore, CA USA
Experimental Investigation of Detonation Corner-Turning Using High Resolution Radiography
Molitoris, J. D.; Andreski, H. G.; Garza, R. G.; Batteux, J. D.; Souers, P. C.; Jul. 20, 2006; 11 pp.; In English
Report No.(s): DE2007-900061; UCRL-CONF-222997; No Copyright; Avail.: Department of Energy Information Bridge

We have performed experiments investigating detonation corner turning over a range of high-explosives including LX-17, Composition B, LX-04 and Tritonal. The primary diagnostic utilized here was a new high-resolution x-ray system that was capable of recording a time sequence of the detonation process as it negotiated the corner of interest and propagated. For LX-17 our data detail the formation of a significant dead-zone. Although the detonation eventually turned the corner in LX-17, the dead zone persisted to late times and evidence exists that it never was consumed by either detonation or fast combustion processes. In LX-17 the detonations ability to corner-turn increases as the density is reduced. Furthermore, lowering the density decreases the size of the dead-zone and alters its shape. The other high-explosives investigated were able to turn the corner immediately with no indication of any dead-zone formation.
NTIS
Corners; Detonation; Explosives; High Resolution; Radiography

20070026144 Boston Univ., Boston, MA, USA
Cantilever Probes for Nanoscale Magnetic and Atomic Force Microscopy
Naughton, M. J., Inventor; 2 May 05; 19 pp.; In English
Contract(s)/Grant(s): NSF 02-10533
Patent Info.: Filed Filed 2 May 05; US-Patent-Appl-SN-11-119-859
Report No.(s): PB2007-104046; No Copyright; Avail.: CASI: A03, Hardcopy

The various embodiments discloses a cantilever probe comprising a first electrode and a second electrode engaged to a substrate and a branched cantilever wherein the cantilever comprises a nanostruture. Furthermore, the probe comprises a first arm of the cantilever engaged to the first electrode and a second arm of the cantilever engaged to the second electrode. Additionally, the cantilever probe comprises an electrical circuit coupled to the cantilever wherein the electrical circuit is capable of measuring a change in piezoresistance of the cantilever resulting from an atomic force and/or a magnetic force applied to the cantilever. Additionally, the invention discloses a method of performing atomic force microscopy, magnetic force microscopy, or magnetic resonance force microscopy. The nanostructures may comprise carbon or non-carbon materials. Additionally, the nanostructures may include nanotubes, nanowire, nanofibers and various other types of nanostructures.
NTIS
Atomic Force Microscopy; Magnetic Force Microscopy; Magnetic Resonance; Microscopy; Nanostructures (Devices)

20070026146 Lober (T. A.) Patent Services, Concord, MA, USA
Material Deposition Techniques for Control of Solid State Aperture Surface Properties
Branton, D., Inventor; Gordon, R. G., Inventor; Chen, P., Inventor; Misui, T., Inventor; Farmer, D. B., Inventor; 17 Dec 04; 54 pp.; In English
Contract(s)/Grant(s): DARPA-F49620-01-1-0467; DMR-0073590
Patent Info.: Filed Filed 17 Dec 04; US-Patent-Appl-SN-11-015-349
Report No.(s): PB2007-104045; No Copyright; Avail.: CASI: A04, Hardcopy

The invention provides a method for molecular analysis. In the method, sidewalls are formed extending through a structure between two structure surfaces, to define an aperture. A layer of material is deposited on the aperture sidewalls and

the two structure surfaces. The aperture with the deposited material layer is then configured in a liquid solution with a gradient in a chemical potential, between the two structure surfaces defining the aperture, that is sufficient to cause molecular translocation through the aperture.
NTIS
Apertures; Control Surfaces; Deposition; Solid State; Surface Properties

20070026185 Lawrence Livermore National Lab., Livermore, CA USA
Determining Compound-Nuclear Reaction Cross Sections Via Surrogate Reactions: Approximation Schemes for (n,f) Reactions
Escher, J. E.; Dietrich, F. S.; Jul. 19, 2006; 12 pp.; In English
Report No.(s): DE2007-900047; UCRL-PROC-222939; No Copyright; Avail.: Department of Energy Information Bridge
The validity of the Surrogate Nuclear Reactions method in the Weisskopf-Ewing limit and the Surrogate Ratio method are examined for neutron-induced fission of uranium nuclei. Both methods are approximations to the full Surrogate Nuclear Reactions approach, which aims at determining cross sections for compound-nuclear reactions. A nuclear-reaction model is employed to simulate physical quantities that are typically measured in Surrogate experiments and to test commonly-used assumptions underlying the analyses of Surrogate experiments.
NTIS
Approximation; Nuclear Reactions

20070026188 Xerox Corp., Rochester, NY, USA
Continuous Flow Particle Concentrator
Volkel, A. R., Inventor; Lean, M. H., Inventor; Hsieh, H. B., Inventor; Daniel, J. H., Inventor; 4 May 04; 15 pp.; In English
Contract(s)/Grant(s): DAAD19-03-C-0116
Patent Info.: Filed Filed 4 May 04; US-Patent-Appl-SN-10-838 570
Report No.(s): PB2007-104004; No Copyright; Avail.: CASI: A03, Hardcopy
An apparatus for extracting and concentrating bioagents within a continuously flowing fluid medium includes a flow channel fluid inlet, in which bioagents are concentrated from three dimensions to a two-dimensional transport layer in a preconcentration area. Traveling wave grids cause the preconcentrated bioagents to migrate to one side of the flow channel and then to an extraction port. Each of the traveling wave grids includes a substrate, a collection of closely spaced and parallel electrically conductive electrodes extending across said substrate, and a collection of buses providing electrical communication with the collection of conductive electrodes. A voltage controller provides a multiphase electrical signal to the collection of buses and electrodes of the traveling wave grids. Fluid exits through an outlet port.
NTIS
Charged Particles; Concentrators; Continuum Flow; Fluid Flow; Patent Applications

20070026189 Woodard, Emhardt, Moriarty, McNett and Henry, LLP, Indianapolis, IN, USA
Devices with Extended Area Structures for Mass Transfer Processing of Fluids
TeGrotenhuis, W. E., Inventor; Wegeng, R. S., Inventor; Whyatt, G. A., Inventor; King, D. L., Inventor; Brooks, K. P., Inventor; 18 Feb 05; 36 pp.; In English
Contract(s)/Grant(s): DE-AC0676RL01830
Patent Info.: Filed Filed 18 Feb 05; US-Patent-Appl-SN-11-061 237
Report No.(s): PB2007-104003; No Copyright; Avail.: CASI: A03, Hardcopy
A microchannel device includes several mass transfer microchannels to receive a fluid media for processing at least one heat transfer microchannel in fluid communication with a heat transfer fluid defined by a thermally conductive wall, and at several thermally conductive fins each connected to the wall and extending therefrom to separate the mass transfer microchannels from one another. In one form, the device may optionally include another heat transfer microchannel and corresponding wall that is positioned opposite the first wall and has the fins and the mass transfer microchannels extending there between.
NTIS
Mass Transfer; Patent Applications

20070026192 Bruckner (John), P.C, Austin, TX, USA

Space Charge Dosimeters for Extremely Low Power Measurements of Radiation in Shipping Containers

Britton, C. L., Inventor; Bucknerr, M. A., Inventor; Hanson, G. R., Inventor; Bryan, W. L., Inventor; 6 May 04; 31 pp.; In English

Contract(s)/Grant(s): DE-AC05-000R22725

Patent Info.: Filed Filed 6 May 04; US-Patent-Appl-SN-10-840 553

Report No.(s): PB2007-104013; No Copyright; Avail.: CASI: A03, Hardcopy

Methods and apparatus are described for space charge dosimeters for extremely low power measurements of radiation in shipping containers. A method includes insitu polling a suite of passive integrating ionizing radiation sensors including reading-out dosimetric data from a first passive integrating ionizing radiation sensor and a second passive integrating ionizing radiation sensor, where the first passive integrating ionizing radiation sensor and the second passive integrating ionizing radiation sensor remain situated where the dosimetric data was integrated while reading-out. Another method includes arranging a plurality of ionizing radiation sensors in a spatially dispersed array; determining a relative position of each of the plurality of ionizing radiation sensors to define a volume of interest; collecting ionizing radiation data from at least a subset of the plurality of ionizing radiation sensors; and triggering an alarm condition when a dose level of an ionizing radiation source is calculated to exceed a threshold.

NTIS

Dosimeters; Radiation Measuring Instruments; Space Charge; Containers

20070026197 Hamilton, Brook, Smith and Reynolds, Concord, MA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA

Surface Plasmon Coupled Nonequilibrium Thermoelectric Devices

Chen, G., Inventor; Yang, R., Inventor; Narayanaswamy, A., Inventor; 8 Dec 04; 40 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0803

Patent Info.: Filed Filed 8 Dec 04; US-Patent-Appl-SN-11-007 557

Report No.(s): PB2007-104002; No Copyright; Avail.: CASI: A03, Hardcopy

A surface-plasmon-coupled thermoelectric apparatus includes a first surface-plasmon substrate and a thermoelectric substrate electrically coupled to a plurality of electrodes. The substrates are electrically isolated from each other, and a first face of the thermoelectric substrate opposes a first face of the first surface-plasmon substrate to define a phonon insulating gap. A method of transferring thermal energy across the phonon insulating gap includes creating a first surface-plasmon polariton at the first surface-plasmon substrate when the first surface-plasmon substrate is coupled to a first thermal reservoir. Also included is creating a nonequilibrium state between the electron temperature and the phonon temperature at a first face of the thermoelectric substrate, when a second face of the thermoelectric substrate is coupled to a second thermal reservoir. Also included is coupling the first surface plasmon polariton with electrons in the thermoelectric substrate across the phonon insulating gap, thereby transferring thermal energy between the thermal reservoirs through the phonon insulating gap.

NTIS

Patent Applications; Plasmons; Thermoelectric Materials; Thermoelectricity

20070026237 Oxford Univ., Oxford, UK; Fermi National Accelerator Lab., Batavia, IL, USA

Constraints on PDF Uncertainties from CDF

Issever, C.; Jul. 2006; 4 pp.; In English

Report No.(s): DE2007-899696; FERMILAB-CONF-06-263-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent electroweak measurements and jet physics results from CDF which constrain the parton density functions (PDFs) are presented. Measurements of the W charge asymmetry, W and Z as well as jet cross sections based on k(Tau) and midpoint algorithm with up to 1fb(-1) RunII data are discussed.

NTIS

Particle Accelerators; Partons; Standard Model (Particle Physics)

20070026256 Ryan, Mason and Lewis LLP, Fairfield, CT, USA
Field Ramp Down for Pinned Synthetic Antiferromagnet
Trouilloud, P. L., Inventor; Klostermann, U., Inventor; 30 Apr 04; 10 pp.; In English
Contract(s)/Grant(s): MDA972-99-C-0009
Patent Info.: Filed Filed 30 Apr 04; US-Patent-Appl-SN-10-835-623
Report No.(s): PB2007-104064; No Copyright; Avail.: CASI: A02, Hardcopy

Techniques for processing magnetic devices are provided. In one aspect, a method of processing a magnetic device comprising two or more anti-parallel coupled layers comprises the following steps. A magnetic field is applied in a given direction to orient a direction of magnetization of the two or more anti-parallel coupled layers. The direction of the applied magnetic field is rotated in relation to a positioning of the two or more anti-parallel coupled layers to counteract at least a portion of a change in a direction of magnetization experienced by at least one of the two or more anti-parallel coupled layers when the applied magnetic field is reduced.
NTIS
Antiferromagnetism; Patent Applications

20070026261 Hunton and Williams, LLP, Washington, DC, USA
Entangled Photon Spectroscopy for Stand-Off Detection and Characterization
Freeling, R., Inventor; Augustyn, K., Inventor; 24 Mar 04; 21 pp.; In English
Contract(s)/Grant(s): AF-F33615-99-D-1501
Patent Info.: Filed Filed 24 Mar 04; US-Patent-Appl-SN-11-088-206
Report No.(s): PB2007-104060; No Copyright; Avail.: CASI: A03, Hardcopy

A system for and method of detecting and characterizing materials using entangled photons is presented. The material may be at a great distances from the detector and may be biological material, complex organic compounds, or inorganic chemicals. The disclosed system and method provide advantages over traditional techniques in that they are largely impervious to atmospheric reduction of probing radiation and in that less probing radiation is required. The reduced probe energy requirement allows for detecting and characterizing sensitive material with significantly reduced material bleaching compared with traditional techniques.
NTIS
Characterization; Patent Applications; Photons; Spectroscopy

20070026269 Godward (Cooley), LLP, Palo Alto, CA, USA
X-ray Transmissive Optical Mirror Apparatus
Loewen, R. J., Inventor; Rifkin, J., Inventor; Ruth, R. D., Inventor; 8 Apr 05; 27 pp.; In English
Contract(s)/Grant(s): NIH-4 R44 GM066511-02
Patent Info.: Filed Filed 8 Apr 05; US-Patent-Appl-SN-11-101-790
Report No.(s): PB2007-104069; No Copyright; Avail.: CASI: A03, Hardcopy

A mirror is reflective to light and transmissive to x-rays. The mirror has a continuous mirror surface and an x-ray aperture within a body portion of the mirror proximate the continuous mirror surface that is transmissive to x-rays.
NTIS
Mirrors; Optical Equipment; Patent Applications; X Ray Optics; X Ray Sources

20070026276 Fermi National Accelerator Lab., Batavia, IL, USA
Dynamic Alignment in Presence of Ground Motion and Technical Noise
Ivanov, V.; January 2006; 6 pp.; In English
Report No.(s): DE2007-897895; FERMILAB-CONF-06-500-CD; No Copyright; Avail.: National Technical Information Service (NTIS)

The ground motion (GM) and technical noise are the important limiting factor in the performance of modern linear colliders. They continuously misalign the elements of accelerating structure and beam delivery system. It needs the efficient dynamic alignment procedure to preserve the transversal emittance and to optimize the luminosity factor of the linear collider. The GM model implemented by A. Seryi for the LIAR code (1) is used to provide some simulations for the ILC project with using the experimental data obtained at the Aurora site and compare them with the results published before. The one-to-one

steering algorithm is used to study the performance of various subsystems of ILC. One of the goals of this work was to embed the GM model to the CHEF code developed at FNAL. For that the original Fortran algorithms have been rewritten in C++.
NTIS
Alignment; Earth Movements; Noise (Sound)

20070026281 Karlsruhe Univ., Germany; Stanford Linear Accelerator Center, CA, USA
Measurement of the e+ e- Multihadronic Cross Sections Below 4.5 GeV with BaBar
Denig, A.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897759; SLAC-PUB-12315; No Copyright; Avail.: Department of Energy Information Bridge

We present a summary of the hadronic cross section measurements performed with BABAR at the PEP-II collider via radiative return. BABAR has performed measurements of exclusive final states containing 3, 4 and 6 hadrons via this complementary method, as well as a measurement of the proton form factor.
NTIS
Hadrons; Cross Sections; Particle Theory

20070026282 Fermi National Accelerator Lab., Batavia, IL, USA
Test Results of Fermilab-Built Quadrupoles for the LHC Interaction Regions
Lamm, M. J.; Bossert, R.; DiMarco, J.; Feher, S.; Hocker, J. A.; January 2006; 3 pp.; In English
Report No.(s): DE2007-899706; FERMILAB-CONF-06-187-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

As part of the US LHC Accelerator Project, Fermilab is nearing the completion of the Q2 optical elements for the LHC interaction region final focus. Each Q2 element (LQXB) consists of two identical high gradient quadrupoles (MQXB) with a dipole orbit corrector (MCBX). This paper summarizes the test results for the LQXB/MQXB program including quench performance, magnetic measurements and alignment, and gives the status of production and delivery of the LQXB magnets to the LHC.
NTIS
Hadrons; Quadrupoles

20070026283 Stanford Linear Accelerator Center, CA, USA
R&D of Accelerator Structures at SLAC
Wang, J.; January 2006; 5 pp.; In English
Report No.(s): DE2007-897757; SLAC/PUB-12293; No Copyright; Avail.: National Technical Information Service (NTIS)

The research activities for accelerator structures at SLAC are reviewed including the achievement via the main linac design for the Next Linear Collider (NLC), the program adjustment after the decision of the International Linear Collider (ILC) to be based on superconducting technology, and the work progress for the ILC, photon science at SLAC and basic accelerator structure studies.
NTIS
Research and Development; Linear Accelerators

20070026286 Lawrence Livermore National Lab., Livermore, CA USA
Data Report on Material Ablation and Shock Pressure Measurements at ZBL
Smith, E.; Bonahoom, B.; De La Cruz, C.; Jan. 16, 2007; 40 pp.; In English
Report No.(s): DE2007-900044; UCRL-TR-227274; No Copyright; Avail.: National Technical Information Service (NTIS)

A series of tests were conducted on ZBL to provide data that can be used to determine the laser coupling coefficient and validate code capabilities. The gauges and cables in the chamber were shielded with conduit and resulted in high fidelity signals. The stress measurements show a clear trend of peak stress attenuation with propagation distance, as would be expected. The aluminum sample stresses measured were in the 4 to 8 Kbar range. This constitutes a good data set for model validation. VISAR was considered as a diagnostic for this test series but predicted stress levels were uncertain and we had had good success previously with PVDF at this test facility; plus, the aggressive test schedule and limited number of shots left little opportunity to set up this diagnostic. Shock profile measurements were made with both PVDF and Quartz gauges. The PVDF gauge and the Quartz gauge measured very similar shock pulses transmitted through 1.5-mm thick 2024-T3 samples at a nominal fluence of 400 J/cm2. The similarity in the two profiles indicates good correlation between measurement techniques and the differences between the sensor areas allow one to evaluate different parts of the beam. The laser beam ablated the front

surfaces of the samples. Surface profile measurements of the ablated surface were used to estimate the depth of material removed. Ablated sample surface and crater formation indicate a non-uniform hot spot in the center of the sample.
NTIS
Ablation; Pressure Measurement; Pulsed Lasers

20070026287 Lawrence Livermore National Lab., Livermore, CA USA
Neutron Induced Inelastic Cross Sections of 150Sm for En=1 to 35 MeV
Dashdorj, D.; Mitchell, G. E.; Kawano, T.; Becker, J. A.; Agvaanluvsan, U.; Aug. 18, 2006; 14 pp.; In English
Report No.(s): DE2007-900042; UCRL-PROC-223818; No Copyright; Avail.: Department of Energy Information Bridge

