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Langley Research Center

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WHAT'S INSIDE

NASA STI Program ... in Profile

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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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Physics

Social and Information Sciences

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

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20080033698 NASA Langley Research Center, Hampton, VA, USA

Rotor Airloads Prediction Using Unstructured Meshes and Loose CFD/CSD Coupling

Biedron, Robert T.; Lee-Rausch, Elizabeth M.; August 18, 2008; 18 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 877868; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033698

The FUN3D unsteady Reynolds-averaged Navier-Stokes solver for unstructured grids has been modified to allow prediction of trimmed rotorcraft airloads. The trim of the rotorcraft and the aeroelastic deformation of the rotor blades are accounted for via loose coupling with the CAMRAD II rotorcraft computational structural dynamics code. The set of codes is used to analyze the HART-II Baseline, Minimum Noise and Minimum Vibration test conditions. The loose coupling approach is found to be stable and convergent for the cases considered. Comparison of the resulting airloads and structural deformations with experimentally measured data is presented. The effect of grid resolution and temporal accuracy is examined. Rotorcraft airloads prediction presents a very substantial challenge for Computational Fluid Dynamics (CFD). Not only must the unsteady nature of the flow be accurately modeled, but since most rotorcraft blades are not structurally stiff, an accurate simulation must account for the blade structural dynamics. In addition, trim of the rotorcraft to desired thrust and moment targets depends on both aerodynamic loads and structural deformation, and vice versa. Further, interaction of the fuselage with the rotor flow field can be important, so that relative motion between the blades and the fuselage must be accommodated. Thus a complete simulation requires coupled aerodynamics, structures and trim, with the ability to model geometrically complex configurations. NASA has recently initiated a Subsonic Rotary Wing (SRW) Project under the overall Fundamental Aeronautics Program. Within the context of SRW are efforts aimed at furthering the state of the art of high-fidelity rotorcraft flow simulations, using both structured and unstructured meshes. Structured-mesh solvers have an advantage in computation speed, but even though remarkably complex configurations may be accommodated using the overset grid approach, generation of complex structured-mesh systems can require months to set up. As a result, many rotorcraft simulations using structured-grid CFD neglect the fuselage. On the other hand, unstructured-mesh solvers are easily able to handle complex geometries, but suffer from slower execution speed. However, advances in both computer hardware and CFD algorithms have made previously state-of-the-art computations routine for unstructured-mesh solvers, so that rotorcraft simulations using unstructured grids are now viable. The aim of the present work is to develop a first principles rotorcraft simulation tool based on an unstructured CFD solver.

Author

Unsteady Flow; Unstructured Grids (Mathematics); Reynolds Averaging; Navier-Stokes Equation; Computational Fluid Dynamics; Aerodynamic Loads; Rotary Wing Aircraft; Flow Distribution

20080033840 Jagtiani and Guttag, Fairfax, VA, USA

Airfoil Having Improved Impact and Erosion Resistance and Method for Preparing Same

Bruce, R. W., Inventor; Schell, J. D., Inventor; Gorman, M. D., Inventor; 26 Jul 04; 11 pp.; In English

Contract(s)/Grant(s): N00019-96-C-0176

Patent Info.: Filed Filed 26 Jul 04; US-Patent-Appl-SN-10-898 755

Report No.(s): PB2008-100648; No Copyright; Avail.: CASI: A03, Hardcopy

A turbine airfoil having an improved impact and erosion resistance. The airfoil comprises: (a) a base segment having an

impact resistant leading edge section proximate to the leading edge comprising a material having having a yield strength of least about 250 ksi and an elongation percentage of about 12% or less; and (b) an erosion resistant coating overlaying the base segment at least in the leading and trailing edge portions of the pressure side, the erosion resistant coating comprising at least one ceramic layer having at least one of the following properties: (1) an erosion value of at least about 200 g. of erodent to cause a thickness loss of about 15-20 microns; (2) an erosion volume loss value (V) of about 1.9 or less as defined by the equation V=H(sup -0.18) times E(sup 0.75) times F(sup -1.65) where H is hardness, E is elastic modulus and F is fracture toughness; and (3) an F value of at least about 1.5 MPa(star)m(sup 1/2). The erosion resistant coating can comprise alternating ceramic and metallic layers and is typically formed by a method involving the step of forming on the pressure side of the base segment of the airfoil in alternating fashion at least one ceramic layer and at least one metallic layer.
NTIS
Airfoils; Corrosion Resistance; Erosion; Impact Resistance; Patent Applications

20080034511 NASA Marshall Space Flight Center, Huntsville, AL, USA
Closed Loop System Identification with Genetic Algorithms
Whorton, Mark S.; [2008]; 12 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: Other Sources

High performance control design for a flexible space structure is challenging since high fidelity plant models are difficult to obtain a priori. Uncertainty in the control design models typically require a very robust, low performance control design which must be tuned on-orbit to achieve the required performance. Closed loop system identification is often required to obtain a multivariable open loop plant model based on closed-loop response data. In order to provide an accurate initial plant model to guarantee convergence for standard local optimization methods, this paper presents a global parameter optimization method using genetic algorithms. A minimal representation of the state space dynamics is employed to mitigate the non-uniqueness and over-parameterization of general state space realizations. This control-relevant system identification procedure stresses the joint nature of the system identification and control design problem by seeking to obtain a model that minimizes the difference between the predicted and actual closed-loop performance.
Author
System Identification; Genetic Algorithms; Feedback Control; Control Systems Design; Mathematical Models

20080034563 National Renewable Energy Lab., Golden, CO USA
Wind Turbine Blade Flow Fields and Prospects for Active Aerodynamic Control
Schreck, S.; Robinson, M.; Aug. 2007; 15 pp.; In English
Report No.(s): DE2007-913595; NREL/CP-500-41606; No Copyright; Avail.: Department of Energy Information Bridge

As wind turbines continue to grow larger, problems associated with adverse aerodynamic loads will grow more critical. Thus, the wind energy technical community has begun to seriously consider the potential of aerodynamic control methodologies for mitigating adverse aerodynamic loading. Spatial and temporal attributes of the structures and processes present in these flow fields hold important implications for active aerodynamic control methodologies currently being contemplated for wind turbine applications. The current work uses complementary experimental and computational methodologies, to isolate and characterize key attributes of blade flow fields associated with axisymmetric and yawed turbine operation. During axisymmetric operation, a highly three-dimensional, shear layer dominated flow field yields rotational augmentation of both mean and standard deviation levels of aerodynamic forces. Under yawed operating conditions, pseudo-sinusoidal inflow angle oscillations elicit dynamic stall, which significantly intensifies aerodynamic load production. Both rotationally augmented and dynamically stalled flows possess attributes likely to pose central challenges for turbine flow control. Whether active control of turbine aerodynamics can help alleviate adverse aerodynamic loads will depend on comprehension and command of the issues documented herein.
NTIS
Active Control; Aerodynamics; Control Surfaces; Flow Distribution; Turbine Blades; Wind Turbines

20080034578 Boston Univ., Boston, MA, USA
Final Report on the New Directions in the Variational Multiscale Formulation of Large Eddy Simulation of Turbulence. Report for September 14, 2004 to September 1, 2006
Oberai, A. A.; January 2007; 12 pp.; In English
Contract(s)/Grant(s): DE-FG02-04ER25648
Report No.(s): DE2007-909698; No Copyright; Avail.: Department of Energy Information Bridge

In this study we have developed a numerical method for the spectral approximation of non- linear conservation laws.

These laws describe a broad range of physical phenomena which include the dynamics of gasses, the ow of trac and the propagation of shallow water and nonlinear acoustic waves. In all these systems we have addressed the cases when the usivity is small or zero. In the small viscosity case, the solution to such systems is known to develop local regions of large spatial and temporal gradients called shocks. The width of a shock reduces with reducing viscosity, and in the limit of zero viscosity the solution becomes discontinuous. In fact, in this limit in order to ensure unique solutions, the conservation law must be supplemented with an entropy production inequality and conditions that relate jumps in conserved quantities across the shock. NTIS

Jet Flow; Large Eddy Simulation; Turbulence; Vortices

20080034650 NASA Langley Research Center, Hampton, VA, USA

Distributed Aviation Concepts and Technologies

Moore, Mark D.; August 19, 2008; 18 pp.; In English; Wichita Aviation Technology Conference, 19-21 Aug. 2008, Wichita, KS, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 492505.01.07.89R4.01

Report No.(s): SAE 2008-01-2268; Copyright; Avail.: Other Sources

Aviation has experienced one hundred years of evolution, resulting in the current air transportation system dominated by commercial airliners in a hub and spoke infrastructure. While the first fifty years involved disruptive technologies that required frequent vehicle adaptation, the second fifty years produced a stable evolutionary optimization of decreasing costs with increasing safety. This optimization has resulted in traits favoring a centralized service model with high vehicle productivity and cost efficiency. However, it may also have resulted in a system that is not sufficiently robust to withstand significant system disturbances. Aviation is currently facing rapid change from issues such as environmental damage, terrorism threat, congestion and capacity limitations, and cost of energy. Currently, these issues are leading to a loss of service for weaker spoke markets. These catalysts and a lack of robustness could result in a loss of service for much larger portions of the aviation market. The impact of other competing transportation services may be equally important as casual factors of change. Highway system forecasts indicate a dramatic slow down as congestion reaches a point of non-linearly increasing delay. In the next twenty-five years, there is the potential for aviation to transform itself into a more robust, scalable, adaptive, secure, safe, affordable, convenient, efficient and environmentally friendly system. To achieve these characteristics, the new system will likely be based on a distributed model that enables more direct services. Short range travel is already demonstrating itself to be inefficient with a centralized model, providing opportunities for emergent distributed services through air-taxi models. Technologies from the on-demand revolution in computers and communications are now available as major drivers for aviation on-demand adaptation. Other technologies such as electric propulsion are currently transforming the automobile industry, and will also significantly alter the functionality of future distributed aviation concepts. Many hurdles exist, including technology, regulation, and perception. Aviation has an inherent governmental role not present in other recent on-demand transformations, which may pose a risk of curtailing aviation democratization .

Author

Commercial Aircraft; Aeronautical Engineering; Air Transportation; Electric Propulsion

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.