Cross-section measurements were made of prompt gamma-ray production as a function of incident neutron energy (En = 1 to 35 MeV) on an enriched (95.6%) l50Sm sample. Energetic neutrons were delivered by the Los Alamos National Laboratory spallation neutron source located at the Los Alamos Neutron Science Center (LANSCE) facility. The prompt-reaction gamma rays were detected with the large-scale Compton-suppressed Germanium Array for Neutron Induced Excitations (GEANIE). Neutron energies were determined by the time-of-flight technique. The a-ray excitation functions were converted to partial a-ray cross sections taking into account the dead-time correction, target thickness, detector efficiency and neutron flux (monitored with an in-line fission chamber). Partial a-ray cross sections were predicted using the Hauser-Feshbach statistical reaction code GNASH. Above En around 8 MeV the pre-equilibrium reaction process dominates the inelastic reaction. The spin distribution transferred in pre-equilibrium neutron-induced reactions was calculated using the quantum mechanical theory of Feshbach, Kerman, and Koonin (FKK). These pre-equilibrium spin distributions were incorporated into a new version of GNASH and the a-ray production cross sections were calculated and compared with experimental data. The difference in the partial a-ray cross sections using spin distributions with and without pre-equilibrium effects is discussed.
NTIS
Gamma Rays; Neutron Cross Sections; Neutron Sources

20070026288 Queen Mary and Westfield Coll., London, UK; Stanford Linear Accelerator Center, CA, USA
Measurement of Alpha /phi 2 from B to pi pi Decays
Bevan, A. J.; Jan. 2007; 4 pp.; In English
Report No.(s): DE2007-897728; SLAC/PUB-12298; No Copyright; Avail.: National Technical Information Service (NTIS)

The current results of B (yields) (pi)(pi) decays and SU(2) constraints on the Unitarity Triangle angle (alpha) or (phi)(sub 2)from the B-factories are summarized. Based on these measurements, predictions of the isospin analysis constraints at the end of the lifetime of both B-factories are given.
NTIS
Mesons; Particle Decay; Isotopic Spin

20070026289 Northern Illinois Univ., De Kalb, IL, USA
Search for Third Generation Scalar Leptoquarks
Zatserklyaniy, A.; January 2007; 118 pp.; In English
Report No.(s): DE2007-900000; No Copyright; Avail.: National Technical Information Service (NTIS)

Leptoquarks (LQ) are particles with both color and lepton number predicted in some gauge theories and composite models. Current theory suggests that leptoquarks would come in three different generations. We report on a search for charge 1/3 third generation leptoquarks produced in p(overbar)p collisions at square root of s=1.96 TeV using data collected by the D0 detector at Fermilab.
NTIS
Elementary Particles; Scalars; Quarks

20070026292 California Univ., Oakland, CA, USA
Diagnostic System for Profiling Micro-Beams
Elmer, J. W., Inventor; Palmer, T. A., Inventor; Teruya, A. T., Inventor; Walton, C. C., Inventor; 27 Apr 05; 14 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 27 Apr 05; US-Patent-Appl-SN-11-116-697
Report No.(s): PB2007-104038; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for characterization of a micro beam comprising a micro modified Faraday cup assembly including a first

layer of material, a second layer of material operatively connected to the first layer of material, a third layer of material operatively connected to the second layer of material, and a fourth layer of material operatively connected to the third layer of material. The first layer of material comprises an electrical conducting material and has at least one first layer radial slit extending through the first layer. An electrical ground is connected to the first layer. The second layer of material comprises an insulating material and has at least one second layer radial slit corresponding to the first layer radial slit in the first layer of material. The second layer radial slit extends through the second layer. The third layer of material comprises a conducting material and has at least one third layer radial slit corresponding to the second layer radial slit in the second layer of material. The third layer radial slit extends through the third layer. The fourth layer of material comprises an electrical conducting material but does not have slits. An electrical measuring device is connected to the fourth layer. The micro modified Faraday cup assembly is positioned to be swept by the micro beam.
NTIS
Electron Beams; Microbeams

20070026309 Brookhaven National Lab., Upton, NY USA
Accelerating Polarized Protons to High Energy
Bai, M.; Ahrens, L.; Alkseev, I. G.; Alessi, J.; Beebe-Wang, J.; Nov. 2006; 12 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-899890; BNL-77495-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge

The Relativistic Heavy Ion Collider (RHIC) is designed to provide collisions of high energy polarized protons for the quest of understanding the proton spin structure. Polarized proton collisions at a beam energy of 100 GeV have been achieved in RHIC since 2001. Recently, polarized proton beam was accelerated to 250 GeV in RHIC for the first time. Unlike accelerating unpolarized protons, the challenge for achieving high energy polarized protons is to fight the various mechanisms in an accelerator that can lead to partial or total polarization loss due to the interaction of the spin vector with the magnetic fields. We report on the progress of the RHIC polarized proton program. We also present the strategies of how to preserve the polarization through the entire acceleration chain, i.e. a 200 MeV linear accelerator, the Booster, the AGS and RHIC.
NTIS
Collisions; Protons; Polarization; Proton Beams

20070026314 Lawrence Livermore National Lab., Livermore, CA USA
Soft X Ray Spectrometer Operation at the National Ignition Facility
Schein, J.; Dewald, E.; Campbell, K.; Turner, R.; Weber, F.; May 07, 2006; 16 pp.; In English
Report No.(s): DE2007-895433; UCRL-CONF-221176; No Copyright; Avail.: National Technical Information Service (NTIS)

Radiation drive diagnostics during the NIF early light campaign was supported by an 18 channel soft x-ray spectrometer (Dante). In order to achieve a measurement accuracy of 2% in radiation temperature absolute calibration of the individual channels was necessary and signal distortion through long transmission lines had to be compensated for as well. For fast signals the signal attenuation due to the long (50m) cables amounted to approx. 20% at 100MHz, which was corrected by a cable compensation in the frequency domain. The varying effects of cable distortion for a variety of signals between 1ns and 9ns in length were evaluated and corrections were applied. Results of the thus calculated temperatures of the NEL campaign will be presented compared to LASNEX predictions, showing agreement in peak radiation temperature within less than 2%.
NTIS
Ignition; X Ray Spectrometers

20070026331 Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Searches for New Physics in Lepton Final States
Ciobanu, C. I.; Jun. 01, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-FG2-76CH03000
Report No.(s): DE2007-892381; FERMILAB-CONF-06-184-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Final States Containing charged leptons could provide some of the most distinctive signatures for observing physics beyond the Standard Model. The author presents searches for new physics using 0.32 - 0.45 fb(-1) of data accumulated with

teh CDF II and D0 detectors at the Tevatron. No significant evidence of a signal is found, and in most cases the tighest constraints to date are set on the exotic processes investigated.
NTIS
Leptons; Standard Model (Particle Physics)

20070026344 Lawrence Livermore National Lab., Livermore, CA USA
Laboratory Observation of Secondary Shock Formation Ahead of a Strongly Radiative Blast Wave
Hansen, J. F.; Edwards, M. J.; Froula, D. H.; Edens, A. D.; Gregori, G.; May 07, 2006; 16 pp.; In English
Report No.(s): DE2007-895440; UCRL-PROC-221171; No Copyright; Avail.: Department of Energy Information Bridge
We have previously reported the experimental discovery of a second shock forming ahead of a radiative shock propagating in Xe. The initial shock is spherical, radiative, with a high Mach number, and it sends a supersonic radiative heat far ahead of itself. The heat wave rapidly slows to a transonic regime and when its Mach number drops to two with respect to the downstream plasma, the heat wave drives a second shock ahead of itself to satisfy mass and momentum conservation in the heat wave reference frame. We now show experimental data from a range of mixtures of Xe and N2, gradually changing the properties of the initial shock and the environment into which the shock moves and radiates (the radiative conductivity and the heat capacity). We have successfully observed second shock formation over the entire range from 100% Xe mass fraction to 100% N2. The formation radius of the second shock as a function of Xe mass fraction is consistent with an analytical estimate.
NTIS
Detonation Waves; Shock Wave Propagation; Shock Waves

20070026346 Stanford Linear Accelerator Center, Stanford, CA, USA; Katholieke Univ. te Leuven, Belgium; Rutgers - The State Univ., New Brunswick, NJ, USA; Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France
Physics of String Flux Compactifications
Denef, F.; Douglas, M. R.; Kachru, S.; Feb. 2007; 45 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-899845; SLAC-PUB-12359; No Copyright; Avail.: Department of Energy Information Bridge
We provide a qualitative review of flux compactifications of string theory, focusing on broad physical implications and statistical methods of analysis.
NTIS
String Theory; Strings

20070026347 Stanford Univ., Stanford, CA USA
Charting the Course for Elementary Particle
Richter, B.; Feb. 16, 2007; 14 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-899843; SLAC-PUB-12345; No Copyright; Avail.: National Technical Information Service (NTIS)
It was the best of times; it was the worst of times is the way Dickens begins the Tale of Two Cities. The line is appropriate to our time in particle physics. It is the best of times because we are in the midst of a revolution in understanding, the third to occur during my career. It is the worst of times because accelerator facilities are shutting down before new ones are opening, restricting the opportunity for experiments, and because of great uncertainty about future funding. My task today is to give you a view of the most important opportunities for our field under a scenario that is constrained by a tight budget. It is a time when we cannot afford the merely good, but must give first priority to the really important. The defining theme of particle physics is to learn what the universe is made of and how it all works. This definition spans the full range of size from the largest things to the smallest things. This particle physics revolution has its origins in experiments that look at both.
NTIS
Charts; Elementary Particles

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*.

20070025191 ASRC Aerospace Corp., Cleveland, OH, USA
Noise Generation in Hot Jets
Khavaran, Abbas; Kenzakowski, Donald C.; July 09, 2007; 32 pp.; In English; AIAA/CEAS 13th Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains black and white illustrations
Contract(s)/Grant(s): NNC06BA07B
Report No.(s): NASA/CR-2007-214924; AIAA Paper-2007-3640; E-16145; Copyright; Avail.: CASI: A03, Hardcopy

A prediction method based on the generalized acoustic analogy is presented, and used to evaluate aerodynamic noise radiated from high speed hot jets. The set of Euler equations are split into their respective non-radiating and residual components. Under certain conditions, the residual equations are rearranged to form a wave equation. This equation consists of a third-order wave operator, plus a number of nonlinear terms that are identified with the equivalent sources of sound and their statistical characteristics are modeled. A specialized RANS solver provides the base flow as well as turbulence quantities and temperature fluctuations that determine the source strength. The main objective here is to evaluate the relative contribution from various source elements to the far-field spectra and to show the significance of temperature fluctuations as a source of aerodynamic noise in hot jets.
Author
Aerodynamic Noise; Jet Flow; Noise Generators; Prediction Analysis Techniques; Turbulence

20070025311 Pennsylvania State Univ., University Park, PA USA
Experimental Measurements of the Demo Enclosure
Fahnline, J B; Campbell, R L; Hambric, S A; May 2004; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): PL01000100
Report No.(s): AD-A465778; PSU/ARL-TR-04-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Surface vibrations and sound radiation from a small enclosure, meant to simulate the basic characteristics of an equipment enclosure but without the complexity, are investigated experimentally. Several methods of mounting interior shelves in an enclosure are tested, with an attempt to simulate free-free, simply-supported, and clamped boundary conditions. As expected, the measurements show that the vibrations and sound radiation are intimately related to the way the shelves are mounted in the enclosed. Overall, the demo enclosure measurements have yielded valuable information about the effects of the shelf boundary conditions on noise radiation.
DTIC
Enclosure; Sound Waves; Vibration

20070025575 Demont and Breyer, LLC, Holmdel, NY, USA
Diagnostic System and Method for Transducers
Klein, J. G., Inventor; Scoca, A. L., Inventor; 25 Feb 04; 13 pp.; In English
Contract(s)/Grant(s): N0030-02-C-0021
Patent Info.: Filed Filed 25 Feb 04; US-Patent-Appl-SN-10-786 497
Report No.(s): PB2007-104726; No Copyright; Avail.: CASI: A03, Hardcopy

In accordance with the illustrative embodiment, a diagnostic method for use with multi-element transducers includes determining an acoustic center of a transducer and determining an offset of the determined acoustic center from a theoretical acoustic center of the transducer. In some embodiments, the method also quantifies the impact that the offset has on performance of a transducer array. In some embodiments, the offset is used to correct signal processing calculations that rely on assumptions about the acoustic center of each transducer in the transducer array. A diagnostic system for use with multi-element transducers includes a projector, wherein the projector generates a sound; and a mechanical fixture, wherein the fixture aligns the projector with the transducing elements in the transducer so that in combination, the projector selectively ensonifies each of the transducing elements in the transducer.
NTIS
Sonar; Sound Transducers

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*.

20070026082 Yale Univ., New Haven, CT USA
Intrinsic Electronic Conduction Mechanisms in Self-Assembled Monolayers
Wang, Wenyong; Lee, Takhee; Reed, Mark A; Jan 2005; 25 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0657; DAAD19-01-1-0592
Report No.(s): AD-A465940; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A review on the mechanisms and characterization methods of molecular electronic transport is presented. Using self-assembled monolayers (SAMs) of alkanethiols in a nanometer scale device structure, tunneling is unambiguously demonstrated as the main conduction mechanism for large bandgap SAMs, exhibiting well-known temperature and length dependencies. Inelastic electron tunneling spectroscopy exhibits clear vibrational modes of the molecules in the device, presenting the first direct evidence of the presence of molecules in a molecular device.
DTIC
Self Assembly; Electron Tunneling; Energy Gaps (Solid State)

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*.

20070025233 Lawrence Livermore National Lab., Livermore, CA USA
Deducing the 237U Destruction Cross Sections using the Surrogate Ratio Method
Bernstein, L. A.; Burke, J. T.; Ahle, L.; Church, J. A.; Escher, J.; Apr. 24, 2006; 12 pp.; In English
Report No.(s): DE2007-895425; UCRL-PROC-220800; No Copyright; Avail.: Department of Energy Information Bridge

We have deduced the destruction cross section of 237U via the (n,a) and (n,2n) reactions over an equivalent neutron energy range of 0 to 20 MeV using a new form of the Surrogate Ratio method (1-4) . The relative fission and neutron-evaporation decay probabilities of excited 238U populated via the (a,a) inelastic scattering were measured using the silicon telescope array for reaction studies (STARS) coupled to the Livermore Berkeley array for collaborative experiments (LIBERACE). These relative probabilities were then combined with the 237 U(n,f) cross section deduced by Burke et al., to deduce the (n,a) and (n,2n) cross sections in a model independent fashion. These cross sections are then compared to the compound reaction cross section calculated using an optical model calculation tuned to reproduce scattering data in the transactinide region. Our results presented and the prospects for using this technique to deduce (n,x) cross sections on radioactive nuclei are discussed.
NTIS
Destruction; Fission; Neutrons; Uranium Isotopes; Neutron Decay

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*.

20070025227 Lawrence Livermore National Lab., Livermore, CA USA
Evaluation of Potential Large Synoptic Survey Telescope Spatial Indexing Strategies
Nikolaev, S.; Abdulla, G.; Matzke, R.; Nov. 03, 2006; 14 pp.; In English
Report No.(s): DE2007-895409; UCRL-TR-225827; No Copyright; Avail.: Department of Energy Information Bridge

The LSST requirement for producing alerts in near real-time, and the fact that generating an alert depends on knowing the history of light variations for a given sky position, both imply that the clustering information for all detections is available at any time during the survey. Therefore, any data structure describing clustering of detections in LSST needs to be continuously updated, even as new detections are arriving from the pipeline. We call this use case incremental clustering, to

reflect this continuous updating of clustering information. This document describes the evaluation results for several potential LSST incremental clustering strategies, using: (1) Neighbors table and zone optimization to store spatial clusters (a.k.a. Jim Greys, or SDSS algorithm); (2) MySQL built-in R-tree implementation; (3) an external spatial index library which supports a query interface.
NTIS
Telescopes; Sky Surveys (Astronomy); Astronomy; Data Structures

20070025307 Georgia Inst. of Tech., Atlanta, GA USA
Magnetic and Optical Properties of Ga(1-x)Mn(x)N Grown by Metalorganic Chemical Vapour Deposition
Kane, M H; Asghar, A; Vestal, C R; Strassburg, M; Senawiratne, J; Zhang, Z J; Dietz, N; Summers, C J; Ferguson, I T; Feb 17, 2005; 6 pp.; In English
Report No.(s): AD-A465731; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Epitaxial layers of Ga(1-x)Mn(x)N with concentrations of up to x = 0.015 have been grown on c-sapphire substrates by metalorganic chemical vapor deposition. No ferromagnetic second phases were detected via high-resolution x-ray diffraction. Crystalline quality and surface structure were measured by x-ray diffraction and atomic force microscopy, respectively. No significant deterioration in crystal quality and no increase in surface roughness with the incorporation of Mn were detected. Optical measurements show a broad emission band attributed to a Mn-related transition at 3.0 eV that is not seen in the underlying GaN virtual substrate layers. Room temperature ferromagnetic hysteresis has been observed in these samples, which may be due to either Mn-clustering on the atomic scale or the Ga(1-x)Mn(x)N bulk alloy.
DTIC
Gallium Nitrides; Magnetic Properties; Optical Properties; Vapor Deposition

20070025520 Swedish Defence Research Establishment, Linkoeping, Sweden
Mid-IR Laser for the LYSA System (Mid-IR Laser foer LYSA Systemet)
Eriksson, A.; Henriksson, M.; Oct. 2005; 20 pp.; In English
Report No.(s): PB2007-103406; FOI-R-1749-SE; No Copyright; Avail.: National Technical Information Service (NTIS)
The recent improvement of modern intelligent IR-seekers, which distinguishes flares and decoys from real targets, has lead to an increasing demand for lasers for directed infrared countermeasures. We report here the construction, initial tests and characterization of a tunable mid infrared laser based on a PPLN OPO pumped at 1064 nm by an Nd:YVO4 laser with 10 kHZ pulse repetition frequency. The laser system has been run in two different configurations to obtain radiation from the OPO at the two different wavelengths 2.4 and 3.5 microgram, respectively. The maximum average powers were 70 mW at 2.4 microgram and 516 nW at 3.5 microgram. The idler pulse length was 22 ns.
NTIS
Infrared Radiation; Lasers; Pulse Repetition Rate; Frequencies