20080033242 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Static Aeroelastic Analysis of a Flexible Wing Mini Unmanned Aerial Vehicle

Pitcher, Nathan A; Mar 27, 2008; 111 pp.; In English

Report No.(s): AD-A480444; AFIT/GAE/ENY/08-M23; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480444

The static aeroelastic behavior of the Nighthawk mini unmanned aerial vehicle is examined using a combined experimental and computational approach. Three wings are examined. In order of increasing stiffness they are: a flexible wing, a stiff wing, and a fictitious rigid wing with zero deflection. Photogrammetry is used during wind tunnel testing to measure the average deflected shape of the flexible and stiff wings during flight. The independent variables during wind tunnel tests

are angle of attack (ranging from -5.1 deg through 13.4 deg) and velocity, which is 20 mph, 30 mph, and 40 mph. Roll angle and yaw angle are control variables, held constant at 0 deg. The measured deflection of each wing is used to adjust the wing shape for computational fluid dynamics analysis. Solutions are obtained for the flexible, stiff, and undeflected (or rigid) wings using a steady-state viscous flow solver with a Spalart-Allmaras turbulence model. The flexible and stiff wings experience two forms of deformation during flight. They bend upward along the span increasing the dihedral, and the leading edge twists downward (wing washout). The amplitude of deflection is greatest for the flexible wing. As a result, the flexible wing is more stable, but also exhibits worse static aerodynamic performance. The rigid wing has the greatest lift (CL max=1.29) and the highest lift-to-drag ratio (L/Dmax =10.2). Stall occurs first near the root for all three wings. None of the wings stall at the tip in the range of angles of attack tested. A separation bubble forms under the wing at angles of attack less than 8o. This separation decreases the overall lift. It is most prominent on the flexible wing.
DTIC
Aerodynamic Characteristics; Aeroelasticity; Computational Fluid Dynamics; Drone Vehicles; Flexible Wings; Pilotless Aircraft; Wings

20080033281 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Energy Based Topology Optimization of Morphing Wings a Multidisciplinary Global/Local Design Approach
Lindner, Douglas K; Dec 2006; 12 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0124
Report No.(s): AD-A480574; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480574

A morphing wing is a multidisciplinary system that includes a shape changing flexible structural subsystem, an active material subsystem that generates the desired shape changes, an electronics subsystem that drives the active materials to achieve the desired shape changes. As opposed to fixed wing structures in which the aerodynamic and structure integration for the entire wing is the most important interaction mechanism, in the case of a morphing wing structure the interaction of the structures and aerodynamics occur in conjunction with the active material and electronic subsystem interactions that involve transfer of energy from a source to the shape changing structure and vice versa.
DTIC
Aerodynamics; Body-Wing Configurations; Design Optimization; Wings

20080033488 Army Research Lab., Aberdeen Proving Ground, MD USA
Physics-Based Virtual Fly-Outs of Projectiles on Supercomputers
Sahu, Jubaraj; Nov 2006; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480924; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes the development and application of a new multidisciplinary computational capability to compute the flight trajectories and the free flight aerodynamics of projectiles. Advanced computational capabilities both in computational fluid dynamics (CFD) and rigid body dynamics (RBD) have been successfully fully coupled on high performance computing (HPC) platforms for Virtual Fly-Outs of guided munitions identical to actual free flight tests in the aerodynamic experimental facilities. For the first time, this integrated capability now allows time-accurate truly coupled CFD/RBD computations to simultaneously predict the free flight aerodynamics and compute the actual flight trajectories of both spin and fin stabilized projectiles and missiles with and without flight control maneuvers using microjets or control surfaces such as canards. Computed positions and orientations of the projectiles have been compared with actual data measured from free flight tests and are found to be generally in good agreement. Unsteady numerical results obtained from the coupled method show the flow field, the aerodynamic forces and moments, and the flight trajectories of the projectiles. Computed results obtained for a complex configuration with canard-control pitch-up maneuver in a virtual fly-out show the potential of these techniques for providing the actual timedependent response of the flight vehicle and entire flight trajectory of a complex guided projectile system. It can lead to accurate determination of aerodynamics.
DTIC
Aerodynamics; Free Flight; Projectiles; Supercomputers; Trajectories

20080034445 NASA Langley Research Center, Hampton, VA, USA

Control Laws for a Dual-Spin Stabilized Platform

Lim, K. B.; Moerder, D. D.; August 18, 2008; 19 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 457280; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034445

This paper describes two attitude control laws suitable for atmospheric flight vehicles with a steady angular momentum bias in the vehicle yaw axis. This bias is assumed to be provided by an internal flywheel, and is introduced to enhance roll and pitch stiffness. The first control law is based on Lyapunov stability theory, and stability proofs are given. The second control law, which assumes that the angular momentum bias is large, is based on a classical PID control. It is shown that the large yaw-axis bias requires that the PI feedback component on the roll and pitch angle errors be cross-fed. Both control laws are applied to a vehicle simulation in the presence of disturbances for several values of yaw-axis angular momentum bias. It is seen that both control laws provide a significant improvement in attitude performance when the bias is sufficiently large, but the nonlinear control law is also able to provide improved performance for a small value of bias. This is important because the smaller bias corresponds to a smaller requirement for mass to be dedicated to the flywheel.

Author

Attitude Control; Control Theory; Angular Distribution; Angular Momentum; Attitude (Inclination); Bias; Pitch (Inclination); Stabilized Platforms

20080034477 NASA Langley Research Center, Hampton, VA, USA

Multibody Modeling and Simulation for the Mars Phoenix Lander Entry, Descent and Landing

Queen, Eric M.; Prince, Jill L.; Desai, Prasun N.; August 18, 2008; 11 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 439654.02.08; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034477

A multi-body flight simulation for the Phoenix Mars Lander has been developed that includes high fidelity six degree-of-freedom rigid-body models for the parachute and lander system. The simulation provides attitude and rate history predictions of all bodies throughout the flight, as well as loads on each of the connecting lines. In so doing, a realistic behavior of the descending parachute/lander system dynamics can be simulated that allows assessment of the Phoenix descent performance and identification of potential sensitivities for landing. This simulation provides a complete end-to-end capability of modeling the entire entry, descent, and landing sequence for the mission. Time histories of the parachute and lander aerodynamic angles are presented. The response of the lander system to various wind models and wind shears is shown to be acceptable. Monte Carlo simulation results are also presented.

Author

Descent; Degrees of Freedom; Landing Simulation; Phoenix Mars Lander; Flight Simulation; Parachutes; Attitude (Inclination)

20080034481 NASA Langley Research Center, Hampton, VA, USA

Flow-Field Measurement of a Hybrid Wing Body Model with Blown Flaps

Lin, John C.; Jones, Gregory S.; Allan, Brian G.; Westra, Bryan W.; Collins, Scott W.; Zeune, Cal H.; August 18, 2008; 17 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.20.02; Copyright; Avail.: CASI: A03, Hardcopy

In this paper we describe flow-field measurements obtained in the wake of a full-span Hybrid Wing Body model with internally blown flaps. The test was performed at the NASA Langley 14 x 22 Foot Subsonic Tunnel at low speeds. Off-body measurements were obtained with a 7-hole probe rake survey system. Three model configurations were investigated. At 0deg angle of attack the surveys were completed with 0deg and 60deg flap deflections. At 10deg angle of attack the wake surveys were completed with a slat and a 60deg flap deflection. The 7-hole probe results further quantified two known swirling regions (downstream of the outboard flap edge and the inboard/outboard flap juncture) for the 60deg flap cases with blowing. Flow-field results and the general trends are very similar for the two blowing cases at nozzle pressure ratios of 1.37 and 1.56. High downwash velocities correlated with the enhanced lift for the 60deg flap cases with blowing. Jet-induced effects are the

largest at the most inboard station for all (three) velocity components due in part to the larger inboard slot height. The experimental data are being used to improve computational tools for high-lift wings with integrated powered-lift technologies. Author

Angle of Attack; Flow Distribution; Body-Wing Configurations; Externally Blown Flaps; Wakes; Powered Lift Aircraft

20080034482 NASA Langley Research Center, Hampton, VA, USA

NASA Langley's AirSTAR Testbed: A Subscale Flight Test Capability for Flight Dynamics and Control System Experiments

Jordan, Thomas L.; Bailey, Roger M.; August 18, 2008; 14 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 457280.02.07.07.08

Report No.(s): AIAA-2008-6660; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034482

As part of the Airborne Subscale Transport Aircraft Research (AirSTAR) project, NASA Langley Research Center (LaRC) has developed a subscaled flying testbed in order to conduct research experiments in support of the goals of NASA s Aviation Safety Program. This research capability consists of three distinct components. The first of these is the research aircraft, of which there are several in the AirSTAR stable. These aircraft range from a dynamically-scaled, twin turbine vehicle to a propeller driven, off-the-shelf airframe. Each of these airframes carves out its own niche in the research test program. All of the airplanes have sophisticated on-board data acquisition and actuation systems, recording, telemetering, processing, and/or receiving data from research control systems. The second piece of the testbed is the ground facilities, which encompass the hardware and software infrastructure necessary to provide comprehensive support services for conducting flight research using the subscale aircraft, including: subsystem development, integrated testing, remote piloting of the subscale aircraft, telemetry processing, experimental flight control law implementation and evaluation, flight simulation, data recording/archiving, and communications. The ground facilities are comprised of two major components: (1) The Base Research Station (BRS), a LaRC laboratory facility for system development, testing and data analysis, and (2) The Mobile Operations Station (MOS), a self-contained, motorized vehicle serving as a mobile research command/operations center, functionally equivalent to the BRS, capable of deployment to remote sites for supporting flight tests. The third piece of the testbed is the test facility itself. Research flights carried out by the AirSTAR team are conducted at NASA Wallops Flight Facility (WFF) on the Eastern Shore of Virginia. The UAV Island runway is a 50 x 1500 paved runway that lies within restricted airspace at Wallops Flight Facility. The facility provides all the necessary infrastructure to conduct the research flights in a safe and efficient manner. This paper gives a comprehensive overview of the development of the AirSTAR testbed.

Author

Transport Aircraft; Aircraft Control; Control Theory; Dynamic Control; Flight Safety; Flight Tests; Aerodynamics

20080034483 NASA Langley Research Center, Hampton, VA, USA

Experimental Investigation of the DLR-F6 Transport Configuration in the National Transonic Facility

Gatlin, Gregory M.; Rivers, Melissa B.; Goodliff, Scott L.; Rudnik, Ralf; Sitzmann, Martin; August 18, 2008; 22 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.20.03; Copyright; Avail.: CASI: A03, Hardcopy

An experimental aerodynamic investigation of the DLR (German Aerospace Center) F6 generic transport configuration has been conducted in the NASA NTF (National Transonic Facility) for CFD validation within the framework of the AIAA Drag Prediction Workshop. Force and moment, surface pressure, model deformation, and surface flow visualization data have been obtained at Reynolds numbers of both 3 million and 5 million. Flow-through nacelles and a side-of-body fairing were also investigated on this wing-body configuration. Reynolds number effects on trailing edge separation have been assessed, and the effectiveness of the side-of-body fairing in eliminating a known region of separated flow has been determined. Data obtained at a Reynolds number of 3 million are presented together for comparison with data from a previous wind tunnel investigation in the ONERA S2MA facility. New surface flow visualization capabilities have also been successfully explored and demonstrated in the NTF for the high pressure and moderately low temperature conditions required in this investigation. Images detailing wing surface flow characteristics are presented.