20070025521 SMith (Reed) LLP, Philadelphia, PA USA
Optical Panel System Including Stackable Waveguides
DeSanto, L., Inventor; Veligadan, J. T., Inventor; 29 Apr 04; 17 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-831 924
Report No.(s): PB2007-104126; No Copyright; Avail.: CASI: A03, Hardcopy
An optical panel system including stackable waveguides is provided. The optical panel system displays a projected light image and comprises a plurality of planar optical waveguides in a stacked state. The optical panel system further comprises a support system that aligns and supports the waveguides in the stacked state. In one embodiment, the support system comprises at least one rod, wherein each waveguide contains at least one hole, and wherein each rod is positioned through a corresponding hole in each waveguide. In another embodiment, the support system comprises at least two opposing edge structures having the waveguides positioned therebetween, wherein each opposing edge structure contains a mating surface, wherein opposite edges of each waveguide contain mating surfaces which are complementary to the mating surfaces of the opposing edge structures, and wherein each mating surface of the opposing edge structures engages a corresponding complementary mating surface of the opposite edges of each waveguide.
NTIS
Optical Waveguides; Panels

20070025524 Heller, Ehrman, White, and McAuliffe, LLP, Washington, DC, USA
Automated Imaging System for Single Molecules
Schwarz, D. C., Inventor; Runnheim, R., Inventor; Forrest, D., Inventor; 9 Feb 05; 43 pp.; In English
Contract(s)/Grant(s): DE-FG02-99ER62830
Patent Info.: Filed Filed 9 Feb 05; US-Patent-Appl-SN-11-052 836
Report No.(s): PB2007-104155; No Copyright; Avail.: CASI: A03, Hardcopy

There is provided a high throughput automated single molecule image collection and processing system that requires minimal initial user input. The unique features embodied in the present disclosure allow automated collection and initial processing of optical images of single molecules and their assemblies. Correct focus may be automatically maintained while images are collected. Uneven illumination in fluorescence microscopy is accounted for, and an overall robust imaging operation is provided yielding individual images prepared for further processing in external systems. Embodiments described herein are useful in studies of any macromolecules such as DNA, RNA, peptides and proteins. The automated image collection and processing system and method of same may be implemented and deployed over a computer network, and may be ergonomically optimized to facilitate user interaction.
NTIS
Imaging Techniques; Macromolecules; Automatic Control

20070025528 Blue Road Research, Fairview, OR, USA
Fiber Grating Strain Sensors for Civil Structures
Calvert, S. G., Inventor; Mooney, J., Inventor; Udd, E., Inventor; 11 Mar 05; 17 pp.; In English
Contract(s)/Grant(s): DMI-0131967
Patent Info.: Filed Filed 11 Mar 05; US-Patent-Appl-SN-11-078 896
Report No.(s): PB2007-104169; No Copyright; Avail.: CASI: A03, Hardcopy

A fiber grating strain sensor package that is optimized for axial strain sensitivity and usage on a civil structure that may be a bridge or building is described in this invention. Transverse strain effects are minimized and axial strain sensitivity is enhanced through the design of a substrate with an optimized geometry. These sensors have been deployed and tested on a bridge demonstrating very high sensitivity and the ability of this design to be packaged in an environmentally rugged housing necessary for a commercially successful product.
NTIS
Gratings (Spectra); Sensors; Axial Strain

20070025532 Evan Law Group, LLC, Chicago, IL, USA
Scanning Probe Microscope Probe with Integrated Capillary Channel
Liu, C., Inventor; 26 Apr 04; 10 pp.; In English
Contract(s)/Grant(s): NW 0650 300F245
Patent Info.: Filed Filed 26 Apr 04; US-Patent-Appl-SN-10-831 944
Report No.(s): PB2007-104172; No Copyright; Avail.: CASI: A02, Hardcopy

A scanning probe microscope probe is disclosed. The scanning probe microscope probe includes a handle and a cantilever shank connected with the handle. The cantilever shank has at one end a base connected with the handle and at an opposing end a tip. The cantilever shank forms a capillary channel between the base to the tip of the cantilever shank.
NTIS
Scanners; Scanning Electron Microscopy; Channels

20070025560 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Oakland, CA, USA
Optically Triggered Fire Set Detonator System
Chase, J. B., Inventor; Pincosy, P. A., Inventor; Chato, D. M., Inventor; Kirbie, H., Inventor; James, G. F., Inventor; 30 Sep 03; 8 pp.; In English
Contract(s)/Grant(s): DE-N7405-ENG-48
Patent Info.: Filed Filed 30 Sep 03; US-Patent-Appl-SN-10-676 704
Report No.(s): PB2007-104703; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention is directed to a system having a plurality of capacitor discharge units (CDUs) that includes electrical bridge type detonators operatively coupled to respective explosives. A pulse charging circuit is adapted to provide a voltage

for each respective capacitor in each CDU. Such capacitors are discharged through the electrical bridge type detonators upon receiving an optical signal to detonate respective operatively coupled explosives at substantially the same time.
NTIS
Capacitors; Detonators; Explosives; Fires; Optical Communication

20070025580 Carter, DeLuca, Farrell and Schmidt, Melville, NY, USA; Maryland Univ., College Park, MD, USA
Far-Field Optical Microscope with a Nanometer-Scale Resolution Based on the In-Plane Image Magnification by Surface Plasmon Polaritons
Smolyaninov, I. I., Inventor; Davis, C. C., Inventor; 18 Feb 05; 20 pp.; In English
Contract(s)/Grant(s): NSF-ECS-0210438; NSF-ECS-0304046
Patent Info.: Filed Filed 18 Feb 05; US-Patent-Appl-SN-11-061 837
Report No.(s): PB2007-104728; No Copyright; Avail.: CASI: A03, Hardcopy

A far-field optical microscope capable of reaching nanometer-scale resolution using the in-plane image magnification by surface plasmon polaritons is presented. The microscope utilizes a microscopy technique based on the optical properties of a metal-dielectric interface that may, in principle, provide extremely large values of the effective refractive index n.sub.eff up to 10(sup 2)-10(sup 3) as seen by the surface plasmons. Thus, the theoretical diffraction limit on resolution becomes lambda/2n(sub eff), and falls into the nanometer-scale range. The experimental realization of the microscope has demonstrated the optical resolution better than 50 nm for 502 nm illumination wavelength.
NTIS
Far Fields; Optical Microscopes; Plasmons; Polaritons; Submerging; Magnification

20070025596 Williams (Hovey), LLP, Kansas City, MO, USA
Apparatus and Method for Combining Light from Two and More Fibers into a Single Fiber
Klingsporn, P. E., Inventor; 12 Feb 04; 7 pp.; In English
Contract(s)/Grant(s): DE-AC04-01AL66850
Patent Info.: Filed Filed 12 Feb 04; US-Patent-Appl-SN-10-777 561
Report No.(s): PB2007-104674; No Copyright; Avail.: CASI: A02, Hardcopy

An apparatus and method for combining light signals carried on a plurality of input fibers onto a single receiving fiber with a high degree of efficiency. The apparatus broadly comprises the receiving fiber and a plurality of input fiber-lens assemblies, with each fiber lens assembly including an input fiber; a collimating lens interposed between the input fiber and the receiving fiber and adapted to collimate the light signal; and a focusing lens interposed between the collimating lens and the receiving fiber and adapted to focus the collimated light signal onto the face of the receiving fiber. The components of each fiber-lens assembly are oriented along an optic axis that is inclined relative to the receiving fiber, with the inclination angle depending at least in part on the input fiber's numerical aperture and the focal lengths and diameters of the collimating and focusing lenses.
NTIS
Optical Communication; Collimation; Fiber Optics

20070025600 Greer, Burns and Crain, Chicago, IL, USA; Illinois Univ. at Urbana-Champaign, Savoy, IL, USA
Current Biased Dual DBR Grating Semiconductor Laser
Coleman, J. J., Inventor; Roh, S. D., Inventor; 12 Feb 04; 8 pp.; In English
Contract(s)/Grant(s): F49620-96-1-0163; ECS-99-00258
Patent Info.: Filed Filed 12 Feb 04; US-Patent-Appl-SN-10-778 599
Report No.(s): PB2007-104678; No Copyright; Avail.: CASI: A02, Hardcopy

Dual-wavelength operation is easily achieved by biasing the gain section. Multiple gratings spaced apart from each other are separated from an output aperture by a gain section. A relatively low coupling coefficient, .kappa., in the front grating reduces the added cavity loss for the back grating mode. Therefore, the back grating mode reaches threshold easily. The space section lowers the current induced thermal interaction between the two uniform grating sections, significantly reducing the inadvertent wavelength drift. As a result, a tunable mode pair separations (DELTA.lambda.) as small as 0.3 nm and as large as 6.9 nm can be achieved.
NTIS
Bias; Dbr Lasers; Gratings (Spectra); Semiconductor Lasers

20070026122 Lawrence Livermore National Lab., Livermore, CA USA
Final Report: Posttest Analysis of Omega II Optical Specimens
Newlander, C. D.; Fisher, J. H.; Feb. 01, 2007; 41 pp.; In English
Report No.(s): DE2007-900072; UCRL-TR-227641; No Copyright; Avail.: National Technical Information Service (NTIS)

Preliminary posttest analyses have been completed on optical specimens exposed during the Omega II test series conducted on 14 July 2006. The Omega Facility, located at the Laboratory for Laser Energetics (LLE) at the University of Rochester was used to produce X-ray environments through the interaction of intense pulsed laser radiation upon germanium-loaded silica aerogels. The tests were performed under the direction of Dr Kevin Fournier/LLNL with the support of personnel from LLNL, SNL, and Alme & Associates. The optical specimen testing was supported by GH Systems through experiment design, pre- and posttest analyses, specimen acquisition, and overall technical experience. The test specimens were fabricated and characterized by Surface Optics Corporation (SOC), San Diego, CA and were simple protected gold coatings on silica substrates. Six test specimens were exposed, five filtered with thin beryllium foil filters, and one unfiltered which was exposed directly to the raw environment.
NTIS
Aerogels; Explosives; Germanium; Lasers; Silicon Dioxide

20070026130 Lawrence Livermore National Lab., Livermore, CA USA
Technical Challenges for the Future of High Energy Lasers
LaFortune, K. N.; Hurd, R. L.; Fochs, S. N.; Rotter, M. D.; Pax, P. H.; Jan. 12, 2007; 13 pp.; In English
Report No.(s): DE2007-900058; UCRL-PROC-227257; No Copyright; Avail.: Department of Energy Information Bridge

The Solid-State, Heat-Capacity Laser (SSHCL) program at Lawrence Livermore National Laboratory is a multi-generation laser development effort scalable to the megawatt power levels with current performance approaching 100 kilowatts. This program is one of many designed to harness the power of lasers for use as directed energy weapons. There are many hurdles common to all of these programs that must be overcome to make the technology viable. There will be a in-depth discussion of the general issues facing state-of-the-art high energy lasers and paths to their resolution. Despite the relative simplicity of the SSHCL design, many challenges have been uncovered in the implementation of this particular system. An overview of these and their resolution are discussed. The overall system design of the SSHCL, technological strengths and weaknesses, and most recent experimental results will be presented.
NTIS
High Power Lasers; Weapon Systems

20070026172 Foley and Lardner, LLP, Madison, WI, USA
Type II Quantum Well Mid-Infrared Optoelectronic Devices
Mawst, L. J., Inventor; Tansu, N., Inventor; Meyer, J. R., Inventor; Vurgaftman, I., Inventor; 5 Feb 04; 14 pp.; In English
Contract(s)/Grant(s): NSF-013982-3
Patent Info.: Filed Filed 5 Feb 04; US-Patent-Appl-SN-10-772-573
Report No.(s): PB2007-104596; No Copyright; Avail.: CASI: A03, Hardcopy

Semiconductor optoelectronic devices such as diode lasers are formed on InP substrates with an active region with an InAsN or InGaAsN electron quantum well layer and a GaAsSb or InGaAsSb hole quantum well layer which form a type II quantum well. The active region may be incorporated in various devices to provide light emission at relatively long wavelengths, including light emitting diodes, amplifiers, surface emitting lasers and edge-emitting lasers.
NTIS
Electro-Optics; Optoelectronic Devices; Quantum Wells; Semiconductor Lasers

20070026186 Lawrence Livermore National Lab., Livermore, CA USA
High-resolution Adaptive Optics Scanning Laser Ophthalmoscope with Dual Deformable Mirrors for Large Aberration Correction
Chen, D. C.; Jones, S. M.; Silva, D. A.; Olivier, S. S.; Jan. 30, 2007; 12 pp.; In English
Report No.(s): DE2007-900073; UCRL-CONF-227576; No Copyright; Avail.: National Technical Information Service (NTIS)

Scanning laser ophthalmoscopes with adaptive optics (AOSLO) have been shown previously to provide a noninvasive, cellular-scale view of the living human retina. However, the clinical utility of these systems has been limited by the available deformable mirror technology. In this paper, we demonstrate that the use of dual deformable mirrors can effectively

compensate large aberrations in the human retina, making the AOSLO system a viable, non-invasive, high-resolution imaging tool for clinical diagnostics. We used a bimorph deformable mirror to correct low-order aberrations with relatively large amplitudes. The bimorph mirror is manufactured by Aoptix, Inc. with 37 elements and 18 im stroke in a 10 mm aperture. We used a MEMS deformable mirror to correct high-order aberrations with lower amplitudes. The MEMS mirror is manufactured by Boston Micromachine, Inc with 144 elements and 1.5 im stroke in a 3 mm aperture. We have achieved near diffraction-limited retina images using the dual deformable mirrors to correct large aberrations up to -3D of defocus and -3D of cylindrical aberrations with test subjects. This increases the range of spectacle corrections by the AO systems by a factor of 10, which is crucial for use in the clinical environment. This ability for large phase compensation can eliminate accurate refractive error fitting for the patients, which greatly improves the system ease of use and efficiency in the clinical environment.
NTIS
Aberration; Adaptive Optics; Deformable Mirrors; High Resolution; Laser Applications; Lasers

20070026230 Swedish Defence Research Establishment, Linkoeping, Sweden
Optical Signature Modelling Final Report
Nelsson, C.; Forssell, G.; Hermansson, P.; Nyberg, S.; Persson, A.; Nov. 2005; 48 pp.; In English
Report No.(s): PB2007-103416; FOI-R-1812-SE; No Copyright; Avail.: National Technical Information Service (NTIS)
The project was focused on research issues regarding methods and models for a detailed prediction of optical signature of a target in background. Methods and a computational environment have been established for the needs of the armed forces. Different platform concepts can be studied in different environments and weather conditions. Both geometry and surface parameters can be optimized. Simulations can support the development of tactics. For the design and assessment of sensor systems predictions of target signatures are needed. Credible signature descriptions are also needed as input to duel simulations. This document reports on the work that has been performed concerning the generation of input data, methods/programs for simulations and models validations. The primary programs used were RadThermIR and CAMEO-SIM. Two paths of development of validation methods are presented: (1) Methods for analysis and validation spatial image statistics; (2) Methods for quantifying the propagation of input data uncertainties to output parameters in computational predictions.
NTIS
Signatures; Optics

20070026271 Center for Night Vision and Electro-Optics, Fort Belvoir, VA, USA
Multi-Function Combat Laser for the Dismounted Soldier
Nettleton, J. E., Inventor; Barr, D. N., Inventor; Lei, J. S., Inventor; 29 Apr 04; 5 pp.; In English
Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-839-451
Report No.(s): PB2007-104067; No Copyright; Avail.: CASI: A01, Hardcopy
The invention is achieved by using single or multiple laser sources (laser diodes) in a configuration such that when it is coupled with a dichroic substrate the laser sources outputs are coupled to produce a single desired output. The dismounted soldiers in the Department of Defense are overloaded with equipment they must carry into the combat environment. Due to many advancements in laser technology, laser devices have been produced to enhance the soldiers' war fighting capability or to provide them with realistic training aids. Unfortunately, these devices have separate housings, controls, power supplies, controls, laser sources and optics which leads to an undesired weight, space and power claims. The present invention consolidates multiple laser functions for the dismounted soldier into a single package with shared power supplies, optics and laser sources thus, minimizing the claim on weight, space, and power.
NTIS
Combat; Lasers; Military Personnel; Optical Equipment; Patent Applications; Semiconductor Lasers

20070026273 Lawrence Livermore National Lab., Livermore, CA USA
Liquid Heat Capacity Lasers
Comaskey, B. J., Inventor; Schelbner, K. F., Inventor; Ault, E. R., Inventor; 30 Apr 04; 8 pp.; In English
Contract(s)/Grant(s): DE-W-7405ENG-48
Patent Info.: Filed Filed 30 Apr 04; US-Patent-Appl-SN-10-836-925
Report No.(s): PB2007-104066; No Copyright; Avail.: CASI: A02, Hardcopy
The heat capacity laser concept is extended to systems in which the heat capacity lasing media is a liquid. The laser active

liquid is circulated from a reservoir (where the bulk of the media and hence waste heat resides) through a channel so configured for both optical pumping of the media for gain and for light amplification from the resulting gain.
NTIS
Lasers; Liquid Lasers; Patent Applications; Specific Heat

20070026291 Kushman (Brooks), P.C., Southfield, MI, USA
Microfabricated Radiation Detector Assemblies Methods of Making and Using Same and Interface Circuit for Use Therewith
Gianchandani, Y. B., Inventor; Wilson, C. G., Inventor; 30 Apr 04; 15 pp.; In English
Contract(s)/Grant(s): NSF-EEC-9986866
Patent Info.: Filed Filed 30 Apr 04; US-Patent-Appl-SN-10-837-068
Report No.(s): PB2007-104037; No Copyright; Avail.: CASI: A03, Hardcopy

Microfabricated, gas-filled radiation detector assemblies, methods of making and using same and interface circuit for use therewith are provided. The assembly includes a micromachined radiation detector including a set of spaced-apart electrodes and an ionization gas between the electrodes. A housing has a chamber for housing the detector including the gas. The housing of the assembly also includes a window which allows passage of charged particles therethrough to ionize the gas to create electrons which, in turn, create an electron cascade in the gas between the electrodes when the set of electrodes is biased.
NTIS
Circuits; Electromagnetic Radiation; Radiation Detectors; Fabrication

20070026297 Fulbright and Jaworski, San Antonio, TX, USA
Advanced Optics for Rapidly Patterned Laser Profiles in Analytical Spectrometry
Russell, D. H., Inventor; McLean, J. A., Inventor; 11 Feb 05; 14 pp.; In English
Patent Info.: Filed Filed 11 Feb 05; US-Patent-Appl-SN-11-056-852
Report No.(s): PB2007-104036; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed to a novel arrangement of optical devices for the rapid patterning of laser profiles used for desorption and/or ionization sources in analytical mass spectrometry. Specifically, the new optical arrangement provides for a user-defined laser pattern at the sample target that can be quickly changed (on a microsecond timescale) to different dimensions (or shapes) for subsequent laser firings.
NTIS
Lasers; Spectrometers; Optics

20070026343 Lawrence Livermore National Lab., Livermore, CA USA
Nonlinear Dynamics of Ionization Fronts in Hll Regions
Mizuta, A.; Kane, J. O.; Pound, M. W.; Remington, B. A.; Ryutov, D. D.; May 07, 2006; 8 pp.; In English
Report No.(s): DE2007-895709; UCRL-PROC-221173; No Copyright; Avail.: National Technical Information Service (NTIS)

Hydrodynamic instability of an accelerating ionization front (IF) is investigated with 2D hydrodynamic simulations, including absorption of incident photoionizing photons, recombination in the Hll region, and radiative molecular cooling. When the amplitude of the perturbation is large enough, nonlinear dynamics of the IF triggered by the separation of the IF from the cloud surface is observed. This causes the second harmonic of the imposed perturbation to appear on the cloud surfaces, whereas the perturbation in density of ablated gas in the Hll region remains largely single mode. This mismatch of modes between the IF and the density perturbation in the Hll region prevents the stron stabilization effect seen in the linear regime. Large growth of the perturbation caused by Rayleigh-Taylor-like instability is observed late in time.
NTIS
Ionization; Nonlinearity

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20070025236 Lawrence Livermore National Lab., Livermore, CA USA
Application of Imaging Plate to X-Ray Imaging and Spectroscopy in Laser Plasma Experiments
Izumi, N.; Snavely, R.; Gregori, G.; Koch, J. A.; Park, H. S.; May 07, 2006; 18 pp.; In English
Report No.(s): DE2007-895428; UCRL-CONF-221177; No Copyright; Avail.: National Technical Information Service (NTIS)

We report recent progress of x-ray diagnostic techniques in laser plasma experiment with using imaging plates. Imaging plate is a photo-stimulable phosphor screen (BaF(Br0.85,I0.15) :Eu2+) deposited on flexible metal or plastic substrate. We applied the imaging plate to x-ray microscopy in laser fusion experiments. Self-emission x-ray images of imploded core were obtained successfully with using imaging plate and high magnification target mounted pinhole arrays. The imaging plates were applied also in ultra-intense laser experiment at the Rutherford Appleton Laboratory. Small samarium foil was irradiated by high intensity laser pulse from the Vulcan laser system. The k shell x-rays from the foil (approx. 40keV) was used as a line x-ray source for microscopic radiography. Performance of imaging plate on high-energy x-ray backlit radiography was demonstrated by imaging sinusoidal grooves of 6um amplitude on a Au foil. Detailed spectrum of k shell x-ray from Cu embedded foil target was successfully observed by coupling imaging plate with a highly ordered pyrolytic graphite crystal spectrometer. The performances of the imaging plates evaluated in actual laser plasma experiments will be presented.
NTIS
Imaging Techniques; Laser Plasmas; Plasma Diagnostics; Spectroscopy; X Ray Imagery; Image Processing

20070026078 Lawrence Livermore National Lab., Livermore, CA USA
Heat Loss by Helicity Injection II
Fowler, T. K.; Jun. 02, 2006; 11 pp.; In English
Report No.(s): DE2007-895432; UCRL-TR-221785; No Copyright; Avail.: Department of Energy Information Bridge

We have suggested ways that the transport theory could be tested. Indirect evidence based on limits on current amplification suggests that the theory is basically correct, and the discussion in the Appendix shows that the theory applies to any process that might transport helicity diffusively, not only tearing. If further analysis continues to support the theory, efforts to increase current amplification in SSPX must be based on scenarios consistent with slow helicity transport. Three scenarios that meet this requirement are the pulsed reactor, multipulsing and current drive by neutral beams. There may be others. The pulsed reactor could work because buildup is accomplished without current amplification. The main issues are how much magnetic energy is lost in a transition from the Taylor state produced by electrostatic injection to a stable mode of decay, and whether a stable mode exists that is not supported by gun current at the edge.
NTIS
Cooling; Injection; Spheromaks; Transport Theory

20070026131 Lawrence Livermore National Lab., Livermore, CA USA
Spectral Line Shapes as a Diagnostic Tool in Magnetic Fusion
Stamm, R.; Capes, H.; Demura, A.; Godbert-Mouret, L.; Koubiti, M.; Aug. 18, 2006; 16 pp.; In English
Report No.(s): DE2007-900055; UCRL-CONF-223806; No Copyright; Avail.: National Technical Information Service (NTIS)

Spectral line shapes and intensities are used for obtaining information on the various regions of magnetic fusion devices. Emission from low principal quantum numbers of hydrogen isotopes is analyzed for understanding the complex recycling mechanism. Lines emitted from high principal quantum numbers of hydrogen and helium are dominated by Stark effect, allowing an electronic density diagnostic in the divertor. Intensities of lines emitted by impurities are fitted for a better knowledge of ion transport in the confined plasma.
NTIS
Line Spectra; Nuclear Fusion; Plasmas (Physics); Shapes; Stark Effect; Zeeman Effect

20070026313 Lawrence Livermore National Lab., Livermore, CA USA
Thomson Scattering Techniques in Laser Produced Plasmas
Froula, D. H.; Ross, J. S.; Divol, L.; MacKinnon, A. J.; Sorce, C.; May 06, 2006; 19 pp.; In English
Report No.(s): DE2007-895435; UCRL-CONF-221161; No Copyright; Avail.: National Technical Information Service (NTIS)

Thomson scattering has been shown to be a valuable technique for measuring the plasma conditions in laser produced plasmas. Measurement techniques are discussed that use the ion-acoustic frequency measured from the collective Thomson-scattering spectrum to extract the electron temperature, ion temperature, plasma flow, and electron density in a laser produced plasma. In a recent study, we demonstrated a novel Thomson-scattering technique to measure the dispersion of ion-acoustic fluctuations that employing multiple color Thomson-scattering diagnostics. We obtained frequency-resolved Thomson-scattering spectra of the two separate thermal ion-acoustic fluctuations with significantly different wave vectors. This new technique allows a simultaneous time resolved local measurement of electron density and temperature. The plasma fluctuations are shown to become dispersive with increasing electron temperature. Furthermore, a Thomsonscattering technique to measure the electron temperature profile is presented where recent experiments have measured a large electron temperature gradient (Te=1.4keV to Te=3.2 keV over 1.5-mm) along the axis of a 2-mm long hohlraum when heated asymmetrically.
NTIS
Laser Plasmas; Thomson Scattering

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20070025513 Utah Univ., Salt Lake City, UT, USA
Development of a Demagnetization Refrigerator for Solid State Research and Education
Du, R. R.; Nov. 15, 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-FG02-05ER46190
Report No.(s): DE2007-895147; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project is to develp an instrument to cool electrons in semiconductors to extremely low temperatures (lower than 1 millikelvin), a unique capability that would allow studies of new states of matter formed by low-dimensional electrons. At such low temperatures (and with an intense magnetic field), electronic behavior differs completely from ordinary ones observed at room temperatures. Studies of electrons at such low temperatures would open the door for fundamental discoveries in condensed matter physics. Understanding low-temperature electron transport in low-dimensional and nano-scale devices is the foundation for developing next generation quantum information and quantum computation technologies. The primary material systems for such investigations will be ultra-high quality GaAs/AlGaAs quantum structures grown by molecular beam epitaxy, materials that are widely used in lasers and telecommunications.
NTIS
Demagnetization; Education; Magnetic Cooling; Refrigerators; Solid State

20070025553 Fermi National Accelerator Lab., Batavia, IL, USA; British Columbia Univ., Vancouver, British Columbia, Canada
Tune-Stabilized Linear-Field FFAG for Carbon Therapy
Johnstone, C.; Koscielniak, S.; Jul. 01, 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-899705; FERMILAB-CONF-06-188-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

A hybrid design for a Fixed-Field Alternating-Gradient (FFAG) accelerator has been invented which uses edge and alternating-gradient focusing principles applied in a specific configuration to a combined-function magnet to stabilize tunes through an acceleration cycle which extends over a factor of 2-6 in momentum. Using normal conducting magnets, the final, extracted energy from this machine attains 400 MeV/nucleon and thus supports a carbon ion beam in the energy range of interest for cancer therapy. Competing machines for this application include superconducting cyclotrons, synchrotrons, and, more recently, scaling FFAGs. The machine proposed here has the high average current advantage of the cyclotron with

smaller radial aperture requirements that are more typical of the synchrotron; and as such represents a desirable innovation for therapy machines.
NTIS
Carbon; Gradients; Particle Accelerators; Therapy

20070026111 Fermi National Accelerator Lab., Batavia, IL, USA
Experience with Longitudinal and Transverse Instability Dampers in Tevatron
Shiltsev, V.; Tan, C. Y.; January 2006; 3 pp.; In English
Report No.(s): DE2007-899707; FERMILAB-CONF-06-504-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

We present a short summary of use of longitudinal and transverse dampers in the Tevatron Run II operation (2001-2006).
NTIS
Particle Accelerators; Stability; Dampers; Transverse Momentum

20070026308 Brookhaven National Lab., Upton, NY USA
Brookhaven National Laboratory RHIC Status
Rosner, T.; Jan. 2007; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-899891; BNL-77494-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

As the first hadron accelerator and collider consisting of two independent superconducting rings RHIC has operated with a wide range of beam energies and particle species. Machine operation and performance will be reviewed that includes high luminosity gold-on-gold and copper-on-copper collisions at design beam energy (100 GeVh), asymmetric deuteron-on-gold collisions as well as high energy polarized proton-proton collisions (100 GeV on 100 GeV) with beam polarization of up to 65%. Plans for future upgrades of RHIC will also be discussed.
NTIS
Ion Accelerators; Particle Accelerators

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*.

20070025234 Lawrence Livermore National Lab., Livermore, CA USA
Material Interface Reconstruction for Monte Carlo Particle Tracking
O Brien, M. J.; Mar. 20, 2006; 11 pp.; In English
Report No.(s): DE2007-895426; UCRL-TR-219915; No Copyright; Avail.: National Technical Information Service (NTIS)

In this project we implement material interface reconstruction into a large, massively parallel Monte Carlo particle transport code. Here we examine the benefit of resolving a material interface for criticality calculations. Input to the code is a mesh with material and density defined on the mesh. For mesh zones that contain more than one material (mixed zones), the old approximation made in the code is to homogenize the material properties of all the materials in the zone. The neutron mean free path is a function of the material density that the neutron is traveling through, so for mixed zones, we use the average density of the zone, rather than reconstructing a material interface, determining which material within the zone the particle is in and using the correct density based on the position of the particle within the zone. In order to get a better answer, here we implement material interface reconstruction and rather than homogenizing the materials in a mixed zone, we have a material interface divide the zone so we can tell which material the particle is in, based on the particles position and the location of the material interface.
NTIS
Monte Carlo Method; Neutrons

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20070025536 NASA Marshall Space Flight Center, Huntsville, AL, USA
Managing External Relations: The Lifeblood of Mission Success
Dumbacher, Daniel L.; February 06, 2007; 15 pp.; In English; 5th Annual NASA Project Management Conference, 6-7 February, Galveston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025536

The slide presentation examines the role of customer and stakeholder relations in the success of space missions. Topics include agency transformation; an overview of project and program experience with a discussion of positions, technical accomplishments, and management lessons learned; and approaches to project success with emphasis on communication. Projects and programs discussed include the Space Shuttle Main Engine System, DC-XA Flight Demonstrator, X-33 Flight Demonstrator, Space Launch Initiative/2nd Generation Reusable Launch Vehicle, X-37 Flight Demonstrator, Constellation (pre Dr. Griffin), Safety and Mission Assurance, and Exploration Launch Projects.
CASI
Space Missions; Project Management; Communication; NASA Programs; Public Relations

20070026207 Defence Research and Development Canada, Valcartier, Quebec, Canada
Modelling and Simulation and Capability Engineering Process
Mokhtari, Marielle; Bernier, Francois; Couture, Mario; Dussault, Genevieve; Lalancette, Claire; Lam, Sylvia; Lizotte, Michel; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 5-1 - 5-12; In English; See also 20070026206; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Department of National Defence and Canadian Forces are currently implementing Capability Based Planning (CBP) as a core element of their overall business process. According to CBP, once a capability is defined, it must be both properly engineered and managed. To this end, the Collaborative Capability Definition, Engineering, and Management (CapDEM) project aims at defining Capability Engineering (CE) and validating the discipline (through the Capability Engineering Process - CEP) in the Canadian defence context, including collaboration with various DND and industrial stakeholders. This paper provides a preliminary discussion on the role of Modeling and Simulation (M&S) in the context of the CE-CEP. With the combination of a collaborative engineering environment and a robust suite of M&S tools, CE-CEP promote simulation-based acquisition and facilitate information sharing and collaboration among the participants involved in the acquisition process.
Author
Defense Program; Canada; Systems Engineering; Mathematical Models; Computerized Simulation; Management Planning

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DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20070025314 Michigan State Univ., East Lansing, MI USA
The Impact of Hybrid Team Structures on Performance and Adaptation: Beyond Mechanistic and Organic Prototypes
Jundt, Dustin K; Ilgen, Danial R; Hollenbeck, John R; Humphrey, Stephan E; Johnson, Michael D; Meyer, Christopher J; Jun 2004; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465820; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Building on the idea of asymmetric adaptability, this study focused on structural and compositional ways to arrange teams in order to maximize both initial performance and structural adaptability. Based on 64 teams that completed a command and control simulation, our results suggest that hybrid teams (teams structured using non-redundant, complimentary elements of both departmentation and centralization) were able to perform well initially and successfully shift structures, while teams structured in traditionally mechanistic and organic manners were not. Furthermore, high mean levels of emotional stability and extraversion helped to ease the difficult transition from organic to mechanistic team structures.
DTIC
Group Dynamics; Human Performance; Hybrid Structures; Prototypes; Teams

20070025315 Air Force Research Lab., Wright-Patterson AFB, OH USA
Improving Analysis: Dealing with Information Processing Errors
Rodgers, R S; Nov 2006; 24 pp.; In English
Report No.(s): AD-A465822; AFRL-HE-WP-JA-2007-0002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Intelligence analysts and mental health clinicians have some aspects of their respective crafts in common. In many cases both have to make predictions about future behavior. Findings from the clinical literature were used to make the point that humans, in general, are not particularly skilled at combining various pieces of information in order to make predictions, and by extension, intelligence analysts suffer the same fate. Understanding the problems involved in information processing can help us develop methods and tools to assist in mitigating three broad cognitive errors: (a) the tendency to see patterns where none exist, (b) the tendency to seek confirmatory evidence, and (c) the use of preconceived biases.
DTIC
Clinical Medicine; Cognition; Data Processing; Errors; Mental Health

20070025329 Illinois Univ., Urbana-Champaign, IL USA
Similar Shape Retrieval in MARS
Chakrabarti, Kaushik; Ortega-Binderberger, Michael; Porkaew, Kriengkrai; Zuo, Peng; Mehrotra, Sharad; Jan 2000; 5 pp.; In English
Contract(s)/Grant(s): DAAL01-96-2-0003
Report No.(s): AD-A465881; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper presents a novel approach to representing 2-dimensional shapes that adaptively models different portions of the shape at different resolutions, having higher resolution where it improves the quality of the representation and lower resolution elsewhere. The proposed representation is invariant to scale, translation, and rotation. The representation is amenable to indexing using existing multidimensional index structures and can thus support efficient similarity retrieval. The experiments reported here show that the adaptive resolution technique performs significantly better compared to the fixed resolution approach previously proposed in the literature.
DTIC
High Resolution; Image Processing; Information Retrieval; Photography; Shapes

20070025330 Space and Naval Warfare Systems Command, San Diego, CA USA
Improving Individual and Team Decisions Using Iconic Abstractions of Subjective Knowledge (Briefing Charts)
Fleming, Robert A; Cowen, Michael B; Jun 2004; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465885; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Research has shown that in a group decision making environment, members usually discount any uniquely held information that gets shared with the group. We hypothesize this is so because: (1) A group member already has a high cognitive burden in processing the information he has found. (2) Shared information from other members usually arrives in an unprocessed form. (3) The new information is not integrated into the decision process because it causes too great of a cognitive burden on the recipient. We proposed an approach where information is converted into an iconic representations that encapsulate an individual's subjective perception of the information; we refer to these icons as Information Objects (IOBs). In this briefing we report on an experiment that evaluates the use of IOBs in an individual decision making environment.
DTIC
Charts; Decision Making

20070025333 Electronic Systems Center, Hanscom AFB, MA USA
The C2 Constellation a US Air Force Network Centric Warfare Program
Sweet, Norman; Kanefsky, Stu; Jun 2004; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465907; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) released Joint Vision 2020 in late 2000. JV2020 states The evolution of information technology will increasingly permit us to integrate the traditional forms of information operations with sophisticated all-source intelligence, surveillance, and reconnaissance in a fully synchronized information campaign. Network Centric Warfare (NCW) was coined to describe how we will fight using integrated information technology. NCW networks connect various weapon systems, information flows, sensors, and decision makers in a peer based, machine to machine (M2M) structure which enhances information flow efficiency, quality, and timeliness. NCW is a means to achieve JV2020. The end result is a more

lethal fighting force. The C2 Constellation is an Air Force program designed to support NCW and JV2020. The C2 Constellation will facilitate the development of decisive information superiority, collaborative planning, and synchronized operations for the warfighters by promoting interoperability and integration between systems that support Command, Control, Computing, Communication, Intelligence, Surveillance, and Reconnaissance (C4ISR). The C2 Constellation promotes rapid access to data stores that support situational awareness, effects based operations, and predictive battlespace awareness.
DTIC
Command and Control; Constellations; Information Systems; Interoperability; Warfare