Author

Body-Wing Configurations; Trailing Edges; Separated Flow; Flow Visualization; Reynolds Number; Computational Fluid Dynamics; Flow Characteristics

20080034484 NASA Langley Research Center, Hampton, VA, USA

Advanced Unstructured Grid Generation for Complex Aerodynamic Applications

Pirzadeh, Shahyar Z.; August 18, 2008; 22 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.20.02; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034484

A new approach for distribution of grid points on the surface and in the volume has been developed and implemented in the NASA unstructured grid generation code VGRID. In addition to the point and line sources of prior work, the new approach utilizes surface and volume sources for automatic curvature-based grid sizing and convenient point distribution in the volume. A new exponential growth function produces smoother and more efficient grids and provides superior control over distribution of grid points in the field. All types of sources support anisotropic grid stretching which not only improves the grid economy but also provides more accurate solutions for certain aerodynamic applications. The new approach does not require a three-dimensional background grid as in the previous methods. Instead, it makes use of an efficient bounding-box auxiliary medium for storing grid parameters defined by surface sources. The new approach is less memory-intensive and more efficient computationally. The grids generated with the new method either eliminate the need for adaptive grid refinement for certain class of problems or provide high quality initial grids that would enhance the performance of many adaptation methods. Author

Unstructured Grids (Mathematics); Computational Grids; Point Sources; Grid Generation (Mathematics); Anisotropy; Aerodynamics

20080034488 NASA Langley Research Center, Hampton, VA, USA

Verification of a Constraint Force Equation Methodology for Modeling Multi-Body Stage Separation

Tarabini, Paul V.; Roithmayr, Carlos; Toniolo, Matthew D.; Karlgaard, Christopher; Pamadi, Bandu N.; August 18, 2008; 24 pp.; In English; AIAA Modeling and Simulation Technologies Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper discusses the verification of the Constraint Force Equation (CFE) methodology and its implementation in the Program to Optimize Simulated Trajectories II (POST2) for multibody separation problems using three specially designed test cases. The first test case involves two rigid bodies connected by a fixed joint; the second case involves two rigid bodies connected with a universal joint; and the third test case is that of Mach 7 separation of the Hyper-X vehicle. For the first two cases, the POST2/CFE solutions compared well with those obtained using industry standard benchmark codes, namely AUTOLEV and ADAMS. For the Hyper-X case, the POST2/CFE solutions were in reasonable agreement with the flight test data. The CFE implementation in POST2 facilitates the analysis and simulation of stage separation as an integral part of POST2 for seamless end-to-end simulations of launch vehicle trajectories. Author

Stage Separation; Trajectories; Flight Tests; Hypersonic Speed; Launch Vehicles

20080034652 NASA Langley Research Center, Hampton, VA, USA

Comparison of NTF Experimental Data with CFD Predictions from the Third AIAA CFD Drag Prediction Workshop

Vassberg, John C.; Tinoco, Edward N.; Mani, Mori; Levy, David; Zickuhr, Tom; Mavriplis, Dimitri J.; Wahls, Richard A.; Morrison, Joseph H.; Brodersen, Olaf P.; Eisfeld, Bernhard; Murayama, Mitsuhiro; August 18, 2008; 25 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 877868

Report No.(s): AIAA Paper 2008-6918; Copyright; Avail.: CASI: A03, Hardcopy

Recently acquired experimental data for the DLR-F6 wing-body transonic transport con figuration from the National Transonic Facility (NTF) are compared with the database of computational fluid dynamics (CFD) predictions generated for the Third AIAA CFD Drag Prediction Workshop (DPW-III). The NTF data were collected after the DPW-III, which was conducted with blind test cases. These data include both absolute drag levels and increments associated with this wing-body geometry. The baseline DLR-F6 wing-body geometry is also augmented with a side-of-body fairing which eliminates the flow separation in this juncture region. A comparison between computed and experimentally observed sizes of the side-of-body flow-separation bubble is included. The CFD results for the drag polars and separation bubble sizes are computed on grids which represent current engineering best practices for drag predictions. In addition to these data, a more rigorous attempt to predict absolute drag at the design point is provided. Here, a series of three grid densities are utilized to establish an asymptotic

trend of computed drag with respect to grid convergence. This trend is then extrapolated to estimate a grid-converged absolute drag level.
Author
Body-Wing Configurations; Boundary Layer Separation; Computational Fluid Dynamics; Computational Grids; Separated Flow; Fairings

20080034653 Boeing Co., Huntington Beach, CA, USA; NASA Langley Research Center, Hampton, VA, USA
Development of a Common Research Model for Applied CFD Validation Studies
Vassberg, John C.; Dehaan, Mark A.; Rivers, S. Melissa; Wahls, Richard A.; August 18, 2008; 22 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.07.20.03
Report No.(s): AIAA Paper 2008-6919; Copyright; Avail.: CASI: A03, Hardcopy

The development of a wing/body/nacelle/pylon/horizontal-tail configuration for a common research model is presented, with focus on the aerodynamic design of the wing. Here, a contemporary transonic supercritical wing design is developed with aerodynamic characteristics that are well behaved and of high performance for configurations with and without the nacelle/pylon group. The horizontal tail is robustly designed for dive Mach number conditions and is suitably sized for typical stability and control requirements. The fuselage is representative of a wide/body commercial transport aircraft; it includes a wing-body fairing, as well as a scrubbing seal for the horizontal tail. The nacelle is a single-cowl, high by-pass-ratio, flow-through design with an exit area sized to achieve a natural unforced mass-flow-ratio typical of commercial aircraft engines at cruise. The simplicity of this un-bifurcated nacelle geometry will facilitate grid generation efforts of subsequent CFD validation exercises. Detailed aerodynamic performance data has been generated for this model; however, this information is presented in such a manner as to not bias CFD predictions planned for the fourth AIAA CFD Drag Prediction Workshop, which incorporates this common research model into its blind test cases. The CFD results presented include wing pressure distributions with and without the nacelle/pylon, ML/D trend lines, and drag-divergence curves; the design point for the wing/body configuration is within 1% of its max-ML/D. Plans to test the common research model in the National Transonic Facility and the Ames 11-ft wind tunnels are also discussed.
Author
Body-Wing Configurations; Transport Aircraft; Supercritical Wings; Aerodynamic Configurations; Aircraft Design; Nacelles; Mass Flow; Computational Fluid Dynamics

20080034656 NASA Langley Research Center, Hampton, VA, USA
Aerodynamic Effects and Modeling of Damage to Transport Aircraft
Shah, Gautam H.; August 18, 2008; 13 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 457280.02.07.07.03
Report No.(s): AIAA-2008-6203; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034656

A wind tunnel investigation was conducted to measure the aerodynamic effects of damage to lifting and stability/control surfaces of a commercial transport aircraft configuration. The modeling of such effects is necessary for the development of flight control systems to recover aircraft from adverse, damage-related loss-of-control events, as well as for the estimation of aerodynamic characteristics from flight data under such conditions. Damage in the form of partial or total loss of area was applied to the wing, horizontal tail, and vertical tail. Aerodynamic stability and control implications of damage to each surface are presented, to aid in the identification of potential boundaries in recoverable stability or control degradation. The aerodynamic modeling issues raised by the wind tunnel results are discussed, particularly the additional modeling requirements necessitated by asymmetries due to damage, and the potential benefits of such expanded modeling.
Author
Aerodynamic Characteristics; Control Surfaces; Damage; Wind Tunnel Tests; Tail Assemblies; Stabilizers (Fluid Dynamics); Aerodynamic Stability; Flight Control

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.

20080032859 Department of Homeland Security, Washington, DC, USA
U.S. Customs and Borders Protection Guide for Private Flyers
Sep. 2007; 90 pp.; In English
Report No.(s): PB2008-100399; No Copyright; Avail.: CASI: A05, Hardcopy

The CBP Guide for Private Flyers is your guide; it's written for private and coporate pilots, whether you're on a business or pleasure flight, whether you're going to or arriving from foreign countries. It sets forth basic CBP requirements and provides information about airports where international arrivals are processed by CBP.
NTIS
Borders; Pilots (Personnel); Protection; Security

20080033128 NASA Langley Research Center, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA
Aircraft Loss-of-Control Accident Prevention: Switching Control of the GTM Aircraft with Elevator Jam Failures
Chang, Bor-Chin; Kwatny, Harry G.; Belcastro, Christine; Belcastro, Celeste; August 18, 2008; 15 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 457280; Copyright; Avail.: CASI: A03, Hardcopy

Switching control, servomechanism, and H2 control theory are used to provide a practical and easy-to-implement solution for the actuator jam problem. A jammed actuator not only causes a reduction of control authority, but also creates a persistent disturbance with uncertain amplitude. The longitudinal dynamics model of the NASA GTM UAV is employed to demonstrate that a single fixed reconfigured controller design based on the proposed approach is capable of accommodating an elevator jam failure with arbitrary jam position as long as the thrust control has enough control authority. This paper is a first step towards solving a more comprehensive in-flight loss-of-control accident prevention problem that involves multiple actuator failures, structure damages, unanticipated faults, and nonlinear upset regime recovery, etc.
Author
Aircraft Control; Switching; Thrust Control; Servomechanisms; Actuators; Accident Prevention; Controllers

20080033130 NASA Langley Research Center, Hampton, VA, USA
Trajectory Planning by Preserving Flexibility: Metrics and Analysis
Idris, Husni R.; El-Wakil, Tarek; Wing, David J.; August 18, 2008; 14 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNA07BA86C; WBS 411931.02.11.07.01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033130

In order to support traffic management functions, such as mitigating traffic complexity, ground and airborne systems may benefit from preserving or optimizing trajectory flexibility. To help support this hypothesis trajectory flexibility metrics have been defined in previous work to represent the trajectory robustness and adaptability to the risk of violating safety and traffic management constraints. In this paper these metrics are instantiated in the case of planning a trajectory with the heading degree of freedom. A metric estimation method is presented based on simplifying assumptions, namely discrete time and heading maneuvers. A case is analyzed to demonstrate the estimation method and its use in trajectory planning in a situation involving meeting a time constraint and avoiding loss of separation with nearby traffic. The case involves comparing path-stretch trajectories, in terms of adaptability and robustness along each, deduced from a map of estimated flexibility metrics over the solution space. The case demonstrated anecdotally that preserving flexibility may result in enhancing certain factors that contribute to traffic complexity, namely reducing proximity and confrontation.
Author
Trajectory Planning; Air Traffic; Air Transportation; Flexibility

20080033239 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Simulation Modeling and Analysis of F-16 Pilot Training Squadron

Okal, Adem; Mar 2008; 96 pp.; In English

Report No.(s): AD-A480438; AFIT/GOR/ENS/08-15; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA480438

The need for fighter pilots in the Turkish Air Force is expected to increase with the planned acquisition of Joint Strike Fighters, ongoing new F-16 purchases, and other upgrades to the Turkish Air Force fighter inventory. This increased demand will affect the current fighter training squadron curriculum and scheduling. This study focuses on issues related to 143rd Oncel squadron F-16 Pilot Training with this projected increase in number of student pilots (SPs). Completing the training periods on time is an important issue along with maintaining effective training performance. In our study, the Total Time of the training period serves as our primary performance measure. Simulation modeling concepts are applied to examine the training period based on the squadron syllabus. After constructing a simulation model using Arena, Design of Experiment, Regression Analysis and Metamodeling are implemented to capture the effects of the major factors, including SP, Instructor Pilot, Bandit and F-16, aircraft availability and how they interact with each other. The utilization of IPs and Bandits is also examined as a performance measure. In addition, a sensitivity analysis is conducted using the model with the current 143rd Oncel squadron resources.

DTIC

Education; F-16 Aircraft; Flight Simulation; Pilot Training; Pilots; Simulation

20080033421 Library of Congress, Washington, DC USA

Securing General Aviation

Elias, Bart; Jan 24, 2008; 58 pp.; In English

Report No.(s): AD-A480734; CRS-RL33194; No Copyright; Avail.: Defense Technical Information Center (DTIC)

General aviation (GA) - a catch-all category that includes about 54% of all civilian aviation activity within the USA encompasses a wide range of airports, aircraft, and flight operations. Because GA plays a small but important role in the U.S. economy, improving upon GA security without unduly impeding air commerce or limiting the freedom of movement by air remains a significant challenge. However, policymakers have received mixed signals about the relative security risk posed by GA, due to its diversity and a general lack of detailed information regarding the threat and vulnerability of various GA operations. While some recent high-profile breaches of GA security point to persisting vulnerabilities and limited intelligence information suggest a continued terrorist interest in using GA aircraft, it is evident that GA airports, aircraft, and operations vary considerably with regard to security risk. While the small size and slow speed of most GA aircraft significantly limit the risk they pose, some experts still fear that they could be used as a platform for a chemical, biological, radiological, or nuclear attack. Certain sectors of GA, such as crop dusters and larger business aircraft, present more specific risks because of their unique capabilities and aircraft characteristics.