20070025334 Solipsys Corp., Laurel, MD USA
Architecture for a Truly Integrated Defense Network
Firkin, Eric C; McMahon, Margaret M; Jun 2004; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465916; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The National Capital Region (NCR) of the USA of America (U.S.) is a microcosm of all that is difficult in creating a regional, integrated defense against terrorism: multiple civil jurisdictions, target-rich environment, and the requirement to involve many organizations in any decision. The Region's current defense lacks a truly Integrated Defense System (IDS). Through the use of a demonstrated and available Network-Centric Warfare (NCW) solution, there can be significant improvement in the timeline and quality of decision makers' response to threats. Regional radar systems have an effective data path to military fighter aircraft and missile batteries in the NCR; however, there are other governmental, non-military systems generating data that could also contribute to the real-time picture. This nonmilitary data cannot always flow to decision makers, and when it does, inconsistencies between the disparate systems require human input to resolve. An NCW application would allow these stovepipe systems to share data, thus producing a common picture of the Region. The Tactical Component Network (TCN(Registered) provides an architecture that is successfully deployed by the U.S. military today and can be implemented immediately. The more complete and common picture provided by TCN reduces the threat response timeline.
DTIC
Architecture (Computers); Networks; Warfare

20070025342 Atlantic Consulting Services, Inc., USA
Extensible Battle Management Language (XBML): A Methodology for Web Enabling Command and Control for Network Centric Warfare
Hieb, Michael R; Sudnikovich, William P; Tolk, Andreas; Pullen, J M; Jun 2004; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465927; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Command and Control (C2) communication in a network centric environment such as the Global Information Grid (GIG) is postulated to be data 'rich'. However, our current situation is that the most critical C2 information, the commander's intent, orders and directives, does not actually flow as data. It is often communicated as 'free text'. While suitable for interpersonal communication, it is not able to support advanced automation or intelligent decision aids due to its inherent ambiguity. Battle Management Language (BML) was developed as a solution to this problem. BML is defined as the unambiguous language used to: 1) command and control forces and equipment conducting military operations and, 2) provide for situational awareness and a shared, common operational picture. It can be seen as a representation of a digitized commander's intent to be used for real troops, for simulated troops, and for future robotic forces. Based on this concept, a prototype of BML was developed demonstrating an actual National Training Center (NTC) Brigade Operations Order. The USA (U.S.) Defense Modeling and Simulation Office's (DMSO) Extensible Modeling and Simulation (M&S) Framework (XMSF) initiative is extending BML based on open, commercial Internet standards. The XMSF prototype demonstrates a web-enabled Extensible Battle Management Language (XBML).
DTIC
Command and Control; Warfare

20070025348 Air Force Research Lab., Rome, NY USA
Information and Knowledge Centric Warfare: The Next Steps in the Evolution of Warfare
Phister, Jr , Paul W; Plonisch, Igor G; Jun 2004; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465942; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Over the past 20-years, the military services have evolved from platform-centric to network centric warfare. As they continue to progress in the Information Age, network-centric warfare is envisioned to evolve into information-centric warfare

(some evidence suggests this evolution has already taken place.) This paper is meant to be thought provoking, in as much as it proposes the next step in warfare: transitioning from network-centric/information-centric to knowledge-centric warfare. Network-centric warfare is built around human and organizational behavior a new way of thinking in terms of linkages. Its end result is combat power that can be generated from the effective linking or networking of the warfighting enterprise. Its premise is the ability to push 'information to the edge.' Once this premise becomes institutionalized, warfare will utilize the proven attributes of network-centric/information centric warfare to go to the next, logical, evolutionary step in the conduct of warfare namely pushing knowledge to the edge . This next step is a transformation of network/information- centric-warfare's 'Power to the Edge' to knowledge-centric warfare's Power of the Edge . This paper discusses the basic tenants of network/information-centric warfare and how its attributes form the basis for knowledge-centric warfare. Key technologies for the transition from network/information centric to knowledge centric are discussed.
DTIC
Command and Control; Information Systems; Networks; Warfare

20070025352 Office of Force Transformation, Washington, DC USA
Task Force Fox and IRTF(L) - Reinforce: The Partner to Improve Time-Critical Operations
Bubbers, Lex; Jun 2004; 84 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465954; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Objectives of the case study: problem formulation: operations other than war on the Balkans, the Network-Centric Warfare background of the RNLA, the availability of a ISIS. Key questions to ask: to what extent were NCO capabilities applied in Operations Other than war by task force during NATO Operation Amber Fox? What was the nature of the process that enabled the transformation to Network Centric Operations? Can the Network Centric Operations Conceptual Framework be employed to effectively describe NCO in OOTW as well as to the transformation processes required to achieve relatively mature NCO?
DTIC
Information Systems; Military Operations; Time Dependence; Warfare

20070025353 General Accounting Office, Washington, DC USA
Business Systems Modernization: Strategy for Evolving DOD's Business Enterprise Architecture Offers a Conceptual Approach, but Execution Details are Needed
Hite, Randolph C; Doherty, Neil; Glover, Nancy; Holland, Michael; Lakhmani, Neelaxi; Le, Anh; Mai, Jacqueline; Stavros-Turner, Jennifer; Apr 2007; 44 pp.; In English
Report No.(s): AD-A465961; GAO-07-451; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In 1995, the Government Accountability Office (GAO) first designated the Department of Defense's (DoD) business systems modernization program as 'high risk,' and they continue to designate it as such today. To assist in addressing this high-risk area, Congress passed legislation consistent with prior GAO recommendations for Defense to develop a business enterprise architecture (BEA). In September 2006, DoD released version 4.0 of its BEA, which despite improvements over prior versions, was not aligned with component architectures. Subsequently, Defense issued a strategy for extending its BEA to the component military services and defense agencies. To support GAO's legislative mandate to review DoD's BEA, GAO assessed DoD's progress in defining this strategy by comparing it with prior findings and recommendations relevant to the strategy's content. To assist DoD in its efforts to evolve and extend its BEA, GAO is augmenting a prior recommendation to the Secretary of Defense for developing an architecture development management plan by recommending that this plan incorporate details needed to execute DoD's Business Mission Area federation strategy. In comments, DoD largely disagreed with GAO's recommendation, noting that elements of it were either unnecessary or not appropriately focused.
DTIC
Commerce; Defense Program; Information Systems; Management Planning; Systems Management

20070025359 George Mason Univ., Fairfax, VA USA
Transforming Timed Influence Nets into Time Sliced Bayesian Networks
Haider, Sajjad; Zaidi, Abbas K; Jun 2004; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0033; F30602-01-C-0065
Report No.(s): AD-A465981; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The paper presents an algorithm for transforming Timed Influence Nets (TIN) into Time Sliced Bayesian Networks (TSBN). The advantage of TINs lies in their ability to represent both causal and time-sensitive information in a compact and

integrated manner. They are used to help a decision maker model the causal and temporal interdependencies among variables in a system. The TIN formalism offers a suite of analysis tools that can be used by a user to analyze the impact of alternate courses of actions on likely outcomes. An even larger, and more robust suite of analysis tools exists for TSBNs. These algorithms also allow analyses that are not available in the TIN formalism, e.g., provision for incorporating real-time information in the form of evidence regarding certain variables and calculating its impact on the rest of the system. The knowledge acquisition process of TSBNs, however, is intractable for large models. This paper is an attempt to combine the advantages of both modeling paradigms, TIN and TSBN, into a single formalism by providing a mapping from a TIN to a TSBN. The proposed formalism uses the TIN approach for the model building and the TSBN for analysis and evaluation. A system analyst, in this combined approach, interacts with a TIN, and the analysis results obtained on the TSBN are mapped back to the TIN, making the transformation completely hidden to the analyst.
DTIC
Algorithms; Bayes Theorem; Decision Making; Knowledge Based Systems; Nets; Tin

20070025360 Battle Command, Fort Gordon, GA USA
Information Superiority/Battle Command (Network Centric Warfare Environment)
Dunn, III, Charles; Powell, Gregg; Martin, Christopher J; Hamilton, Michael J; Pangle, II, Charles C; Jun 2004; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465983; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Battle Command Battle Laboratory is the U.S. Army's test bed for advanced networking and telecommunications experimentation. Over the past two years the lab has conducted a series of experiments focused on the Army's conceptual Future Force network. These experiments were designed to integrate a myriad of network-related study issues into a technical analysis of future network concepts. The results of these experiments provide the analytical underpinnings supporting the viability of transitioning the conceptual design of the Army's Future Force into an actual warfighting entity. The Army's Future Force is designed to be a faster, lighter, but more lethal force than today's force. The Future Force will use information superiority as its premier combat enabler. Information superiority coupled with an ultra-reliable networked Battle Command and Control (C2) system will ensure that separate units fight as one. This connectivity and orchestration are performed within a network-centric environment. The Army's view of Network Centric Warfare can be described as the orchestration of integrated successes of its core operational concepts (dominant maneuver, precision engagement, focused/just-in-time logistics, space-to-mud telecommunications, and full dimensional protection), which are all dependent upon information superiority.
DTIC
Command and Control; Data Processing; Information Transfer; Synchronism; Systems Integration; Warfare

20070025361 Honeywell ASC Labs., Minneapolis, MN USA
Computing and Communications Infrastructure for Network-Centric Warfare: Exploiting COTS, Assuring Performance
Richardson, James P; Graba, Lee; Agrawal, Mukul; Jun 2004; 48 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465984; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In network centric warfare (NCW), the effectiveness of warfighters and their platforms is enhanced by rapid and effective information flow. This requires a robust and flexible computing and communications software infrastructure, and a degree of system integration beyond what has ever been achieved. The design of this infrastructure is a tremendous challenge for a number of reasons. We argue that an appropriately architected software infrastructure can employ COTS software to realize much of the required functionality, while having the necessary degree of performance assurance required for military missions. Perhaps the biggest challenge is system resource management allocation of computing and communications resources to COTS and custom software alike so that performance requirements can be met. We describe an approach to system resource management appropriate to the NCW environment.
DTIC
Communication Networks; Computer Programming; Computer Programs; Military Technology; Software Engineering; Warfare

20070025364 Nebraska Univ., Omaha, NE USA

Snap-Cards: A Dynamic Data Construct of Rapid Information Gathering and Integration for C2 Effectiveness in Homeland Security

Zhu, Qiuming; Hicks, Jeffrey D; Flanagan, Richard; Stoyen, Alexander; Mar 24, 2004; 51 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465994; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A dynamic data construct built on the basis of a snap-card paradigm is designed to meet the needs of information empowerment, formation flexibility, and representation versatility for rapid interchange and effective integration of information in complex environment. It facilitates the prompt reporting, gathering, tracking, and analysis of information from wide spread of heterogeneous resources, and effective decision making and event responses. The construct is especially designed to operate in wireless communication environment where the data amount contained in the transmission must be tightly packed. The technique is suitable for applications particularly in C2 situation awareness of battle space and security surveillances of airports, military installations, and occasions of large public events.

DTIC

Data Integration; Data Structures; Multisensor Fusion; Security; SNAP; Wireless Communication

20070025591 Federal Bureau of Investigation, Washington, DC, USA

National Instant Criminal Background Check System (NICS). Operations, 2005

Jan. 2006; 64 pp.; In English

Report No.(s): PB2007-109530; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2005, the FBI Criminal Justice Information Services (CJIS) Division's National Instant Criminal Background Check System (NICS) Section, witnessed many significant improvements and achievements in the furtherance of its mission by identifying, developing, and implementing system improvements to consistently provide its users with a highly effective and efficient level of quality service.

NTIS

Information Systems; Crime

20070026076 Oculus Info, Inc., Toronto, Ontario Canada

Visualization for Tracking Battlefield Events in Time and Space for C2

Kapler, Thomas; Wright, William; Jun 2004; 39 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): 5FUSA-03X105/001/SV

Report No.(s): AD-A465957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Analyzing people, equipment, organizations and their activities over time is increasingly a key concern for command and control. The objective of our research has been to develop a method to capture and visualize the spatial and inter-connectedness of this information over time within a single, highly interactive picture. A novel visualization technique for displaying and tracking events, people, and equipment within a combined temporal and geospatial display has been developed into a demonstratable prototype called GeoTime in order to determine potential utility. The focus of this paper is on land force commanders and staff. However, we believe the concept is applicable to a wide variety of government and business analysis tasks.

DTIC

Command and Control; Scientific Visualization

20070026149 Newcastle-upon-Tyne Univ., Newcastle, UK

Implementing the FuGE Object Model: a Systems Biology Data Portal and Integrator

Lister, A. L.; Jones, A. R.; Pocock, M.; Shaw, O.; Wipat, A.; Apr. 2007; 13 pp.; In English

Report No.(s): PB2007-109993; CS-TR-1016; Copyright; Avail.: National Technical Information Service (NTIS)

The Centre for Integrated Systems Biology of Ageing and Nutrition has developed a Data Portal and Integrator (CISBAN DPI) that is based on the FuGE Object Model and which archives, stores, and retrieves raw high-throughput data. Until now, few published systems have successfully integrated multiple omics data types and information about experiments in a single database. The CISBAN DPI is the first published implementation of FuGE that includes a database back-end, expert and standard interfaces, and utilizes a Life Science Identifier (LSID) Resolution and Assigning service to identify objects and provide programmatic access to the database. Having a central data repository prevents deletion, loss, or accidental

modification of primary data, while giving convenient access to the data for publication and analysis. It also provides a central location for storage of metadata for the high-throughput data sets, and will facilitate subsequent data integration strategies. NTIS

Information Systems; Integrators

20070026178 Budapest Univ. of Technology and Economics, Budapest, Hungary

Meta Data Repository Design Aided by Teleonic Process and Goal Analysis

Horvath, G.; Jun. 2005; 128 pp.; In English

Report No.(s): PB2007-110263; Copyright; Avail.: National Technical Information Service (NTIS)

Building high quality Meta Data Repositories for medium and large private and governmental organizations is a very topical task with innumerable challenges. The MDR can not be considered simply as 'yet another database' in the organization, or they loose they main purpose and value. Examining the business processes and aims of the organization helps us to identify the place and role of the MDR in the organization. Terms, such as process modelling and process patterns come immediately into the picture. Apart from the many successful implementations and uses of business process models, the literature of possible pitfalls and 'bad practices' has grown considerably too. Regarding the latter issue, prevention is undoubtedly the best solution and the application of a process-oriented approach based on the notion of goal rather than on the sequence of activities is suggested. The framework we examine here has a broad coverage of process patterns offering safeguards against many of the most common and painful pitfalls. This framework is called teleonics, and besides the concise description of its terms, it will also be demonstrated how well they fit one of the business process extensions of the Unified Modelling Language (UML). Several important design issues and some golden rules of the MDR design will demonstrate how teleonic considerations can help us keep projects on the right track.

NTIS

Commerce; Data Bases; Information Systems

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ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20070026206 Research and Technology Organization, Neuilly-sur-Seine, France

The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence

October 2005; In English; NATO RTO Modelling and Simulation Conference, 13-14 Oct. 2005, Warsaw, Poland; See also 20070026207 - 20070026226; CD-ROM contains multi-media files.

Report No.(s): RTO-MP-MSG-035; AC/323(MSG-035)TP/22; Copyright; Avail.: CASI: C01, CD-ROM

The topics covered include: Progress to Date on NMSG 031 The Cost Effectiveness of Modelling and Simulation; Modelling and Simulation Process in the Polish Proposal of Early Warning System for DAT and Crisis Management; Viking 05; Role of Effects-based Metrics in Advancing R&D Agility through Modelling and Simulation Based Exercises; Modelling and Simulation and Capability Engineering Process; Case-Based C2 Modelling and Effective Development, Implementation and Experimentation for Simulation Based Operational Training Support System; USAF Distributed Mission Operations (DMO) 2005 NATO M&S Group Conference; The US Air Force Distributed Mission Operations - A Premier Application of Distributed Modeling and Simulation in 'Training The Way We Fight'; The Role of BMC3I Simulation in Advancing the NATO ALTBMD Programme; Effectiveness by Reusability, MSG-042 First Findings; Assessing the Training Potential of MTDS in Exercise First Wave; Evaluating the Impacts of Mission Training via Distributed Simulation on Live Exercise Performance: Results from the US/UK 'Red Skies' Study; Sustainability Simulations for Fighter Aircraft in Peace and at War; Transfer of Manual Flying Skills from PC-Based Simulation to Actual Flight - A Comparison of In-Flight Measured Data and Instructor Ratings; A Critique of the Live Synthetic Trials Balance to Support the Smart Acquisition Cycle - Better Dead than Alive?; SimEC3: An Innovative Simulation Based Acquisition Tool for France's Cooperative Fighting System; VIntEL: An Environment for Distributed Collaborative Simulation Integration and Application; CALIPSO M&S to Support MPO French Armed Forces Planning Process; The U.S. Army's Next Generation Simulation Modelling the Response to the World's Future Threat; and Review and Update of Findings from Economics of Simulation Study Groups.

Derived from text

Environment Simulation; Early Warning Systems; Military Operations; Support Systems; Cost Effectiveness; Warfare; Management Methods; Education

20070026208 QinetiQ Ltd., Farnborough, UK

Progress to Date on NMSG 031 The Cost Effectiveness of Modelling and Simulation

Summons, Gary; MacDonald, Alastair; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005; 24 pp.; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The use of modelling and simulation (M&S) has grown rapidly. Continued growth will depend on M&S being seen as cost effective and adding value. Programmes generally make a specific business case for any M&S outlay and there is a need for generic business case guidance. By identifying non cost effective application areas, the barriers preventing the proliferation of M&S will be identified providing an indication of future research priorities. M&S will provide a framework to collect evidence associated with the cost effective application of M&S based upon the NATO procurement process. This presentation will provide an insight in the work to date that the member countries have undertaken.

Derived from text

Cost Effectiveness; Computerized Simulation; Models; Defense Program

20070026209 Georgia Tech Research Inst., USA

Review and Update of Findings from Economics of Simulation Study Groups

Gordon, Steven; Waite, William; Oehlund, Gunnar; Bjoerk, Asa; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 20-1 - 20-30; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper reviews findings from previous studies on the Economics of Modelling and Simulation (M&S), updates those findings, discusses related studies being planned or conducted, and highlights challenges in establishing metrics to evaluate contributions of M&S to future programs. This paper includes discussion of an ongoing study initiated at the Swedish Materiel Administration (FMV) for The Swedish Armed Forces; the questions, justifications, and answers to date will help identify the evidence needed to assist future decision makers faced with difficult choices for spending on M&S. Efforts to evaluate the effectiveness of M&S and its usefulness in assisting acquisition programs in North Atlantic Treaty Organization (NATO) countries such as the UK and Canada will be mentioned also. Two international simulation organizations -- the Simulation Interoperability Standards Organization (SISO) and the Society for Computer Simulation (SCS) -- chartered groups in the late 1990 s to build a better understanding of the Economics of M&S. The SISO and SCS groups were formed to establish the general parameters of the topic, and, while the result was substantial, especially in data compilation, much of the original tasking remains. SISO may soon undertake a follow-on effort to define the Business Case for M&S. The data compiled by these two groups will be useful to establish a current understanding of the preceding work, filter out the substantive evidence, and establish a baseline for further work on the Effectiveness of M&S and also within the NATO M&S Task Group (MSG) 031 on The Cost Effectiveness of M&S. The findings and status of the SISO and SCS studies have been briefed to meetings of the International Test and Evaluation Association; the Interservice/Industry Training, Simulation, and Education Conference; and the SimSummit. This paper will recommend further steps to complete the actions recommended in both the SISO and SCS studies. However, the existence of these SISO and SCS study groups and the products from these legacy efforts are not widely known throughout the community-of-practice in M&S. This paper will recommend ways to preserve and advertise the state of understanding from the previous efforts in order to foster explicit, conscious coordination among M&S stakeholders internationally. Use of a venue such as the international SimSummit organization and a convenient effectiveness of M&S web portal to continue progress in understanding the effectiveness of M&S will be discussed. Within the Swedish study, the need for convincing evidence for the economical benefits of M&S is stressed. The challenge is to identify the most important expenditures for M&S to give the greatest return on investment and consequently increase the willingness among project managers to invest in M&S support. This section of the paper will present the progress in developing a Best Practice Guide for individual decision makers to know what to invest in M&S support for a specific task.

Author

Computerized Simulation; Economics; Models; Military Technology

20070026210 Army Simulation Training, and Instrumentation Command, Orlando, FL, USA

The U.S. Army's Next Generation Simulation Modelling the Response to the World's Future Threat

Parsons, Doug; Surdu, John; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 19-1 - 19-13; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Modelling the NATO Response Force (NRF) requires that corresponding simulation tools exhibit a great deal of

flexibility. The force and equipment necessary to counter an asymmetric threat must continually evolve to remain effective. The U.S. Army is developing an entity-based simulation, known as the One Semi-Automated Forces (OneSAF) Objective System (OOS), with a composability toolkit that will provide this degree of flexibility. While the OOS represents a leap-ahead in modelling and simulation technology, its need for the U.S. Army is to provide the capability to retire several legacy simulations and foster a greater degree of interoperability. As such, the OOS will provide an integral simulation service for a wide and varied group of users to include those involved in analysis of advanced military concepts, requirements, research and development, as well as supporting training, exercises, and military operations. While the OOS is required to model up to brigade-level operations and provide a robust threat in a Contemporary Operating Environment (COE), the composability toolkit offers the ability to create NRF units with unique military behaviours through a Graphical User Interface. NRF missions that could be supported include crisis response, peacekeeping, counter terrorism operations, humanitarian assistance, initial entry force, and non combatant evacuation. This paper will discuss those OOS capabilities supporting the NATO Response Force, such as sides and forces, multiple levels of resolution modelling, operations in urban environments, and the COE. In addition, other topics covered include the ongoing interactions between PM OneSAF and joint, multi-service, and international organizations leading toward collaborative development of the OOS baseline.
Author
Terrorism; Armed Forces (United States); Models; Systems Engineering; Systems Simulation; Object-Oriented Programming

20070026214 Military Univ. of Technology, Warsaw, Poland
Case-Based C2 Modelling and Effective Development, Implementation and Experimentation for Simulation Based Operational Training Support System
Najgebauer, Andrzej; Tarapata, Zbigniew; Pierzchala, Dariusz; Antkiewicz, Ryszard; Rulka, Jaroslaw; Kulas, Wojciech; Rekowski, Roman Wantoch; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 6-1 - 6-16; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper we will describe the concept for modelling and effective development, implementation and experimentation for simulation based operational training support system. The idea and model of command and control process applied for the decision automata on the tactical level are presented. The automata execute the two main processes: decision planning process and direct combat control. The decision planning process relating to the automata contains three stages: the identification of a decision situation, the generation of decision variants (action plans), the variants evaluation and nomination the best variant of these, which satisfy the proposed criteria. The particular approach to identification of decision situation and variants of action are presented. The procedure of variants generation based on some kind of pre-simulation process contains the evaluation module, which allows us the best choice of action plan according to specified criteria. The direct combat control process contains such phase like command, reporting and reaction to fault situations.
Author
Automata Theory; Command and Control; Support Systems; Computerized Simulation; Mathematical Models

20070026216 Department of the Air Force, Washington, DC, USA
USAF Distributed Mission Operations (DMO) 2005 NATO M&S Group Conference
Lollar, Grover; Hambleton, Orris; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 7-1 - 7-16; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Contemporary military leaders are faced with numerous obstacles to effective training. This paper examines critical aspects of the U.S. Air Force response to these challenges through its user-directed acquisition and development of a Distributed Mission Operations (DMO) system of systems. The DMO vision is to provide warfighters routine in-garrison access to multiple, simultaneous, and large/small training or mission rehearsal events within a true joint force environment while avoiding the traditional expense and disruption of having to assemble assigned units and opposing forces for training at a common and observable physical location. This paper details the primary components of the DMO system linking real-time, high fidelity live, virtual, and constructive (LVC) simulators and simulations with the real-world mission planning, command and control (C2) and intelligence systems and products needed when units train the entire mission process (Plan-Brief-Employ-Debrief) and as part of larger Joint Task Force (JTF) training and mission rehearsal events. This paper further examines the key methods being used to implement the DMO vision as the air and space elements of the larger Joint

National Training Capabilities (JNTC) network of training systems linking live, virtual, and constructive (LVC) air/space components and entities in a common joint synthetic battle space. The primary objective underpinning DMO is enabling warfighters to train as they would expect to fight, maximizing the combat realism available in modern visually immersive simulators that cannot be replicated in expensive traditional live training. It is being established to meet the full range of Air Force Aerospace Expeditionary Force (AEF) and Home Land Defense (HLD) operational training and mission rehearsal needs from tactical-level individual, team, and inter-team training to participation in operational and strategic-level joint command and control events. DMO system capabilities are evolving to meet both joint and air commander s mandates to train and assess mission essential competencies for JTF and other real-world missions offering distributed AEF units routine opportunities to practice high-end cooperative combat skills, within highly realistic constructive threat/natural environments, with a variety of Air Force, joint and coalition forces. Key findings highlight the need for (1) a professional control force to perform scheduling functions, develop scenarios, and conduct systems-based training; (2) the advantages of userdirected development to evaluate, prioritize, invent and evolve legacy training systems and integration solutions in the field; (3) and the call for industry solutions to improve system efficiencies, tools and common/interoperable data sources.
Author
Mission Planning; Military Operations; Computerized Simulation; Mathematical Models; Education; North Atlantic Treaty Organization (NATO); Air Defense

20070026219 Swedish Armed Forces, Stockholm, Sweden
Viking 05
Svetoft, Jan; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005; 14 pp.; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Viking 05 includes the following objectives: 1) Practice and Conduct planning at Operational and Tactical level. (2) Exercise Standing Operating Procedures (SOP's) within a Combined Joint Task Force Concept (CJTF Concept). (3) Practise Civil-Military Co-operation (CIMIC) and Civil Military Relations (CMR), in a Crisis Response Operation (CRO). (4) Further development of the ability to conduct Command Post Exercises/Computer Assisted Exercises (CPX/CAX) within the framework of Partnership for Peace Simulation Network (PSN). The operational and tactical planning, is an integrated part of the exercise. The exercise scenario settings cover a medium intensive conflict, as seen in several ongoing missions. The VIKING 05 exercise has an increased interaction between the Military, Civilian organisations including the Police.
Derived from text
Military Operations; Armed Forces (Foreign); Sweden; Management Planning

20070026221 Delegation Generale de l'Armement, Issy-les-Moulineaux, France
CALIPSO M&S to Support MPO French Armed Forces Planning Process
Khimeche, Lionel; Bouche, Jean-Paul; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 8-1 - 8-13; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

CALIPSO (acronym for 'Concepts avances pour la connexion de la simulation avec les SIO') is a French MoD R&T program which aims to support M&S (Modeling and Simulation) army higher level commanders and staffs in generating CONOPS (Concept of Operations), OPLAN (Operational Plan) and OPORDs (Operational Orders) at Corps or HRF (High Readiness Forces) and Division level. The paper first introduces the RRC-FR (Rapid Reaction Corps - France), its organization and highlights cells which could better perform their activities by using M&S. At first glance, G5 responsible to provide CONOPS and OPLANs is the logical user. Furthermore, G3 and more specifically G35 in charge to produce OPORDs based on approved OPLAN and JEC (Joint Effect Center) responsible for targeting and 3D coordination are also candidates to take advantages of M&S. In the second part, the paper presents the NATO OPP (Operational Planning Process) and explains how this process is consistent with the French MPO (Methode de Planification Operationnelle). It details the OPP different stages (Initiation, Orientation, Concept Development, Plan Development, Plan Review) and underlines where M&S could perform functions to aid operational planners. The paper ends with major M&S requirements and technical solutions to support Head Quarter planning process. If the planners must be confident in M&S results, simulation has to require no additional resources and must not be time consuming to cope with the crisis response planning tempo. It then appears that in most cases simulation must run with a time acceleration ratio up to 1:400. As a result of these considerations it appears that current M&S techniques do not provide effective solutions and new modeling approaches have to be explored. At last, for C4ISR and M&S coupling

the paper introduces different approaches to solve existing gaps. The CBML (Coalition Battle Management Language) is foreseen as a promising concept that requires further experimentations. Thus, ET-016 has just proposed the creation of a CBML Technical Activity.
Author
Computerized Simulation; Armed Forces (Foreign); Mathematical Models; Management Planning; Operations Research

20070026223 Greenley and Associates, Inc., Ottawa, Ontario, Canada
Role of Effects-based Metrics in Advancing R&D Agility through Modelling and Simulation Based Exercises
Pogue, C; Vallerand, A. L.; Pagotto, J.; Lam, S.; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 4-1 - 4-14; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

While modelling and simulation technologies have been applied across the breadth and depth of military applications, such as concept development and experimentation, system and force structure design, training and operational decision-support, the perceived value of M&S technologies has seemingly focused on traditional measures of cost-effectiveness associated primarily with the consequence of early decisions on downstream lifecycle cost avoidance. The lack of extensive and rigorous side-by-side analysis of the validity of these assertions results in a reliance on anecdotal and subjective evidence which receives operational enduser acceptance when the results are intuitive. Unfortunately, this has yet to fully transform the role of M&S within the decision making process. A series of inter-related, M&S-focused activities within the Future Force Synthetic Environment Section of DRDC Ottawa Laboratory have begun to explore a metrics approach that recasts M&S value in terms of effects-based outcomes. This on-going development has shown early potential as both a diagnostic and strategic measurement approach to address how the defence R&D community could increase its agility in response to evolving operational mission requirements through an M&S-based framework. A 'utility' metric is described which characterizes preliminary results of both a Live and Synthetic Environment (SE) based trial of a military operational scenario associated with littoral intelligence, surveillance and reconnaissance (ISR). The results highlight operational end-user perspectives on the value of SE-based experimentation and perceived M&S limitations, which prompted the subsequent metrics development to focus on measuring the outcomes of M&S-based analysis within an 'effects-based' framework that more closely mirrors operational mission Key Performance Parameters (KPPs). A follow-on SE-based trial, centered on a domestic security scenario and the role of Uninhabited Aerial Vehicles (UAVs) in defined ISR tasks, is currently applying an 'effects-based' measurement structure employing operational principles of 'Persistence, Agility, Information, Reach, and Range' to evaluate options in terms of the operational impact of various system-of-systems configurations in achieving mission objectives. Additionally,
Author
Systems Engineering; Simulation; Military Technology; Mission Planning; Education; Decision Making; Cost Effectiveness

20070026226 NATO Consultation, Command, and Control Agency, The Hague, Netherlands
The Role of BMC3I Simulation in Advancing the NATO ALTBMD Programme
Hatton, Nicholas J.; Watkins, Jim; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 9-1 - 9-15; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes how Modelling and Simulation has played a pivotal role in advancing the NATO Active Layered Theatre Ballistic Missile Defence (ALTBMD) Programme which is one of the largest and technically most complex in the history of the NATO Alliance. As one of a suite of models used on the programme, the SMDC s Extended Air Defense Simulation (EADSIM) was utilised to support an integrated assessment of system architectures and BMC3I options. Its application to Battle Management options analysis including Autonomous, Decentralised, Centralised, and Distributed modes of control shall be described together with the impact of varying the location of BMC3I functions at different levels within the command hierarchy. The paper then describes EADSIM s capabilities to model systems and BMC3I to include descriptions of the Flexible Commander/Flexible SAM Rulesets and the functional modelling capabilities for the elements and their subsystems. It will focus on the capability, functionality, and fidelity in describing the level of modelling detail a user of the simulation can derive.
Author
Simulation; Management Analysis; Distributed Parameter Systems; Air Defense; Systems Integration

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20070026224 Defence Scientific Technology Lab., UK

Evaluating the Impacts of Mission Training via Distributed Simulation on Live Exercise Performance: Results from the US/UK 'Red Skies' Study

Smith, Ebb; Gehr, Sara Elizabeth; Symons, Steve; McIntrye Heather; Schurig, Margaret; Schreiber, Brian; Bennett, Winston, Jr.; The Effectiveness of Modelling and Simulation - From Anecdotal to Substantive Evidence; October 2005, pp. 12-1 - 12-10; In English; See also 20070026206; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the past several years, the UK Defence Science and Technology Laboratory (DSTL) and the US Air Force Research Laboratory (AFRL) have been involved in research to develop training and assessment methods for use in mission training via distributed simulation. As part of our efforts, we have developed competency-based training and rehearsal scenarios and data collection instrumentation for routinely delivering and assessing distributed training events. Our most recent collaborative study, named 'Red Skies,' involved extending our work to include field assessments of the training benefits derived from involvement in a simulation-based distributed mission training event and subsequent live flying at a Coalition Red Flag exercise event at Nellis Air Force Base, Nevada in the US. The event was the largest Red Flag event ever hosted, and presented a number challenges for the study and for data collection. This paper will present the methods and results from the distributed simulation preparation, which involved connecting simulators in Bedford UK with those of the Warfighter Readiness Research Division of the AFRL, located in Mesa, Arizona. We will also present results from the subsequent live fly and evaluation in the Coalition Red Flag exercise. These results will include demonstrating our first and successful attempt to follow coalition pilots from a DMO training event to the Red Flag exercise and to collect data while the live fly event was underway. Outcome data will be presented and discussed. We will close with a discussion of the implications of our work to date as a way forward for future training events and how the methods and process developed for Red Skies can allow us to quantify and demonstrate training benefits from distributed simulation training for live operations.

Author

Military Technology; Simulation; Technologies; Physical Exercise; Research and Development; Education; Data Acquisition

20070026635 NASA Johnson Space Center, Houston, TX, USA

NASA Johnson Space Center SBIR STTR Program Technology Innovations

Krishen, Kumar; September 24, 2007; 14 pp.; In English; International Astronautical Congress, 24-28 Sep. 2007, Hydrabad, India; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070026635

The Small Business Innovation Research (SBIR) Program increases opportunities for small businesses to participate in research and development (R&D), increases employment, and improves U.S. competitiveness. Specifically the program stimulates U.S. technological innovation by using small businesses to meet federal R&D needs, increasing private-sector commercialization of innovations derived from federal R&D, and fostering and encouraging the participation of socially disadvantaged businesses. In 2000, the Small Business Technology Transfer (STTR) Program extended and strengthened the SBIR Program, increasing its emphasis on pursuing commercial applications by awarding contracts to small business concerns for cooperative R&D with a nonprofit research institution. Modeled after the SBIR Program, STTR is nevertheless a separately funded activity. Technologies that have resulted from the Johnson Space Center SBIR STTR Program include: a device for regenerating iodinated resin beds; laser-assisted in-situ keratomileusis or LASIK; a miniature physiological monitoring device capable of collecting and analyzing a multitude of real-time signals to transmit medical data from remote locations to medical centers for diagnosis and intervention; a new thermal management system for fibers and fabrics giving rise to new line of garments and thermal-enhancing environments; and a highly electropositive material that attracts and retains electronegative particles in water.

Author

NASA Programs; Technology Utilization; Display Devices; Mechanical Engineering

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*.