DTIC

Civil Aviation; General Aviation Aircraft; Security

20080033697 NASA Langley Research Center, Hampton, VA, USA

Transport Aircraft System Identification from Wind Tunnel Data

Murphy, Patrick C.; Klein, Vladislav; August 18, 2008; 14 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 457280; Copyright; Avail.: CASI: A03, Hardcopy

Recent studies have been undertaken to investigate and develop aerodynamic models that predict aircraft response in nonlinear unsteady flight regimes for transport configurations. The models retain conventional static and rotary dynamic terms but replace conventional acceleration terms with more general indicial functions. In the Integrated Resilient Aircraft Controls project of the NASA Aviation Safety Program one aspect of the research is to apply these current developments to transport configurations to facilitate development of advanced controls technology. This paper describes initial application of a more general modeling methodology to the NASA Langley Generic Transport Model, a sub-scale flight test vehicle.

Author

Aircraft Safety; Transport Aircraft; Flight Test Vehicles; Flight Safety; Aerodynamic Characteristics; System Identification

20080033888 Forest Service, Washington, DC, USA
Fire and Aviation Management Fiscal Year 2006 in Review
Jul. 2007; 40 pp.; In English
Report No.(s): PB2008-101278; USFS/FS-885; No Copyright; Avail.: National Technical Information Service (NTIS)

The Fire and Aviation Management (FAM) Staff resides within the State & Private Forestry (S&PF) deputy area. The programs primary areas of responsibility include fire operations, hazardous fuel reduction, aviation, national fire plan, partnerships, and planning and budget. In fiscal year (FY) 2006 the program leadership and their staff were responsible and accountable for an appropriated budget of approximately $660 million for preparedness, $690 million for suppression, $280 million for hazardous fuels reduction, and $54 million for community assistance programs.

NTIS
Fires; Forest Management; Fuels

20080034450 General Accounting Office, Washington, DC USA
Defense Transportation: DOD Should Ensure that the Final Size and Mix of Airlift Force Study Plan Includes Sufficient Detail to Meet the Terms of the Law and Inform Decision Makers
Apr 28, 2008; 10 pp.; In English
Report No.(s): AD-A480307; GAO-08-704R; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480307

Global mobility is a key component of U.S. national security. Since the end of the Cold War, senior decision makers have relied upon Department of Defense (DOD) mobility studies to provide insights they need to build and maintain the right mix of mobility capabilities. The most recent study, the Mobility Capabilities Study, identified the mobility support needed for the full range of strategic operations in the context of the September 11, 2001 attacks, the global war on terror, and DOD's evolving global defense posture, all in support of the National Military Strategy. According to DOD officials, the department plans to issue the next mobility study -- the Mobility Capabilities Requirements Study -- in the spring of 2009. The 2005 mobility study also assessed requirements for two overlapping war fights, DOD support to homeland defense, civil support, lesser contingency operations sustainment of forward-deployed forces and national strategic missions. In accomplishing these missions, DOD depends on its airlift force.

DTIC
Decision Making; Defense Program; Military Operations; Deployment; Strategy

20080034571 Lawrence Livermore National Lab., Livermore, CA USA
Summary Document. Restoration Plan for Major Airports after a Bioterrorist Attack
Raber, E.; Jan. 12, 2007; 15 pp.; In English
Report No.(s): DE2007-914613; UCRL-TR-227254; No Copyright; Avail.: Department of Energy Information Bridge

This document provides general guidelines for developing a Restoration Plan for a major airport following release of a biological warfare agent. San Francisco International Airport was selected as the example airport during development of the Plan to illustrate specific details. The sporeforming bacterium Bacillus anthracis was selected as the biological agent of primary concern because it is the most difficult of known bioterrorism agents to inactivate and is considered to be one of the agents most likely to be used as a biological weapon. The focus of the Plan is on activities associated with the Characterization, Remediation, and Clearance Phases that are defined herein. Activities associated with the Notification and First-Response Phases are briefly discussed in Appendixes A and B, respectively. In addition to the main text of this Plan and associated appendixes, a data supplement was developed specifically for San Francisco International Airport. Requests for the data supplement must be made directly to the Emergency Planning Operations Division of San Francisco International Airport. This document does not describe public health responses to release of a biological warfare agent. If laboratory analytical results confirm the presence of a biological agent, the responsible public health agency involved in the response will commence appropriate public health actions, such as treatment (CDC 2004) and decontamination of potentially contaminated individuals, distribution of prophylaxis, and medical examinations.

NTIS
Airports; Restoration

20080034651 NASA Langley Research Center, Hampton, VA, USA

A Simulation Testbed for Airborne Merging and Spacing

Santos, Michel; Manikonda, Vikram; Feinberg, Art; Lohr, Gary; August 18, 2008; 20 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 305295.02.07.07.20; Copyright; Avail.: CASI: A03, Hardcopy

The key innovation in this effort is the development of a simulation testbed for airborne merging and spacing (AM&S). We focus on concepts related to airports with Super Dense Operations where new airport runway configurations (e.g. parallel runways), sequencing, merging, and spacing are some of the concepts considered. We focus on modeling and simulating a complementary airborne and ground system for AM&S to increase efficiency and capacity of these high density terminal areas. From a ground systems perspective, a scheduling decision support tool generates arrival sequences and spacing requirements that are fed to the AM&S system operating on the flight deck. We enhanced NASA's Airspace Concept Evaluation Systems (ACES) software to model and simulate AM&S concepts and algorithms.

Author

Airspace; Sequencing; Computer Systems Programs; Spacing; Scheduling

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.

20080033672 NASA Langley Research Center, Hampton, VA, USA

Radio Frequency Compatibility of an RFID Tag on Glideslope Navigation Receivers

Nguyen, Truong X.; Mielnik, John J.; August 18, 2008; 6 pp.; In English; 2008 IEEE EMC Symposium, 18-22 Aug. 2008, Detroit, MI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 645846.02.07.07; Copyright; Avail.: CASI: A02, Hardcopy

A process is demonstrated to show compatibility between a radio frequency identification (RFID) tag and an aircraft glideslope (GS) radio receiver. The particular tag chosen was previously shown to have significant peak spurious emission levels that far exceeded the emission limits in the GS aeronautical band. The spurious emissions are emulated in the study by capturing the RFID fundamental transmission and playing back the signal in the GS band. The signal capturing and playback are achieved with a vector signal generator and a spectrum analyzer that can output the in-phase and quadrature components (IQ). The simulated interference signal is combined with a desired GS signal before being injected into a GS receiver s antenna port for interference threshold determination. Minimum desired propagation loss values to avoid interference are then computed and compared against actual propagation losses for several aircraft.

Author

Radio Frequencies; Radio Receivers; Signal Generators; Exhaust Emission; Spectrum Analysis; Navigation

20080034491 NASA Langley Research Center, Hampton, VA, USA

The Role of Trust and Interaction in Global Positioning System Related Accidents

Johnson, Chris W.; Shea, Christine; Holloway, C. Michael; August 25, 2008; 11 pp.; In English; 26th International System Safety Conference, 25-29 Aug. 2008, Vancouver, BC, Canada

Contract(s)/Grant(s): WBS 457280.02.07.07.08; Copyright; Avail.: CASI: A03, Hardcopy

The Global Positioning System (GPS) uses a network of satellites to calculate the position of a receiver over time. This technology has revolutionized a wide range of safety-critical industries and leisure applications. These systems provide diverse benefits; supplementing the users existing navigation skills and reducing the uncertainty that often characterizes many route planning tasks. GPS applications can also help to reduce workload by automating tasks that would otherwise require finite cognitive and perceptual resources. However, the operation of these systems has been identified as a contributory factor in a range of recent accidents. Users often come to rely on GPS applications and, therefore, fail to notice when they develop faults or when errors occur in the other systems that use the data from these systems. Further accidents can stem from the over confidence that arises when users assume automated warnings will be issued when they stray from an intended route. Unless greater attention is paid to the role of trust and interaction in GPS applications then there is a danger that we will see an

increasing number of these failures as positioning technologies become integral in the functioning of increasing numbers of applications.
Author
Global Positioning System; Navigation; Errors; Failure; Accidents

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.

20080033124 NASA Langley Research Center, Hampton, VA, USA
Direct Adaptive Control of Systems with Actuator Failures: State of the Art and Continuing Challenges
Tao, Gang; Joshi, Suresh M.; August 18, 2008; 23 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA
Contract(s)/Grant(s): NNX08AB99A; NSF ECS0601475; WBS 457280; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033124

In this paper, the problem of controlling systems with failures and faults is introduced, and an overview of recent work on direct adaptive control for compensation of uncertain actuator failures is presented. Actuator failures may be characterized by some unknown system inputs being stuck at some unknown (fixed or varying) values at unknown time instants, that cannot be influenced by the control signals. The key task of adaptive compensation is to design the control signals in such a manner that the remaining actuators can automatically and seamlessly take over for the failed ones, and achieve desired stability and asymptotic tracking. A certain degree of redundancy is necessary to accomplish failure compensation. The objective of adaptive control design is to effectively use the available actuation redundancy to handle failures without the knowledge of the failure patterns, parameters, and time of occurrence. This is a challenging problem because failures introduce large uncertainties in the dynamic structure of the system, in addition to parametric uncertainties and unknown disturbances. The paper addresses some theoretical issues in adaptive actuator failure compensation: actuator failure modeling, redundant actuation requirements, plant-model matching, error system dynamics, adaptation laws, and stability, tracking, and performance analysis. Adaptive control designs can be shown to effectively handle uncertain actuator failures without explicit failure detection. Some open technical challenges and research problems in this important research area are discussed.
Author
Adaptive Control; Systems Engineering; Actuators; System Failures; Control Systems Design; Aircraft Control

20080033292 Naval Research Lab., Washington, DC USA
Anytime Coevolution of Form and Function
Bugajska, Magdalena D; Schultz, Alan C; Jan 2003; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MIPR-N0001403WR20212; MIPR-N0001403WR20057
Report No.(s): AD-A480609; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480609

This paper describes an approach to continuous coevolution of form (the morphology) and function (the control behavior) for autonomous vehicles. This study focuses on coevolution of the characteristics such as beam width and range of individual sensors in the sensor suite, and the reactive strategies for collision-free navigation for an autonomous micro air vehicle. The results of the evolution of the system in a fixed simulation model were compared to case-based anytime learning (also called continuous and embedded learning) where the simulation model was updated over time to better match changes in the environment.
DTIC
Autonomous Navigation; Autonomy; Detectors; Drone Vehicles; Machine Learning; Morphology

20080033310 Naval Research Lab., Washington, DC USA
Coevolution of Form and Function in the Design of Micro Air Vehicles
Bugajska, Magdalena D; Schultz, Alan C; Jan 2002; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N0001402ZWX30005
Report No.(s): AD-A480642; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480642