20070026227 Artz and Artz, P.C., Southfield, VA, USA; Boeing Co., Chicago, IL, USA
Multiple Stayout Zones for Ground-Based Bright Object Exclusion
Needelman, D. D., Inventor; Fowell, R. A., Inventor; Lai, P. C., Inventor; Wu, Y. W. A., Inventor; Li, R., Inventor; 29 Apr 04; 11 pp.; In English
Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-709 348
Report No.(s): PB2007-103992; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates generally to attitude or angular velocity or sensor alignment estimate adjustment for a vehicle, and more particularly, to algorithms involving attitude or angular velocity or sensor alignment determination, using star position measurements and using multiple exclusion zones.
NTIS
Exclusion; Patent Applications

20070026228 Artz and Artz, P.C., Southfield, VA, USA; Boeing Co., Chicago, IL, USA
Method and Apparatus for Real-Time Star Exclusion from a Database
Needelman, D. D., Inventor; Li, R., Inventor; Fowell, R. A., Inventor; Wu, Y. W., Inventor; Eyerly, B. N., Inventor; 29 Apr 04; 10 pp.; In English
Patent Info.: Filed Filed 29 Apr 04; US-Patent-Appl-SN-10-709 346
Report No.(s): PB2007-103991; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention relates generally to attitude or angular velocity or sensor alignment estimate adjustment for a vehicle, and more particularly, to algorithms involving attitude or angular velocity or sensor alignment determination, using star position measurements. The present invention allows identification of stars whose position measurements are suspect, due to the presence of nearby bright objects, in order to exclude such measurements from such determination.
NTIS
Data Bases; Exclusion; Patent Applications; Real Time Operation

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20070025132 NASA Johnson Space Center, Houston, TX, USA; Kent Univ., Canterbury, UK
Characteristics of Cometary Dust Tracks in Stardust Aerogel and Laboratory Calibrations
Burchell, M. J.; Fairey, S. A. J.; Wozniakiewicz, P.; Brownlee, D. E.; Hoerz, F.; Kearsley, A. T.; See, T. H.; Tsou, P.; Westphal, A.; Green, S. F.; Trigo-Rodriguez, J. M.; Dominguez, G.; [2007]; 49 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The cometary tray of the NASA Stardust spacecraft s aerogel collector has been examined to study the dust that was captured during the 2004 fly by of comet 81P/Wild-2. An optical scan of the entire collector surface revealed 256 impact features in the aerogel (width > 100 microns). 20 aerogel blocks (out of a total of 132) were removed from the collector tray for a higher resolution optical scan and 186 tracks were observed (track length > 50 microns and width > 8 microns). The impact features were classified into three types based on their morphology. Laboratory calibrations were conducted which reproduce all three types. This work suggests that the cometary dust consisted of some cohesive, relatively strong particles as well as particles with a more friable or low cohesion matrix containing smaller strong grains. The calibrations also permitted a particle size distribution to be estimated for the cometary dust. We estimate that approximately 1200 particles bigger than 1 micron struck the aerogel. The cumulative size distribution of the captured particles was obtained and compared with observations made by active dust detectors during the encounter. At large sizes (>20 microns) all measures of the dust are

compatible, but at micrometer scales and smaller discrepancies exist between the various measurement systems which may reflect structure in the dust flux (streams, clusters etc.) along with some possible instrument effects.
Author
Stardust Mission; Aerogels; Dust; Particle Size Distribution; Wild 2 Comet

20070026341 Lawrence Livermore National Lab., Livermore, CA USA
Origin and Properties of GEMS
Dai, Z. R.; Bradley, J. P.; Apr. 12, 2006; 19 pp.; In English
Report No.(s): DE2007-895714; UCRL-PROC-220563; No Copyright; Avail.: National Technical Information Service (NTIS)

GEMS are to the outer solar system what chondrules are to the inner solar system. Ten years after it was first proposed that GEMS are the long-sought interstellar amorphous silicates, ion microprobe measurements have confirmed that some of them are indeed interstellar amorphous silicates. The new challenges are to obtain even higher precision isotope measurements from these submicrometer-sized objects and to clarify how and where they originally formed. Individual GEMS exhibit a strikingly narrow (0.1-0.5 im diameter) size distribution and they are systematically depleted from solar abundances in S/Si, Mg/Si, Ca/Si and Fe/Si, implying that they formed by a common mechanism. Mineralogical and petrographic evidence suggest that irradiation processing may be that mechanism. Recent nanometer-scale compositional mapping using new-generation transmission electron microscopes reveals that truly pristine GEMS may be relatively rare and new metrics need to be developed to distinguish the primordial properties of GEMS from more recent secondary alteration effects.
NTIS
Embedding; Glass; Solar System; Sulfides

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20070025188 Michigan Univ., Ann Arbor, MI, USA; NASA Johnson Space Center, Houston, TX, USA
Optical Properties of High Area-to-Mass Objects at GEO
Seitzer, Patrick; Schildknecht, Thomas; Musci, Reto; Flohrer, Tim; Barker, Ed; Stansbery, Eugene; Agapov, Vladimir; Rumyantsev, Vasilij; Biryukov, Vadym; Abercromby, Kira; Rodriguez, Heather; Liou, J.-C.; Kelecy, Thomas; Africano, John; September 24, 2007; 2 pp.; In English; 58th International Astronautical Congress 2007, 24-28 September 2007, Hyderabad, India; Copyright; Avail.: Other Sources; Abstract Only

There exists at GEO a significant population of faint debris (R > 15th magnitude) with high area-to-mass ratios (AMR) (1 to 30 sq m/kg). Their orbital elements (particularly eccentricity and inclination) are observed to change on the time-scale of a week. The consensus is that these objects may be fragments of multi-layer insulation (MLI) blankets. Their orbits are primarily perturbed by solar radiation pressure. In this paper we will report preliminary results from an international collaboration to investigate the unresolved optical properties of these objects. This population was originally discovered by the ESA Space Debris Telescope, and the bulk of the objects to be described here are based on discoveries made with this telescope. Additional objects were supplied by both Russia and the US Air Force. Follow-up optical observations were obtained for a sample of a dozen objects by MODEST (the Michigan Orbital DEbris Survey Telescope) located at Cerro Tololo Inter-American Observatory in Chile. Sequences of calibrated observations in filters B, V, Broad R, and I were obtained under photometric conditions. Multi-color photometric observations in B, V, R, and I band of the same objects were also acquired at the Zimmerwald 1-meter telescope, located near Bern, Switzerland. Light curves of selected high AMR objects will be shown with a temporal resolution of a few seconds and typically span about 10 minutes. Photometric observations of these objects were acquired at the Crimean Astrophysical Observatory (CrAO). This data set includes light curves of objects having high variability of brightness and observed with 2.6 m and 0.64 m class instruments. We will present an analysis of the observed magnitudes and colors, and their correlations (or lack of correlation) with orbital elements, and with predicted values for MLI fragments. This represents the first such collaborative observational program on faint debris at GEO.
Author
Optical Properties; Space Debris; Orbital Elements; Eccentricity; Multilayer Insulation; Visual Observation; Mass Ratios; Fragments; Solar Radiation

20070025203 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
A 70 Kiloparsec X-Ray Tail in the Cluster A3627
Sun, M.; Jones, C.; Forman, W.; Nulsen, P. E. J.; Donahue, M.; Voit, G. M.; Astrophysical Journal; February 2006; Volume 637, Part 2, pp. L81-L85; In English; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1086/500590

We present the discovery of a 70 kpc X-ray tail behind the small late-type galaxy ESO 137-001, in the nearby, hot (T=6.5 keV) merging cluster A3627, from both Chandra and XMM-Newton observations. The tail has a length-to-width ratio of approx. 10. It is luminous (L(0.5-2keV) approx 1041 ergs/s), with a temperature of approx. 0.7 keV and an X-ray gas mass of approx 10(exp 9) solar masses (approx 10% of the galaxy's stellar mass). We interpret this tail as the stripped interstellar medium of ESO 137-001 mixed with the hot cluster medium, with this blue galaxy being converted into a gas-poor galaxy. Three X-ray point sources are detected in the axis of the tail, which may imply active star formation there. The straightness and narrowness of the tail also imply that the turbulence in the intracluster medium is not strong on scales of 20-70 kpc.
Author
Galaxies; Intergalactic Media; Interstellar Matter; Stellar Mass; X Ray Astronomy

20070025417 Lawrence Livermore National Lab., Livermore, CA USA
Mass Stripping Analysis of an Interstellar Cloud by a Supernova Shock
Hansen, J. F.; Robey, H. F.; Miles, A. R.; Klein, R. I.; McKee, C. F.; May 07, 2006; 15 pp.; In English
Report No.(s): DE2007-895430; UCRL-PROC-221170; No Copyright; Avail.: Department of Energy Information Bridge

The interaction of supernova shocks and interstellar clouds is an important astrophysical phenomenon since it can result in stellar and planetary formation. Our experiments attempt to simulate this mass-loading as it occurs when a shock passes through interstellar clouds. We drive a strong shock using the Omega laser (approx. 5 kJ) into a foam-filled cylinder with an embedded Al sphere (diameter D = 120 micron) simulating an interstellar cloud. The density ratio between Al and foam is approx. 9. We have previously reported on the interaction between shock and cloud, the ensuing Kelvin-Helmholtz and Widnall instabilities, and the rapid stripping of all mass from the cloud.
NTIS
Interstellar Matter; Molecular Clouds; Shock Waves; Supernovae; Star Formation; Planetary Evolution

20070025476 Molecular Research Inst., CA, USA
Computational Confirmation of the Carrier for the 'XCN' Interstellar Ice Bank: OCN(-) Charge Transfer Complexes
Park, J.-Y.; Woon, D. E.; Astrophysics Journal; August 2004; Volume 601, pp. L63-L66; In English
Contract(s)/Grant(s): NAG5-13482; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1086/381734

Recent experimental studies provide evidence that carrier for the so-called XCN feature at 2165 cm(exp -1) (4.62 micron) in young stellar objects is an OCN(-)/NH4(+) charge transfer (CT) complex that forms in energetically processed interstellar icy grain mantles. Although other RCN nitriles and RCN iosonitriles have been considered, Greenberg's conjecture that OCN(-) is associated with the XCN feature has persisted for over 15 years. In this work we report a computational investigation that thoroughly confirms the hypothesis that the XCN feature observed in laboratory studies can result from OCN(-)/NH4(+) CT complexes arising from HNCO and NH3, in a water ice environment. Density functional theory calculations with theory calculations with HNCO, NH3, and up to 12 waters reproduce seven spectroscopic measurements associated with XCN: the band origin of the asymmetric stretching mode of OCN(-), shifts due to isotopic substitutions of C, N, O, and H, and two weak features. However, very similar values are also found for the OCN(-)/NH4(+) CT complex arising from HOCN and NH3. In both cases, the complex forms by barrierless proton transfer from HNCO or HOCN to NH3 during the optimization of the solvated system. Scaled B3LYP/6-31+G** harmonic frequencies for HNCO and HOCN cases are 2181 and 2202 cm(exp -1), respectively.
Author
Charge Transfer; Ice; Interstellar Matter; Interstellar Chemistry; Computational Astrophysics; Computational Chemistry

20070026114 Stanford Linear Accelerator Center, CA, USA; Bari Univ., Italy
Environmental Test Activity on the Flight Modules of the Glast Lat Tracker
Brigida, M.; Caliandro, A.; Favuzzi, C.; Fusco, P.; Gargano, F.; January 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-899577; SLAC-PUB-12355; No Copyright; Avail.: National Technical Information Service (NTIS)

The GLAST Large Area Telescope (LAT) is a gamma-ray telescope consisting of a silicon micro-strip detector tracker followed by a segmented CsI calorimeter and covered by a segmented scintillator anticoincidence system that will search for a-rays in the 20 MeV-300 GeV energy range. The results of the environmental tests performed on the flight modules (towers) of the Tracker are presented. The aim of the environmental tests is to verify the performance of the silicon detectors in the expected mission environment. The tower modules are subjected to dynamic tests that simulate the launch environment and thermal vacuum test that reproduce the thermal gradients expected on orbit. The tower performance is continuously monitored during the whole test sequence. The environmental test activity, the results of the tests and the silicon tracker performance are presented.
NTIS
Environmental Tests; Gamma Ray Telescopes; Modules; Telescopes

20070026115 Bari Univ., Italy
Performance of the Integrated Tracker Towers of the Glast Large Area Telescope
Brigida, M.; Caliandro, A.; Favuzzi, C.; Fusco, P.; Gargano, F.; January 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-899576; SLAC-PUB-12356; No Copyright; Avail.: Department of Energy Information Bridge

The GLAST Large Area Telescope (LAT) is a high energy gamma ray observatory, mounted on a satellite that will be on in 2007. The LAT tracker consists of an array of tower modules, equipped with planes of silicon strip detectors (SSDs) interleaved with tungsten converter layers. Photon detection is based on the pair conversion process; silicon strip detectors will reconstruct tracks of electrons and positrons. The instrument is actually being assembled. The first towers have been already tested and integrated at Stanford Linear Accelerator Center (SLAC). An overview of the integration stages of the main components of the tracker and a description of the pre-launch tests will be given. Experimental results on the performance of the tracker towers will be also discussed.
NTIS
Gamma Ray Telescopes; Telescopes; Towers

20070026116 Bari Univ., Italy
First Results from Glast-Lat Integrated Towers Cosmic Ray Data Taking and Montecarlo Comparison
Brigida, M.; Caliandron, A.; Favuzzi, C.; Fusco, P.; Gargano, F.; January 2006; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-899575; SLAC-PUB-12358; No Copyright; Avail.: National Technical Information Service (NTIS)

GLAST Large Area Telescope (LAT) is a gamma ray telescope instrumented with silicon-strip detector planes and sheets of converter, followed by a calorimeter (CAL) and surrounded by an anticoincidence system (ACD). This instrument is sensitive to gamma rays in the energy range between 20 MeV and 300 GeV. At present, the first towers have been integrated and pre-launch data taking with cosmic ray muons is being performed. The results from the data analysis carried out during LAT integration will be discussed and a comparison with the predictions from the MonteCarlo simulation will be show
NTIS
Cosmic Rays; Gamma Ray Telescopes; Towers; Monte Carlo Method

20070026179 Lawrence Livermore National Lab., Livermore, CA USA
Equation of State, Occupation Probabilities and Conductivities in the Average Atom Purgatorio Code
Sterne, P. A.; Hansen, S. B.; Wilson, B. G.; Isaacs, W. A.; Jan. 12, 2007; 16 pp.; In English
Report No.(s): DE2007-900053; UCRL-PROC-227242; No Copyright; Avail.: National Technical Information Service (NTIS)

We report on recent developments with the Purgatorio code, a new implementation of Liberman's Inferno model. This fully relativistic average atom code uses phase shift tracking and an ecient renement scheme to provide an accurate description of continuum states. The resulting equations of state accurately represent the atomic shell-related features which are absent in Thomas-Fermi-based approaches. The authors discuss various representations of the exchange potential and some of the

ambiguities in the choice of the effective charge Z* in average atom models, both of which affect predictions of electrical conductivities and radiative properties.
NTIS
Conductivity; Equations of State; Probability Theory

20070026274 Stanford Linear Accelerator Center, CA, USA
VHE Gamma-ray Supernova Remnants
Funk, S.; Jan. 2007; 17 pp.; In English
Report No.(s): DE2007-898150; SLAC-PUB-12307; No Copyright; Avail.: National Technical Information Service (NTIS)
Increasing observational evidence gathered especially in X-rays and (gamma)-rays during the course of the last few years support the notion that Supernova remnants (SNRs) are Galactic particle accelerators up to energies close to the 'knee' in the energy spectrum of Cosmic rays. This review summarizes the current status of (gamma)-ray observations of SNRs. Shell-type as well as plerionic type SNRs are addressed and prospect for observations of these two source classes with the upcoming GLAST satellite in the energy regime above 100 MeV are given.
NTIS
Gamma Rays; Supernova Remnants

20070026278 Wisconsin Univ., Madison, WI, USA
Atomic Database Project Final Report
Yuan, J.; Gui, Z.; Moses, G. A.; January 2006; 5 pp.; In English
Report No.(s): DE2007-897651; No Copyright; Avail.: National Technical Information Service (NTIS)
Atomic physics in hot dense plasmas is essential for understanding the radiative properties of plasmas either produced terrestrially such as in fusion energy research or in space such as the study of the core of the sun. Various kinds of atomic data are needed for spectrum analysis or for radiation hydrodynamics simulations. There are many atomic databases accessible publicly through the web, such as CHIANTI (an atomic database for spectroscopic diagnostics for astrophysical plasmas) from Naval Research Laboratory (1), collaborative development of TOPbase (The Opacity Project for astrophysically abundant elements) (2), NIST atomic spectra database from NIST (3), TOPS Opacities from Los Alamos National Laboratory (4), etc. Most of these databases are specific to astrophysics, which provide energy levels, oscillator strength f and photoionization cross sections for astrophysical elements (Z=1-26). There are abundant spectrum data sources for spectral analysis of low Z elements. For opacities used for radiation transport, TOPS Opacities from LANL is the most valuable source. The database provides mixed opacities from element for H (Z=1) to Zn (Z=30) The data in TOPS Opacities is calculated by the code LEDCOP.
NTIS
Astrophysics; Atoms; Data Bases; Opacity

20070026285 Stanford Linear Accelerator Center, CA, USA
Virialization Heating in Galaxy Formation
Wang, P.; Abel, T.; Jan. 2007; 5 pp.; In English
Report No.(s): DE2007-897734; SLAC/PUB-12304; No Copyright; Avail.: National Technical Information Service (NTIS)
In a hierarchical picture of galaxy formation virialization continually transforms gravitational potential energy into kinetic energies in the baryonic and dark matter. For the gaseous component the kinetic, turbulent energy is transformed eventually into internal thermal energy through shocks and viscous dissipation. Traditionally this virialization and shock heating has been assumed to occur instantaneously allowing an estimate of the gas temperature to be derived from the virial temperature defined from the embedding dark matter halo velocity dispersion. As the mass grows the virial temperature of a halo grows. Mass accretion hence can be translated into a heating term. We derive this heating rate from the extended Press Schechter formalism and demonstrate its usefulness in semi-analytical models of galaxy formation. Our method is preferable to the traditional approaches in which heating from mass accretion is only modeled implicitly through an instantaneous change in virial temperature. Our formalism can trivially be applied in all current semi-analytical models as the heating term can be computed directly from the underlying merger trees. Our analytic results for the first cooling halos and the transition from cold to hot accretion are in agreement with numerical simulations.
NTIS
Galactic Evolution; Heating; Mathematical Models

20070026311 Lawrence Livermore National Lab., Livermore, CA USA

Electron Impact Excitation Cross Section Measurement for n=3 to n=2 Line Emission in Fe17+ to Fe23+

Chen, H.; Beiersdorfer, P.; Brown, G. V.; Scofield, J.; Gu, M. F.; Apr. 21, 2006; 6 pp.; In English

Report No.(s): DE2007-895717; UCRL-PROC-220791; No Copyright; Avail.: Department of Energy Information Bridge

The authors have measured the electron impact excitation cross sections for the strong iron L-shell 3 -> 2 lines of Fe XVIII to Fe XXIV at the EBIT-I electron beam ion trap using a crystal spectrometer and NASA-Goddard Space Flight Centers 6 x 6 pixel array microcalorimeter. The cross sections were determined by direct normalization to the well established cross section of radiative electron capture through a sophisticated model analysis which results in the excitation cross section for the strong Fe L-shell lines at multiple electron energies. This measurement is part of a laboratory X-ray astrophysics program utilizing the Livermore electron beam ion traps EBIT-I and EBIT-II.