This paper discusses approaches to cooperative coevolution of form and function for autonomous vehicles, specifically

evolving morphology and control for an autonomous micro air vehicle (MAV). The evolution of a sensor suite with minimal size, weight, and power requirements, and reactive strategies for collision-free navigation for the simulated MAV is described. Results are presented for several different coevolutionary approaches to evolution of form and function (single- and multiple-species models) and for two different control architectures (a rulebase controller based on the SAMUEL learning system and a neural network controller implemented and evolved using ECkit).
DTIC
Drone Vehicles; Microinstrumentation; Microminiaturization; Sensors

20080033311 Naval Research Lab., Washington, DC USA
Co-Evolution of Form and Function in the Design of Autonomous Agents: Micro Air Vehicle Project
Bugajska, Magdalena D; Schultz, Alan C; Jul 8, 2000; 6 pp.; In English
Report No.(s): AD-A480643; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480643

This paper addresses issues of co-evolution of form and function for autonomous vehicles specifically evolving morphology and control for an autonomous micro air vehicle (MAV). The evolution of an optimal minimum sensor suite and reactive strategies for navigation and collision avoidance for the simulated MAV is described. The details of the implementation of the simulated aircraft, the environment, and the two cooperating genetic algorithm-based systems, SAMUEL and Genesis, used for evolution, are presented, as are preliminary results.
DTIC
Autonomous Navigation; Autonomy; Drone Vehicles; Microinstrumentation; Microminiaturization; Sensors

20080033406 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Analyzing Carbohydrate-Based Regenerative Fuel Cells as a Power Source for Unmanned Aerial Vehicles
Wojnar, Olek; Mar 2008; 62 pp.; In English
Report No.(s): AD-A480693; AFIT/GAE/ENY/08-M31; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Based on current capabilities, we examine the feasibility of creating a carbohydrate-based regenerative fuel cell (CRFC) as the primary power source for unmanned aerial vehicles (UAV) for long endurance missions where station keeping is required. A CRFC power system is based on a closed-loop construct where carbohydrates are generated from zooxanthellae, algae that create excess carbohydrates during photosynthesis. The carbohydrates are then fed to a carbohydrate fuel cell where electric power is generated for the UAV's propulsion, flight control, payload, and accessory systems. The waste products from the fuel cell are used by the zooxanthellae to create more carbohydrates, therefore mass is conserved in the process of power generation. The overall goal of this research is to determine if CRFCs should be explored further as a viable power source. Through simulations, a UAV is sized to determine if greater than 24 hour endurance flight is possible and these results are compared to UAVs using more traditional photocell based power systems. The initial results suggest that more research should be done in the development of CRFCs as a power system for long endurance UAVs. The final outcome of this research is to identify the most important areas for more detailed follow-on work in designing a production-ready CRFC power system for long endurance UAVs.
DTIC
Carbohydrates; Drone Vehicles; Fuel Cells; Glucose; Photosynthesis; Pilotless Aircraft; Regenerative Fuel Cells; Surveillance

20080033474 Space and Naval Warfare Systems Center, San Diego, CA USA
Preliminary Design and Prototyping Results of an Encapsulated Underwater Launch System for Micro Unmanned Aerial Vehicles (UAVs)
Buescher, James; Mailey, Chris; Stenson, Ryan; Sura, Daniel; Feb 2008; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480879; No Copyright; Avail.: Defense Technical Information Center (DTIC)

After a brief overview of the Space and Naval Warfare (SPAWAR) System Center in San Diego, the briefing goes on to discuss Waterworks. Waterworks is a new innovations cell at SPAWAR designed to react rapidly to warfighter needs. The team has demonstrated its capabilities by designing and building a prototype underwater launch system for unmanned aerial vehicles.
DTIC
Drone Vehicles; Launching; Pilotless Aircraft; Prototypes

20080033497 Flying Training Wing (0047th), Laughlin AFB, TX USA
Iraq and the AC-130 Gunships Unleashed
Seifert, Robert J; Jan 2007; 7 pp.; In English
Report No.(s): AD-A480950; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this paper is to save American lives and improve the chances of a successful outcome in Iraq. Costly and demoralizing attacks continue unabated against coalition and Iraqi ground forces. Working hard to support these forces are AC-130 gunships and crews. They fly every night in Iraq but rarely identify a single insurgent due to the inefficient manner in which they are requested by the Army and employed by the Air Force. This article shows how a simple yet fundamental change in AC 130 employment can kill or capture more insurgents, save friendly lives, and improve prospects for coalition success. The author argues that instead of patrolling assigned cover for specific ground forces, the AC-130 crews should be allowed to actively search for insurgent activity and respond accordingly.
DTIC
Alternating Current; Iraq; Support Systems

20080033544 Ervin (Michael A.), Austin, TX, USA
Distributed Mode System for Real Time Acoustic Emission Monitoring
Austin, R. K., Inventor; Coughlin, C., Inventor; 4 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): N00421-99-C-156; W31P4Q-04-C-R041
Patent Info.: Filed Filed 4 Jun 04; US-Patent-Appl-SN-10-862 096
Report No.(s): PB2008-100675; No Copyright; Avail.: CASI: A03, Hardcopy

A distributed real time health monitoring system is described for monitoring of acoustic emission signals from different regions of a structure such as aircraft or spacecraft structures. The health monitoring system has its analysis and prognosis intelligence distributed out to the local regions being monitored and therefore does not require extensive cabling systems to carry the high bandwidth information characteristic of acoustic emission.
NTIS
Acoustic Emission; Patent Applications; Prognosis; Real Time Operation

20080033605 Army Research Lab., Adelphi, MD USA
Lensless Synthetic Aperture Chirped Amplitude-Modulated Laser Radar for Microsystems
Stann, Barry; Jian, Pey-Schuan; Apr 2008; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480683; ARL-TN-308; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480683

Future micro unmanned aerial vehicles and micro unmanned ground vehicles will require compact, low-cost, and low-power sensors for forming world maps of their surroundings for navigation and obstacle avoidance. These same sensors may also acquire, identify, and locate targets. This study examines an extremely simple laser radar design from a hardware standpoint that will form three-dimensional images of its surroundings while meeting the desired aforementioned attributes of a sensor for microsystems.
DTIC
Collision Avoidance; Detection; Detectors; Lasers; Optical Radar; Rangefinding; Synthetic Aperture Radar; Synthetic Apertures; Target Acquisition

20080033741 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Robust Aircraft Squadron Scheduling in the Face of Absenteeism
Gokcen, Osman B; Mar 2008; 123 pp.; In English
Report No.(s): AD-A480282; AFIT/GOR/ENS/08-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480282

Air Force fighter aircraft squadrons the world over share a unique problem. Each requires complex training schedules coupling aircraft to pilots, the duo to missions and airspaces, and then the entire combination to a feasible time slot. Creating daily and weekly flight schedules that include shifts around the clock every day of the year with a set number of pilots is a time consuming job for manual schedulers within a squadron. If one or more pilots are unable to perform their previously assigned tasks, due to sickness or aircraft failure, those tasks must be performed by previously not scheduled pilots. These changes can not conflict with the rules of Air Force regulations, squadron policy, the squadron commander, operations officer or flight training officer's direction. Given these constraints, the goal of a new re-rostered schedule, in the event of

absenteeism, should be to affect the previous schedule as little as possible. This research will develop a weekly flight schedule. The goal of this reformulated schedule is robustness to absenteeism. In order to find a robust schedule, a comparison will be done to select the most robust schedule from among 17 candidate schedules. The expected values for the number of changes for each schedule are compared, and a general conclusion will be provided using a new objective function to create a model that yields a robust schedule on the first attempt.
DTIC
Fighter Aircraft; Pilots; Scheduling

20080033764 Naval Research Lab., Washington, DC USA
Building Adaptive Computer-Generated Forces: The Effect of Increasing Task Reactivity on Human and Machine Control Abilities
Bugajska, Magdalena D; Schultz, Alan C; Trafton, J G; Gittens, Shaun; Mintz, Farilee; Jan 2001; 7 pp.; In English
Report No.(s): AD-A480550; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480550

Computer Generated Forces (CGF), to be effective training tools, must exhibit robust, challenging, and realistic behaviors. CGF tasks usually have both cognitive and reactive aspects to them. The reactivity has to co-exist with (higher-level) cognitive activities like planning and strategy assessment. The overall purpose of this research is to merge a machine-learning algorithm (SAMUEL, an evolutionary algorithm-based rule learning system) with a cognitive model (ACT-R) into a system where the learning algorithm handles the reactive aspects of the task and provides an adaptation mechanism, and where the behavior's realism is constrained by the cognitive model. Such a system would learn through experience and would be able to adapt to changes in adversaries' strategies and capabilities to present human opponents with more exciting, varied, yet realistic training situations. This preliminary work presents an initial examination of the effects of the changes in task reactivity on human and SAMUEL control abilities.
DTIC
Cognition; Computerized Simulation; Drone Vehicles; Machine Learning; Manual Control; Reactivity; Remote Control

20080033780 Aeronautical Systems Center, Wright-Patterson AFB, OH USA
Hydrema Mine Area Clearance Equipment Vehicle Validation Load Approval
Simpson, Douglas D; Feb 2008; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-Q240
Report No.(s): AD-A480472; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480472

This memorandum validates the results of the C-130 ramp test for the Hydrema Mine Clearing Vehicle. The objective was to determine if the Hydrema met the C-130 air transportable requirements. This memorandum provides loading and off-loading procedures for the MACE on a C-130 and gives validation load approval.
DTIC
Air Cargo; Clearances; Loads (Forces)

20080033788 Army Tank-Automotive Command, Warren, MI, USA
C-130 Ramp Test 3 of a Hydrema Mine Clearing Vehicle
Meldrum, William R; Feb 2008; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-GOVT
Report No.(s): AD-A480425; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480425

This report presents the results of a third C-130 ramp test for the Hydrema Mine Clearing Vehicle. The test was conducted using a reconfigurable mock C-130 ramp. The objective was to determine if the Hydrema met the C-130 air transportable axle load limitations of 13,000 lbs per axle. Sixteen channels of instrumentation were recorded to determine the weight of the vehicle as it traversed up the test ramp and onto the floor of the plane.
DTIC
Air Transportation; Clearances

20080033829 Fritz (Shimokaji I.), LLP, Newport Beach, CA, USA
Installation Tool for Aerospace Fastening System
Jensen, D. G., Inventor; Pett, D. M., Inventor; Buehler, P., Inventor; 20 Jan 04; 24 pp.; In English
Contract(s)/Grant(s): AF-F33657-91-C-0006
Patent Info.: Filed Filed 20 Jan 04; US-Patent-Appl-SN-10-762 084
Report No.(s): PB2008-100662; No Copyright; Avail.: CASI: A03, Hardcopy

A system, for installation of fastening systems to a structure, includes a fastening system installation specification, which includes dimensional and qualitative requirements for components of the fastening systems; and a tool. The tool includes an outer housing having an interior hollow, a gage surface, and a base surface, the base surface having a contact area that contacts the surface of the structure. An inner plug disposed within the interior hollow translates axially within the interior hollow. The inner plug has a sensing end that contacts a bolt of the fastening system and references the shank section of the bolt. The inner plug has an indicator end dimensioned to accept washers and nuts of the fastening system stacked on the gage surface. The inner plug has an indicator that provides installation information, according to either qualitative or dimensional requirements, about the components of the fastening system being installed using the tool.
NTIS
Aerospace Systems; Fasteners; Patent Applications

20080034447 Library of Congress, Washington, DC USA
Air Force Air Refueling: The KC-X Aircraft Acquisition Program
Knight, William; Bolkcom, Christopher; Apr 4, 2008; 54 pp.; In English
Report No.(s): AD-A480721; No Copyright; Avail.: Defense Technical Information Center (DTIC)

KC-X is the first of three planned programs intended to recapitalize the Air Force's air refueling fleet. Eventually, the KC-X program is expected to acquire 179 new, commercial off-the-shelf airliners modified to accomplish air refueling. The program is expected to cost approximately $35 billion. Both Boeing and a consortium consisting of Northrop Grumman and European Aeronautic Defense and Space Company (EADS) the parent company of Airbus were in competition for KC-X. Boeing offered a variant of the 767-200, while Northrop Grumman submitted a version of the Airbus 330-200. On February 29, 2008, the Air Force awarded the KC-X contract to Northrop Grumman. The initial $12.1 billion KC-X contract provides for the purchase the first 68 KC-45s of the anticipated 179 aircraft. On March 11, 2008, Boeing protested the Air Force's decision to the Government Accountability Office (GAO). GAO has 100 days to evaluate the protest.
DTIC
Tanker Aircraft; Air to Air Refueling

20080034455 Aeronautical Systems Center, Wright-Patterson AFB, OH USA
Final Report for the C-130 Ramp Test 2 of a Hydrema Mine Clearing Vehicle
Meldrum, William R; Oct 2007; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-Q240
Report No.(s): AD-A480775; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents the results of the follow-on C-130 ramp test for the Hydrema Mine Clearing Vehicle. The test was conducted using a reconfigurable mock C-130 ramp. The objective was to determine if the Hydrema met the C-130 air transportable axle load limitations of 13,000 lbs per axle. Sixteen channels of instrumentation were recorded to determine the weight of the vehicle as it traversed up the test ramp and onto the floor of the plane.
DTIC
Transport Aircraft; Floors; Weight

20080034476 NASA Langley Research Center, Hampton, VA, USA
Real-Time Dynamic Modeling - Data Information Requirements and Flight Test Results
Morelli, Eugene A.; Smith, Mark S.; August 18, 2008; 22 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 457280; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034476

Practical aspects of identifying dynamic models for aircraft in real time were studied. Topics include formulation of an equation-error method in the frequency domain to estimate non-dimensional stability and control derivatives in real time, data information content for accurate modeling results, and data information management techniques such as data forgetting,

incorporating prior information, and optimized excitation. Real-time dynamic modeling was applied to simulation data and flight test data from a modified F-15B fighter aircraft, and to operational flight data from a subscale jet transport aircraft. Estimated parameter standard errors and comparisons with results from a batch output-error method in the time domain were used to demonstrate the accuracy of the identified real-time models.
Author
Aircraft Models; Dynamic Models; Real Time Operation; Stability Derivatives; Flight Simulation; Flight Tests; Transport Aircraft

20080034644 NASA Dryden Flight Research Center, Edwards, CA, USA; Jet Propulsion Lab., USA
UAVSAR G-III Precision Autopilot Overview and Results
Lin, Victor; Strovers, Brian; Lee, James; Beck, Roger; February 08, 2008; 24 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation gives a general overview of the Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) G-III precision autopilot.
CASI
Automatic Pilots; General Overviews; Synthetic Aperture Radar; Flight Tests

20080034655 NASA Langley Research Center, Hampton, VA, USA
Overview of the Phoenix Entry, Descent and Landing System Architecture
Grover, Myron R., III; Cichy, Benjamin D.; Desai, Prasun N.; August 18, 2008; 10 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 599489.02.07.07.04.06
Report No.(s): AIAA Paper No 2008-7218; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034655

NASA s Phoenix Mars Lander began its journey to Mars from Cape Canaveral, Florida in August 2007, but its journey to the launch pad began many years earlier in 1997 as NASA s Mars Surveyor Program 2001 Lander. In the intervening years, the entry, descent and landing (EDL) system architecture went through a series of changes, resulting in the system flown to the surface of Mars on May 25th, 2008. Some changes, such as entry velocity and landing site elevation, were the result of differences in mission design. Other changes, including the removal of hypersonic guidance, the reformulation of the parachute deployment algorithm, and the addition of the backshell avoidance maneuver, were driven by constant efforts to augment system robustness. An overview of the Phoenix EDL system architecture is presented along with rationales driving these architectural changes.
Author
Descent; Phoenix Mars Lander; Mission Planning; Mars Surveyor 2001 Mission; Mars Surface; Landing Sites

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.

20080033978 NASA Dryden Flight Research Center, Edwards, CA, USA
The X-43A Flush Airdata Sensing System Flight Test Results
Baumann, Ethan; Pahle, Joseph W.; Davis, Mark; White, John Terry; August 18, 2008; 25 pp.; In English; AIAA Atmospheric Flight Mechanics Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2008-6570; Copyright; Avail.: CASI: A03, Hardcopy

The National Aeronautics and Space Administration (NASA) has flight-tested a flush airdata sensing (FADS) system on the Hyper-X Research Vehicle (X-43A) at hypersonic speeds during the course of two successful flights. For this series of tests, the FADS system was calibrated to operate between Mach 3 and Mach 8, and flight test data was collected between Mach 1 and Mach 10. The FADS system acquired pressure data from surface-mounted ports and generated a real-time angle-of-attack (alpha) estimate on board the X-43A. The collected data were primarily intended to evaluate the FADS system performance, and the estimated alpha was used by the flight control algorithms on the X-43A for only a portion of the first successful flight.

This paper provides an overview of the FADS system and alpha estimation algorithms, presents the in-flight alpha estimation algorithm performance, and provides comparisons to wind tunnel results and theory. Results indicate that the FADS system adequately estimated the alpha of the vehicle during the hypersonic portions of the two flights.
Author
Flight Tests; Angle of Attack; Flight Control; Research Vehicles; NASA Programs; Calibrating; Real Time Operation; Hypersonic Speed

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.

20080032751 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Theoretical and Experimental Analysis of the Ramjet Performance using Polybutadiene as Solid Fuel
Moura, Gabriela Silva; January 2008; 156 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15172-TDI/1289; Copyright; Avail.: CASI: C01, CD-ROM: A08, Hardcopy

Solid fuel ramjets (SFR's) constitute an important subject in the current stage of propulsion research. These systems can incorporate the high performance achieved by conventional liquid fuel ramjets to the simplicity of solid fuel motors, leading to significant advantages related to fabrication and operation costs. A ramjet is an air-breathing propulsion device. As it flies at a certain speed and altitude, the air captured from the atmosphere is heated and compressed as it passes through the shock wave established in the air intake entrance section. Air pressure is additionally increased as it traverses the diffusion zone of the engine and, in the combustion section, this hot, high-pressure air stream is put in contact with some fuel, that can be liquid or solid. The resulting combustion gases are then expanded in a nozzle to produce thrust. The operational conditions during supersonic flights were emulated by the use of a vitiated air generator, connected-pipe type. Hydroxyl terminated polybutadiene is the fuel used in this research. It is the most commonly used binder for composite propellants. Its combustion properties are a matter of great interest in propulsion field. The ramjet combustion conditions allow the study of these properties, providing a means to evaluate its linear regression rate, a procedure which is otherwise hard to perform. The following steps were followed: review of HTPB physical and chemical characteristics; theoretical analysis of HTPB combustion using mathematical models and computational codes; theoretical analysis of the ramjet performance when using HTPB as fuel; definition of the system dimensions (grain case, nozzles throats and area ratios, and chambers) for use with HTPB; rebuild and updating of the existing vitiated air generator/ramjet engine set; determination of the best formula for the fuel (polymer + cure agent) as far as mechanical and propulsive properties are concerned; analysis of an intermediate mixture chamber and an extended recirculation zone influences on the system performance, and, comparison between theoretical and experimental results.
Author
Ramjet Engines; Solid Propellants; Polybutadiene; Chemical Properties; Physical Properties; Combustion; Computational Fluid Dynamics; Engine Tests; Aircraft Performance; Propulsion System Performance; Aeronautical Engineering

20080032801 Teasdale (Patrick W.), Saint Louis, MO, USA
Methods and Apparatus for Assessing Gas Turbine Engine Damage
Wiseman, M. W., Inventor; 30 Sep 04; 11 pp.; In English
Patent Info.: Filed Filed 30 Sep 04; US-Patent-Appl-SN-10-955 551
Report No.(s): PB2008-100099; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus for assessing damage to machine components is provided. The method includes calculating an expected parameter value based on a first parameter value indicator, calculating an estimate of an actual parameter value based on a second parameter value indicator, the second parameter value indicator being different than the first parameter value indicator, determining if the calculated expected parameter value is different than the calculated estimate of the actual parameter value by a predefined limit, and generating a damage flag based on a result of the comparison. The apparatus includes a computing device including a processor and a memory communicatively coupled to the processor, the processor

programmed to execute a software product code segment that includes a detection boundary module, an estimator, and a comparator wherein the computing device is programmed to assess damage within an engine.
NTIS
Damage; Damage Assessment; Gas Turbine Engines; Patent Applications

20080032893 McDermott Will and Emery, LLC, Los Angeles, CA, USA
Onboard Supplemental Power System at Varying High Altitudes (PAT-APPL-10-896 309)
Epstein, S. W., Inventor; 21 Jul 04; 12 pp.; In English
Contract(s)/Grant(s): F33615-03-2367
Patent Info.: Filed Filed 21 Jul 04; US-Patent-Appl-SN-10-896 309
Report No.(s): PB2008-100609; No Copyright; Avail.: CASI: A03, Hardcopy

Systems and methods for supplementing a power system to achieve consistent operation at varying altitudes are disclosed herein. A hybrid power system comprising a single power source driving multiple generators may implement a power recovery turbine to drive a supercharger compressor, which may provide compressed air at increased altitudes. The supplemental power system disclosed herein provides necessary shaft horsepower at high altitudes to drive a generator and produce cooling air.
NTIS
Gas Turbine Engines; High Altitude; Electric Generators; Aircraft Power Supplies; Auxiliary Power Sources

20080032899 McDermott Will and Emery, LLC, Los Angeles, CA, USA
Onboard Supplemental Power System at Varying High Altitudes (PAT-APPL-10-896 145)
Epstein, S. W., Inventor; 21 Jul 04; 12 pp.; In English
Contract(s)/Grant(s): F33615-03-23673
Patent Info.: Filed Filed 21 Jul 04; US-Patent-Appl-SN-10-896 145
Report No.(s): PB2008-100608; No Copyright; Avail.: CASI: A03, Hardcopy

Systems and methods for supplementing a power system to achieve consistent operation at varying altitudes are disclosed herein. A hybrid power system comprising a single power source driving multiple generators may implement a power recovery turbine to drive a supercharger compressor, which may provide compressed air at increased altitudes. The supplemental power system disclosed herein provides necessary shaft horsepower at high altitudes to drive a generator and produce cooling air.
NTIS
Gas Turbine Engines; High Altitude; Electric Generators; Aircraft Power Supplies; Auxiliary Power Sources