NTIS

Astrophysics; Atomic Excitations; Electron Beams; Electron Impact; Cross Sections

20070026858 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Intergalactic Photon Spectra from the Far-IR to the UV Lyman Limit for 0 < z < 6 and the Optical Depth of the Universe to High-Energy Gamma Rays

Stecker, F. W.; Malkan, M. A.; Scully, S. T.; The Astrophysical Journal; January 2006; Volume 648, Number 2, Part 1, pp. 774-783; In English; See also 20070027402; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1086/506188

We calculate the intergalactic photon density as a function of both energy and redshift for 0<z<6 for photon energies from.003 eV to the Lyman limit cutoff at 13.6 eV in a (Omega)CDM universe with (Omega)(Lambda)=0.7 and (Omega)m=0.3. The basic features of our backward-evolution model for galaxies were developed in earlier papers by Malkan & Stecker. With a few improvements, we find that this evolutionary model gives predictions of new deep number counts from Spitzer, as well as a calculation of the spectral energy distribution of the diffuse infrared background, which are in good agreement with the data. We then use our calculated intergalactic photon densities to extend previous work on the absorption of high-energy Gamma-rays in intergalactic space owing to interactions with low-energy photons and the 2.7 K cosmic microwave background radiation. We calculate the optical depth of the universe, Tau , for Gamma-rays having energies from 4 GeV to 100 TeV emitted by sources at redshifts from 0 to 5. We also give an analytic fit with numerical coefficients for approximating (E(Gamma), z). As an example of the application of our results, we calculate the absorbed spectrum of the blazar PKS 2155-304 at z=0.117 and compare it with the spectrum observed by the HESS air Cerenkov Gamma-ray telescope array.

Author

Gamma Rays; Optical Thickness; Photon Density; Universe; Background Radiation; Spectral Energy Distribution

20070027402 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Erratum: Intergalactic Photon Spectra from the Far IR to the UV Lyman Limit for 0 < z < 6 and the Optical Depth of the Universe to High Energy Gamma-Rays

Stecker, F. W.; Malkan, M. A.; Scully, S. T.; [2007]; 2 pp.; In English; See also 20070026858; Copyright; Avail.: CASI: A01, Hardcopy

Table 1 in our paper had erroneous numbers for the coefficients fitting the parametric form for the optical depth of the universe to gamma-rays; tau. The correct values for these parameters as described in the original text are given in the table for various redshifts for the baseline model (upper row) and fast evolution (lower row) for each individual redshift.

Author

Photon Density; Far Infrared Radiation; Optical Thickness; Universe; Gamma Rays; Background Radiation

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20070025207 NASA Johnson Space Center, Houston, TX, USA
Visions for Space Exploration: ILS Issues and Approaches
Watson, Kevin; May 02, 2005; 10 pp.; In English; Department of the Army Integrated Logistics Support (ILS) Conference, 2-5 May 2005, Huntsville, AL, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025207

This viewgraph presentation reviews some of the logistic issues that the Vision for Space Exploration will entail. There is a review of the vision and the timeline for the return to the moon that will lead to the first human exploration of Mars. The lessons learned from the International Space Station (ISS) and other such missions are also reviewed.
CASI
Moon; Space Exploration; Space Logistics; Resources

20070025416 Lawrence Livermore National Lab., Livermore, CA USA
Modeling Planetary Interiors in Laser Based Experiment Using Shockless Compression
Hawreliak, J.; Colvin, J.; Eggert, J.; Kalantar, D.; Lorenzana, H. E.; May 07, 2006; 11 pp.; In English
Report No.(s): DE2007-895429; UCRL-PROC-221172; No Copyright; Avail.: Department of Energy Information Bridge

X-ray diffraction is a widely used technique for measuring the crystal structure of a compressed material. Recently, short pulse x-ray sources have been used to measure the crystal structure in-situ while a sample is being dynamically loaded. To reach the ultra high pressures that are unattainable in static experiments at temperatures lower than using shock techniques, shockless quasi-isentropic compression is required. Shockless compression has been demonstrated as a successful means of accessing high pressures. The National Ignition Facility (NIF), which will begin doing high pressure material science in 2010, it should be possible to reach over 2 TPa quasi-isentropically. This paper outlines how x-ray diffraction could be used to study the crystal structure in laser driven, shocklessly compressed targets the same way it has been used in shock compressed samples. A simulation of a shockless laser driven iron is used to generate simulated diffraction signals. And recently experimental results are presented.
NTIS
Lasers; Planetary Cores; Shock Waves; Crystal Structure; Simulation; Models

20070025548 California Inst. of Tech., Pasadena, CA, USA
Origin of the Moon
Stevenson, David; May 05, 2006; 2 pp.; In English
Contract(s)/Grant(s): NNG04GQ41G; No Copyright; Avail.: Other Sources; Abstract Only

Many ideas have been proposed for the origin of the Moon, but only one has stood the test of time: During the formation of Earth, about 4.5 billion years ago, our planet was hit by a projectile the size of Mars, leading to a close-in disk of molten material in earth orbit. From this material, our Moon formed in about a thousand years. I will explain how the properties of the Moon can be explained by this model and why the alternative ideas are either incorrect or highly improbable. I will also talk about some new developments in this area that come from a consideration of chemistry and isotopic measurements. Finally. I will talk about what we don't know and why the Moon is still an interesting place for further exploration.
Author
Moon; Lunar Evolution; Selenology

20070025589 Washington Univ., WA, USA
Stardust: Catching a Comet and Bringing it Home
Brownlee, Donald E.; May 04, 2007; 2 pp.; In English
Contract(s)/Grant(s): NNG04GQ41G; No Copyright; Avail.: Other Sources; Abstract Only

The NASA STARDUST mission collected thousands of particles from Comet Wild 2 that are now being studied by two hundred scientists around the world. The spacecraft captured the samples during a close flyby of the comet in 2004 and returned them to Earth with a dramatic entry into the atmosphere early in 2006. The precious cargo of comet dust is being

studied to determine new information about the origin of the Sun and planets. The comet formed at the edge of the solar system, beyond the orbit of Neptune, and is a sample of the material from which the solar system was formed. One of the most dramatic early findings from the mission was that a comet that formed in the coldest place in the solar system contained minerals that formed in the hottest place in the solar system. The comet samples are telling stories of fire and ice and they providing fascinating and unexpected information about our origins.
Author
Comets; Interplanetary Dust; Stardust Mission; Cometary Atmospheres

20070026129 Lawrence Livermore National Lab., Livermore, CA USA
Multi-Petabyte Image Data Management Systems
Dossa, D. D.; Jan. 23, 2007; 7 pp.; In English
Report No.(s): DE2007-900059; UCRL-TR-227567; No Copyright; Avail.: Department of Energy Information Bridge

This research effort is directed to determine the methods and computational infrastructure needed to save, browse, and analyze multiple petabyte databases. The data set to be generated by the Large Synoptic Survey Telescope is used as a template for this research.
NTIS
Data Management; Data Storage; Management Systems; Surveys; Telescopes

20070026184 Lawrence Livermore National Lab., Livermore, CA USA
LSST Camera Optics
Olivier, S. S.; Seppala, L.; Gilmore, K.; Hale, L.; Whistler, W.; Jun. 05, 2006; 14 pp.; In English
Report No.(s): DE2007-900049; UCRL-CONF-221844; No Copyright; Avail.: National Technical Information Service (NTIS)

The Large Synoptic Survey Telescope (LSST) is a unique, three-mirror, modified Paul-Baker design with an 8.4m primary, a 3.4m secondary, and a 5.0m tertiary feeding a camera system that includes corrector optics to produce a 3.5 degree field of view with excellent image quality (<0.3 arcsecond 80% encircled diffracted energy) over the entire field from blue to near infrared wavelengths. We describe the design of the LSST camera optics, consisting of three refractive lenses with diameters of 1.6m, 1.0m and 0.7m, along with a set of interchangeable, broad-band, interference filters with diameters of 0.75m. We also describe current plans for fabricating, coating, mounting and testing these lenses and filters.
NTIS
Cameras; Surveys; Telescopes

20070028414 NASA Glenn Research Center, Cleveland, OH, USA
High Specific Power Motors in LN2 and LH2
Brown, Gerald V.; Jansen, Ralph H.; Trudell, Jeffrey J.; July 16, 2007; 11 pp.; In English; Cryogenic Engineering Conference, 16-20 Jul. 2007, Chattanooga, TN, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.15.02; Copyright; Avail.: CASI: A03, Hardcopy

A switched reluctance motor has been operated in liquid nitrogen (LN2) with a power density as high as that reported for any motor or generator. The high performance stems from the low resistivity of Cu at LN2 temperature and from the geometry of the windings, the combination of which permits steady-state rms current density up to 7000 A/cm2, about 10 times that possible in coils cooled by natural convection at room temperature. The Joule heating in the coils is conducted to the end turns for rejection to the LN2 bath. Minimal heat rejection occurs in the motor slots, preserving that region for conductor. In the end turns, the conductor layers are spaced to form a heat-exchanger-like structure that permits nucleate boiling over a large surface area. Although tests were performed in LN2 for convenience, this motor was designed as a prototype for use with liquid hydrogen (LH2) as the coolant. End-cooled coils would perform even better in LH2 because of further increases in copper electrical and thermal conductivities. Thermal analyses comparing LN2 and LH2 cooling are presented verifying that end-cooled coils in LH2 could be either much longer or could operate at higher current density without thermal runaway than in LN2.
Author
Liquid Hydrogen; Liquid Nitrogen; Electric Motors; Reluctance; Prototypes

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20070025413 Science Applications International Corp., San Diego, CA, USA
Predicting the Structure of the Solar Corona for the Total Solar Eclipse of March 29,2006
Mikic, Z.; Linker, J. a.; Lionello, R.; Riley, P.; TItov, V.; Solar and Stellar Physics Through Eclipses. ASP Conference Series; 2007; Volume 370, pp. 299-307; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG05EE09C; Copyright; Avail.: Other Sources

We describe the use of a three-dimensional MHD model to predict the structure of the corona prior to the total solar eclipse of March 29, 2006. The calculation uses the observed photospheric radial magnetic field as a boundary condition. We use a new version of our model that has an improved description of energy transport in the corona. The model allows us to predict the emission of X-ray and EUV radiation in the corona. We compare the predicted polarization brightness in the corona with four observations of the eclipse from Greece, Egypt, and Libya, and we demonstrate that the model accurately predicts the largescale structure of the corona. We also compare X-ray emission from the model with GOES/SXI images.
Author
Magnetohydrodynamics; Solar Corona; Solar Magnetic Field; Three Dimensional Models

20070025414 Science Applications International Corp., San Diego, CA, USA
'Bursty' Reconnection Following Solar Eruptions: MHD Simulations and Comparison with Observations
Riley, Pete; Lionello, Roberto; Mikic, zoran; Linker, Jon; Clark, Eric; Lin, Jun; Ko, Yuan-Kuen; The Astrophysical Journal; January 20, 2007; Volume 655, pp. 591-597; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG05EE09C; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1086/509913

Posteruptive arcades are frequently seen in the aftermath of coronal mass ejections (CMEs). The formation of these loops at successively higher altitudes, coupled with the classic 'two-ribbon' flare seen in H-alpha, are interpreted as reconnection of the coronal magnetic field that has been dragged outward by the CME. White-light observations of 'rays,' which have been interpreted as being coincident with the current sheet at the reconnection site underneath the erupting CME, also provide evidence for its occurrence. 'Blobs' occasionally seen within these rays suggest an even richer level of structure. In this report, we present numerical simulations that reproduce both the observed rays and the formation and evolution of the blobs. We compare their properties with SOHO/LASCO observations of similar structures, and relate their formation to standard theories of reconnection,
Author
Coronal Mass Ejection; Magnetohydrodynamics; Solar Corona; Solar Wind

20070025415 Science Applications International Corp., San Diego, CA, USA
On the Origin of Near-Radial Magnetic Fields in the Heliosphere: Numerical Simulations
Mikic, Zoran; Riley, Pete; Gosling, T. J.; Journal of Geophysical Research; June 23, 2007; ISSN 0148-0227; Volume 112; 12 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG05EE09C; NNG055GJ55G
Report No.(s): SAIC-07/8005; 01-0011-04-5333-000; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2006JA012210

Deviations from the direction of the 'Parker spiral' can be found in in situ measurements of the interplanetary magnetic field on essentially all scales. One intriguing subset is the intervals of near-radial magnetic field, lasting for many hours. Some such intervals are obviously associated with coronal mass ejections, while others appear to be embedded within the ambient solar wind. Most occur on declining speed profiles, such that, when mapped back to the Sun, an entire radial field interval appears to have been launched at approximately the same time. It has been proposed that these events are the result of abrupt, semipermanent speed decreases on these field lines close to the Sun, and that such speed changes might be due to interchange reconnection. In this study, we use a three-dimensional, time-dependent magnetohydrodynamic model to assess to what extent this can account for near-radial magnetic fields observed relatively far out in the heliosphere. We find that sudden speed drops on the trailing portions of high-speed flows can produce strongly underwound (that is near radial) field lines in the heliosphere, although significantly larger speed gradients are required than are typically observed. Moreover, the simulations also

reproduce the decreases in density, temperature, and magnetic field strength that are also commonly observed within these events. The question of what produces the abrupt speed drops remains to be answered.
Author
Three Dimensional Models; Heliosphere; Magnetohydrodynamic Simulation; Magnetohydrodynamics; Interplanetary Magnetic Fields

20070026071 Science Applications International Corp., San Diego, CA, USA
Maximizing the Scientific Return of the Sentinels Mission Using Global MHD Models
Riley, P.; Linker, J. A.; Mikic, Z.; Lionello, R.; December 11, 2006; In English
Contract(s)/Grant(s): NNG05EE09C; Copyright; Avail.: Other Sources

The Sentinels mission promises to provide a unique view of the acceleration and transport processes of energetic particles as well as the initiation and evolution of coronal mass ejections (CMEs). A crucial component in understanding the physics associated with these processes lies in the large-scale structure of the corona and heliosphere, particularly during the eruption and propagation of fast CMEs. In this talk we review the current status of our MHD modeling efforts, focusing on Sentinels-specific science, and project forward to envisage what capabilities we may have developed by the time that the Sentinels launch (2012). In conjunction with Solar Orbiter, the farside and near-Earth Sentinels spacecraft will provide simultaneous photospheric magnetograph measurements at multiple longitudes, which will lead to major improvements in our ability to prescribe accurate, time-dependent global boundary conditions. Data returned from the inner heliospheric Sentinels will be used to validate these results. The model results can be used in a variety of ways to interpret the observations. For example, products from the model, such as the properties of CME-driven shocks and CME-associated reconnection sites can be used to interpret complex energetic particle profiles. Also, by tracing along magnetic field lines, the inferred sites of the energetic particles can be connected directly with the in situ measurements at each spacecraft. Perhaps more so than any previous mission, sophisticated models will be required to unravel the broad and disparate measurements returned by the suite of Sentinels spacecraft.
Author
Coronal Mass Ejection; Heliosphere; Magnetohydrodynamics; Mission Planning; Solar Wind

20070027101 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Total Solar Eclipse of 2008 August 01
Espenak, F.; Anderson, J.; March 2007; 80 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TP-2007-214149; Rept-2006-01919-1; Copyright; Avail.: CASI: A05, Hardcopy

On 2008 August 01, a total eclipse of the Sun is visible from within a narrow corridor that traverses half the Earth. The path of the Moon's umbral shadow begins in northern Canada and extends across Greenland, the Arctic, central Russia, Mongolia, and China. A partial eclipse is seen within the much broader path of the Moon's penumbral shadow, which includes northeastern North America, most of Europe and Asia. Detailed predictions for this event are presented and include besselian elements, geographic coordinates of the path of totality, physical ephemeris of the umbra, topocentric limb profile corrections, local circumstances for 308 cities, maps of the eclipse path, weather prospects, the lunar limb profile and the sky during totality. Information on safe eclipse viewing and eclipse photography is included.
Author
Solar Eclipses; Sun; Celestial Mechanics; Penumbras

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20070026139 NASA Johnson Space Center, Houston, TX, USA
Planetary and Interplanetary Environmental Models for Radiation Analysis
DeAngelis, G.; Cucinotta, F. A.; July 18, 2005; 1 pp.; In English; 35th COSPAR Scientific Assembly Meeting, 18-25 Jul. 2004, Paris, France; Copyright; Avail.: Other Sources; Abstract Only

The essence of environmental modeling is presented as suited for radiation analysis purposes. The variables of fundamental importance for radiation environmental assessment are discussed. The characterization is performed by dividing modeling into three areas, namely the interplanetary medium, the circumplanetary environment, and the planetary or satellite

surface. In the first area, the galactic cosmic rays (GCR) and their modulation by the heliospheric magnetic field as well as and solar particle events (SPE) are considered, in the second area the magnetospheres are taken into account, and in the third area the effect of the planetary environment is also considered. Planetary surfaces and atmospheres are modeled based on results from the most recent targeted spacecraft. The results are coupled with suited visualization techniques and radiation transport models in support of trade studies of health risks for future exploration missions.
Author
Environment Models; Planetary Environments; Radiation Transport; Interplanetary Medium; Planetary Surfaces; Galactic Cosmic Rays

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20070025220 Government Accountability Office, Washington, DC, USA
NASA: Progress Made on Strategic Human Capital Management, but Future Program Challenges Remain
August 2007; 40 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-07-1004; No Copyright; Avail.: CASI: A03, Hardcopy

NASA's strategic human capital framework is generally aligned with its strategic mission, outcomes, and programmatic goals. NASA's leaders have set its overall direction and goals and involved its mission directorates and centers in implementing human capital strategy and providing feedback to headquarters. Recently, NASA has been improving its workforce planning information technology matching program requirements with human capital resources. Some centers have been critical of the systems performance, but others find these tools useful. NASA attracts and retains critical personnel by using tools such as recruiting and retention bonuses. Recently, NASA has asked Congress for additional human capital flexibilities to help manage its workforce. The centers also have their own programs that address their critical skills shortfalls by training and developing employees. NASA recognizes that critical skills now present in the civil service and contractor Space Shuttle workforce are needed to complete present and future mission objectives, but also understands that additional capability will also be needed in certain areas. Given this, NASA is looking ahead and considering how best to mitigate any potential loss of skills and knowledge that could take place in the period between the Space Shuttle s retirement in 2010 and the resumption of human space flight in 2015.
Derived from text
NASA Space Programs; Aeronautics; Project Management; Space Shuttles

Subject Term Index

Personal Author Index