20080032900 Armstrong Teasdale, LLP, Saint Louis, MO, USA
Methods and Apparatus for Cooling Turbine Engine Combustor Ignition Devices
Howell, S. J., Inventor; Jacobson, J. C., Inventor; Barnes, B. F., Inventor; Souri, R. M., Inventor; 20 Jul 04; 9 pp.; In English
Contract(s)/Grant(s): DAAE07-00-C-N086
Patent Info.: Filed Filed 20 Jul 04; US-Patent-Appl-SN-10-894 483
Report No.(s): PB2008-100606; No Copyright; Avail.: CASI: A02, Hardcopy

An ignition device assembly for a gas turbine engine combustor includes a body and a shroud. The body extends from an inlet end to an outlet end, and the shroud extends circumferentially around at least a portion of the body, and axially from a first end to a tip end. The shroud includes a tip portion and a body portion. The body portion includes a plurality of metering openings and a plurality of first outlet openings. The plurality of metering openings are for channeling cooling air to the ignition device body, and the plurality of first outlet openings are for channeling spent cooling air from the ignition device body. The tip portion includes a plurality of discharge openings extending there-through for channeling cooling from the ignition device body. The plurality of first outlet openings are between the shroud tip portion and the plurality of shroud metering openings.
NTIS
Combustion Chambers; Cooling; Gas Turbine Engines; Ignition; Patent Applications; Turbine Engines

20080033553 Goodloe (R. Reams), PC, Kent, WA, USA
Supersonic Compressor
Lawlor, S. P., Inventor; Novaresi, M. A., Inventor; Cornelius, C. C., Inventor; 28 Mar 05; 22 pp.; In English
Contract(s)/Grant(s): DE-FC026-00NT40915

Patent Info.: Filed Filed 28 Mar 05; US-Patent-Appl-SN-11-091 680
Report No.(s): PB2008-100659; No Copyright; Avail.: CASI: A03, Hardcopy

A gas compressor based on the use of a driven rotor having an axially oriented compression ramp traveling at a local supersonic inlet velocity (based on the combination of inlet gas velocity and tangential speed of the ramp) which forms a supersonic shockwave axially, between adjacent strakes. In using this method to compress inlet gas, the supersonic compressor efficiently achieves high compression ratios while utilizing a compact, stabilized gasdynamic flow path. Operated at supersonic speeds, the inlet stabilizes an oblique/normal shock system in the gasdyanamic flow path formed between the gas compression ramp on a strake, the shock capture lip on the adjacent strake, and captures the resultant pressure within the stationary external housing while providing a diffuser downstream of the compression ramp.
NTIS
Patent Applications; Supersonic Compressors; Turbocompressors

20080033554 Pratt and Whitney Aircraft, East Hartford, CT, USA
Temperature Tolerant Vane Assembly
Harding, B. R., Inventor; Hudson, E. A., Inventor; 11 Aug 04; 6 pp.; In English
Contract(s)/Grant(s): F-33615-97-C-2779
Patent Info.: Filed Filed 11 Aug 04; US-Patent-Appl-SN-10-916 682
Report No.(s): PB2008-100658; No Copyright; Avail.: CASI: A02, Hardcopy

A vane assembly 10 suitable for a turbine engine features a refractory vane 12 with an internal cavity 20 and a pair of flexible metallic baffles 26 extending into the cavity from spanwisely opposite ends of the vane. A rigid fastener 48, such as a nut and bolt assembly applies a tensile load to the baffles. The tensile load is reacted out as a compressive load applied to the vane. In another embodiment, the baffle is relatively rigid but the fastener is flexible. The compressive loading exerted on the vane counteracts the brittleness customarily exhibited by refractory materials and imparts damage tolerance to the vane. The arrangement also allows the use of a metal baffle that can be easily secured to the vane and dispenses with any need for a potentially troublesome seal between the baffles and the spanwise extremities of the vane.
NTIS
Patent Applications; Stators; Turbines; Vanes

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also 05 Aircraft Design, Testing and Performance; and 06 Avionics and Aircraft Instrumentation.

20080032740 NASA Dryden Flight Research Center, Edwards, CA, USA
Full-Scale Flight Research Testbeds: Adaptive and Intelligent Control
Pahle, Joe W.; February 07, 2008; 26 pp.; In English; NAVAIR Meeting, 7 Feb. 2008, Edwards, CA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032740

This viewgraph presentation describes the adaptive and intelligent control methods used for aircraft survival. The contents include: 1) Motivation for Adaptive Control; 2) Integrated Resilient Aircraft Control Project; 3) Full-scale Flight Assets in Use for IRAC; 4) NASA NF-15B Tail Number 837; 5) Gen II Direct Adaptive Control Architecture; 6) Limited Authority System; and 7) 837 Flight Experiments. A simulated destabilization failure analysis along with experience and lessons learned are also presented.
CASI
Control Systems Design; Full Scale Tests; Flight Tests; Aerodynamic Configurations

20080032814 Duke Univ., Durham, NC, USA
Aerothermoelastic Analysis of a NASP-Like Vertical Fin
Rodgers, John P.; April 13, 1992; 13 pp.; In English; AIAA/ASME/ASCE/AHS/ASC 33rd Structures, Structural Dynamics, and Materials Conference, 13-15 Apr. 1992, Dallas, TX; Original contains black and white illustrations
Contract(s)/Grant(s): NASP GWP#71
Report No.(s): AIAA Paper-92-2400; Copyright; Avail.: Other Sources

Several aeroelastic stability analyses for a vertical fin similar to that of the National Aero-Space Plane are described. The

objectives of the study were to design and obtain an experimental data base for a supersonic wind-tunnel model of the fin in order to examine the effects of thermal loading on the flutter characteristics. This paper describes the preliminary efforts to design the wind-tunnel model, including several of the geometric parameter variations that were analyzed. The dominant flutter mechanism involved a flap vibration mode and a fin bending mode. Variation of the thicknesses of flap and root flexures, used to attach the flap to the fin, and the fin to a support, significantly affected the flutter boundary. Uniform thermal loads, affecting only material properties, had little effect, as did the application of different uniform temperatures to each side of the fin. In contrast, the application of significant chord-wise thermal gradients induced stresses which reduced the flutter dynamic pressure by as much as 37 percent. For less extreme distributed loading, the low-aspect ratio fin was relatively unaffected. Author

Aerothermoelasticity; Fins; National Aerospace Plane Program; Wind Tunnel Models; Stability Tests; Supersonic Wind Tunnels

20080033674 NASA Langley Research Center, Hampton, VA, USA

Active Flow Control at Low Reynolds Numbers on a NACA 0015 Airfoil

Melton, LaTunia Pack; Hannon, Judith; Yao, Chung-Sheng; Harris, Jerome; August 18, 2008; 18 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.20.02; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033674

Results from a low Reynolds number wind tunnel experiment on a NACA 0015 airfoil with a 30% chord trailing edge flap tested at deflection angles of 0, 20, and 40 are presented and discussed. Zero net mass flux periodic excitation was applied at the ap shoulder to control flow separation for flap deflections larger than 0. The primary objective of the experiment was to compare force and moment data obtained from integrating surface pressures to data obtained from a 5-component strain-gage balance in preparation for additional three-dimensional testing of the model. To achieve this objective, active flow control is applied at an angle of attack of 6 where published results indicate that oscillatory momentum coefficients exceeding 1% are required to delay separation. Periodic excitation with an oscillatory momentum coefficient of 1.5% and a reduced frequency of 0.71 caused a significant delay of separation on the airfoil with a flap deflection of 20. Higher momentum coefficients at the same reduced frequency were required to achieve a similar level of flow attachment on the airfoil with a flap deflection of 40. There was a favorable comparison between the balance and integrated pressure force and moment results. Author

Active Control; Airfoils; Flaps (Control Surfaces); Low Reynolds Number; Three Dimensional Models; Wind Tunnels

20080033682 NASA Langley Research Center, Hampton, VA, USA

Robustness Analysis and Reliable Flight Regime Estimation of an Integrated Resilent Control System for a Transport Aircraft

Shin, Jong-Yeob; Belcastro, Christine; August 18, 2008; 19 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS1-02117; WBS 457280; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033682

Formal robustness analysis of aircraft control upset prevention and recovery systems could play an important role in their validation and ultimate certification. As a part of the validation process, this paper describes an analysis method for determining a reliable flight regime in the flight envelope within which an integrated resilent control system can achieve the desired performance of tracking command signals and detecting additive faults in the presence of parameter uncertainty and unmodeled dynamics. To calculate a reliable flight regime, a structured singular value analysis method is applied to analyze the closed-loop system over the entire flight envelope. To use the structured singular value analysis method, a linear fractional transform (LFT) model of a transport aircraft longitudinal dynamics is developed over the flight envelope by using a preliminary LFT modeling software tool developed at the NASA Langley Research Center, which utilizes a matrix-based computational approach. The developed LFT model can capture original nonlinear dynamics over the flight envelope with the ! block which contains key varying parameters: angle of attack and velocity, and real parameter uncertainty: aerodynamic coefficient uncertainty and moment of inertia uncertainty. Using the developed LFT model and a formal robustness analysis method, a reliable flight regime is calculated for a transport aircraft closed-loop system.

Author

Robustness (Mathematics); Control Systems Design; Aircraft Control; Transport Aircraft; Reliability Analysis; Systems Integration

20080033683 NASA Langley Research Center, Hampton, VA, USA

A Flight Control System Architecture for the NASA AirSTAR Flight Test Infrastructure

Murch, Austin M.; August 18, 2008; 8 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 457280.02.07.07.03; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033683

A flight control system architecture for the NASA AirSTAR infrastructure has been designed to address the challenges associated with safe and efficient flight testing of research control laws in adverse flight conditions. The AirSTAR flight control system provides a flexible framework that enables NASA Aviation Safety Program research objectives, and includes the ability to rapidly integrate and test research control laws, emulate component or sensor failures, inject automated control surface perturbations, and provide a baseline control law for comparison to research control laws and to increase operational efficiency. The current baseline control law uses an angle of attack command augmentation system for the pitch axis and simple stability augmentation for the roll and yaw axes.

Author

Flight Control; Flight Tests; Control Systems Design; Systems Engineering

20080034426 NASA Dryden Flight Research Center, Edwards, CA, USA

2007 Western States Fire Mission

Howell, Kathleen; July 28, 2008; 31 pp.; In English; EAA AirVenture 2008 (Oshkosh), 28 Jul. - 3 Aug. 2008, Oshkosh, WI, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034426

A general overview of the Ikhana Uninhabited Air System (UAS) is presented. The contents include: 1) Ikhana UAS; 2) Ikhana UAS / Ground Control Station (GCS); 3) Ikhana UAS / Antennas; 4) Western States Fire Mission 2007 Partners; 5) FAA Certificate of Authorization (COA); 6) Western States Fire Missions (WSFM) 2007; 7) WSFM 1-4 2007; 8) California Wildfire Emergency Response 2007; 9) WSFM 5-8 Emergency Response 2007; 10) WSFM Achievements; and 11) WSFM Challenges.

CASI

Emergencies; Air Traffic Control; Fires; Unmanned Aircraft Systems

20080034480 NASA Langley Research Center, Hampton, VA, USA

Practical Application of a Subscale Transport Aircraft for Flight Research in Control Upset and Failure Conditions

Cunningham, Kevin; Foster, John V.; Morelli, Eugene A.; Murch, Austin M.; August 18, 2008; 14 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 457280.02.07.07.08; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034480

Over the past decade, the goal of reducing the fatal accident rate of large transport aircraft has resulted in research aimed at the problem of aircraft loss-of-control. Starting in 1999, the NASA Aviation Safety Program initiated research that included vehicle dynamics modeling, system health monitoring, and reconfigurable control systems focused on flight regimes beyond the normal flight envelope. In recent years, there has been an increased emphasis on adaptive control technologies for recovery from control upsets or failures including damage scenarios. As part of these efforts, NASA has developed the Airborne Subscale Transport Aircraft Research (AirSTAR) flight facility to allow flight research and validation, and system testing for flight regimes that are considered too risky for full-scale manned transport airplane testing. The AirSTAR facility utilizes dynamically-scaled vehicles that enable the application of subscale flight test results to full scale vehicles. This paper describes the modeling and simulation approach used for AirSTAR vehicles that supports the goals of efficient, low-cost and safe flight research in abnormal flight conditions. Modeling of aerodynamics, controls, and propulsion will be discussed as well as the application of simulation to flight control system development, test planning, risk mitigation, and flight research.

Author

Flight Tests; Aircraft Safety; Systems Health Monitoring; Transport Aircraft; Adaptive Control; Aircraft Control; Flight Envelopes; Failure

20080034509 NASA Dryden Flight Research Center, Edwards, CA, USA

Flight Results of the NF-15B Intelligent Flight Control System (IFCS) Aircraft with Adaptation to a Longitudinally Destabilized Plant

Bosworth, John T.; August 18, 2008; 18 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit,

18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034509

Adaptive flight control systems have the potential to be resilient to extreme changes in airplane behavior. Extreme changes could be a result of a system failure or of damage to the airplane. The goal for the adaptive system is to provide an increase in survivability in the event that these extreme changes occur. A direct adaptive neural-network-based flight control system was developed for the National Aeronautics and Space Administration NF-15B Intelligent Flight Control System airplane. The adaptive element was incorporated into a dynamic inversion controller with explicit reference model-following. As a test the system was subjected to an abrupt change in plant stability simulating a destabilizing failure. Flight evaluations were performed with and without neural network adaptation. The results of these flight tests are presented. Comparison with simulation predictions and analysis of the performance of the adaptation system are discussed. The performance of the adaptation system is assessed in terms of its ability to stabilize the vehicle and reestablish good onboard reference model-following. Flight evaluation with the simulated destabilizing failure and adaptation engaged showed improvement in the vehicle stability margins. The convergent properties of this initial system warrant additional improvement since continued maneuvering caused continued adaptation change. Compared to the non-adaptive system the adaptive system provided better closed-loop behavior with improved matching of the onboard reference model. A detailed discussion of the flight results is presented.
Author
Adaptive Control; Feedback Control; Flight Control; System Failures; Controllers; Flight Tests; Maneuvers

20080034515 NASA Dryden Flight Research Center, Edwards, CA, USA
In-Flight Stability Analysis of the X-48B Aircraft
Regan, Christopher D.; August 18, 2008; 10 pp.; In English; 46th AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034515

This report presents the system description, methods, and sample results of the in-flight stability analysis for the X-48B, Blended Wing Body Low-Speed Vehicle. The X-48B vehicle is a dynamically scaled, remotely piloted vehicle developed to investigate the low-speed control characteristics of a full-scale blended wing body. Initial envelope clearance was conducted by analyzing the stability margin estimation resulting from the rigid aircraft response during flight and comparing it to simulation data. Short duration multisine signals were commanded onboard to simultaneously excite the primary rigid body axes. In-flight stability analysis has proven to be a critical component of the initial envelope expansion.
Author
Stability Tests; Blended-Wing-Body Configurations; Remotely Piloted Vehicles; X Wing Rotors; Rigid Structures

20080034581 Aeronautical Systems Div., Wright-Patterson AFB, OH, USA
Geometric Optimums for Transatmospheric Military Vehicles and Models
March 1983; 215 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): F33615-83-R-3003
Report No.(s): CN-164-553; D180-11238-1; Copyright; Avail.: Other Sources

The Boeing Aerospace Company is pleased to submit this proposal for 'Geometric Optimums for Transatmospheric Military Vehicles and Models'. It is totally responsive to Request for Proposal (RFP), F33615-83-R-3003 and is organized in accordance with the RFP-suggested format. R. J. Dixon, program manager from the BAC Engineering Technology Organization, will work directly with a special study group selected from Preliminary Design organization personnel of the Boeing Space Systems division and from the Engineering Technology organization. We feel the Transatmospheric Military Vehicle (TAV) is destined to be the next aerodynamic technological advancement for military space operations. For this reason we are forming a corporate-wide advisory group of senior people with hands-on experience gained through more than 25 years of research or hardware development by The Boeing Company related to TAV technology. This advisory group, chaired by R. L. Hanson, will function as a steering committee to guide study technology activities by monthly reviews of study plans and progress. The Engineering Technology organization, which has supported all BAC space efforts, including Minuteman, Saturn, Inertial Upper Stage (IUS), Air Launched Antisatellite (ASAT), space shuttle and booster systems and Dyna-Soar programs, will have line responsibility for this proposal. Since 1972, Boeing Aerospace Company has actively supported the evolution of a TAV and advanced military spaceflight capability (AMSC) with both Air Force- and NASA-contracted system concept and technology development studies, and company-sponsored independent research and development. The object of

these studies and technology tasks has been to develop a military vehicle capable of operating in near-Earth space, both in and out of the atmosphere.
Derived from text
Aerospace Engineering; Military Spacecraft; Transatmospheric Vehicles; Wind Tunnel Tests; Aerodynamic Configurations

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*.

20080032927 Idaho National Engineering Lab., Idaho Falls, ID, USA
Safety Analysis for a Radioisotope Stirling Generator. Space Nuclear Conference 2007
Richins, W. D.; Lacy, J. M.; Novascone, S. R.; Dolphin, B. H.; Jun. 2007; 10 pp.; In English
Report No.(s): DE2007-912897; INL/CON-07-12211; No Copyright; Avail.: National Technical Information Service (NTIS)

The Idaho National Laboratory (INL) is conducting safety analyses of various low-power Radioisotope Stirling Generator (RSG) design concepts for the U.S. Department of Energy. These systems are electrical power generators converting thermal energy from plutonium (238Pu) decay to electrical energy via a Stirling cycle generator. The design and function are similar to the RTG (Radioisotope Thermoelectric Generator) used in space missions since the early 1960s, with a more efficient Stirling cycle generator replacing the proven thermoelectric converter. This paper discusses the methods the INL is employing in the safety analysis effort, along with the software tools, lessons learned, and results. The overall goal of our safety analyses is to determine the probability of an accidental plutonium release over the life of the generator. Historical accident rates for various transportation modes were investigated using event tree methods. Source terms were developed for these accidents including primarily impact, fire, and creep rupture. A negative result was defined as rupture of the tantalum alloy containment vessel surrounding the encapsulated plutonia pellet. Damage due to identified impact accidents was evaluated using non-linear finite element software tools. Material models, gathered from a wide variety of sources, included strain-rate and temperature dependencies on yield strength, strain hardening, and rupture.
NTIS
Conferences; Electric Generators; Radioisotope Heat Sources; Safety; Stirling Cycle

20080033822 Dla, Piper Rudnick Gray Cary, LLP, San Diego, CA, USA
Payload Adapter
Thomas, G. R., Inventor; Fadick, C. M., Inventor; 6 Jul 04; 23 pp.; In English
Contract(s)/Grant(s): F29601-02-C-0096
Patent Info.: Filed Filed 6 Jul 04; US-Patent-Appl-SN-10-886 214
Report No.(s): PB2008-100617; No Copyright; Avail.: CASI: A03, Hardcopy

A payload adapter consists of a body that when hollow includes a plurality of stiffeners--radial and/or circumferential--or alternatively a core for carrying shear loads. The body may include a first annular face sheet, a second annular face sheet and a plurality of stiffeners connecting between the first annular face sheet and the second annular face sheet. The combination of the annular hollow body and the plurality of stiffeners or the same face sheets combined with an in-filled core results in an axial frequency and a lateral (pitch) frequency for the payload adapter that provides superior vibration isolation. Constrained layer damping is incorporated into the design for additional vibration attenuation.
NTIS
Adapters; Patent Applications; Payloads

20080033823 Davis Wright Tremaine, LLP, Seattle, WA, USA; Stirling Technology Co., Richland, WA, USA
Displacement Sensing System and Method
VunKannon, R. S., Inventor; 20 Jul 04; 10 pp.; In English
Contract(s)/Grant(s): DE-AC03-02SF22491

Patent Info.: Filed Filed 20 Jul 04; US-Patent-Appl-SN-10-895 019
Report No.(s): PB2008-100626; No Copyright; Avail.: CASI: A02, Hardcopy

A displacement sensing system and method addresses demanding requirements for high precision sensing of displacement of a shaft, for use typically in a linear electro-dynamic machine, having low failure rates over multi-year unattended operation in hostile environments. Applications include outer space travel by spacecraft having high-temperature, sealed environments without opportunity for servicing over many years of operation. The displacement sensing system uses a three coil sensor configuration, including a reference and sense coils, to provide a pair of ratio-metric signals, which are inputted into a synchronous comparison circuit, which is synchronously processed for a resultant displacement determination. The pair of ratio-metric signals are similarly affected by environmental conditions so that the comparison circuit is able to subtract or nullify environmental conditions that would otherwise cause changes in accuracy to occur.
NTIS
Detection; Displacement; Patent Applications; Remote Sensing

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

20080032810 NASA Marshall Space Flight Center, Huntsville, AL, USA
RSRM Segment Train Derailment and Recovery
Taylor Jr., Robert H.; McConnaugghey, Paul K.; Beaman, David E.; Moore, Dennis R.; Reed, Harry; May 12, 2008; 15 pp.; In English; JANNAF Conference: Airbreathing Propulsion, 12-16 May 2008, Massachusetts, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

On May 2, 2007, a freight train carrying segments of the space shuttle's solid rocket boosters derailed in Myrtlewood, Alabama, after a rail trestle collapsed. The train was carrying Reusable Solid Rocket Motors (RSRM) 98 center and forward segments (STS-120) and RSRM 99 aft segments (STS-122). Initially, it was not known if the segments had been seriously damaged. Four segments dropped approximately 10 feet when the trestle collapsed and one of those four rolled off the track onto its side. The exit cones and the other four segments, not yet on the trestle, remained on solid ground. ATK and NASA immediately dispatched an investigation and recovery team to determine the safety of the situation and eventually the usability of the segments and exit cones for flight. Instrumentation on each segment provided invaluable data to determine the acceleration loads imparted into each loaded segment and exit cone. This paper details the incident, recovery plan and the team work that created a success story that ended with the safe launch of STS120 using the four center segments and the launch of STS122 using the Aft exit cones assemblies.
Author
Space Transportation System; Space Shuttle Boosters; Booster Rocket Engines; Rail Transportation; Accident Investigation; Recoverability

20080032898 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Atmospheric Flow Study in the Alcantara Launching Center, using Anemometric Tower and Wind Tunnel Measurements
Roballo, Suelen Trindade; [2007]; 140 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-14824-TDI/1264; Copyright; Avail.: CASI: C01, CD-ROM: A07, Hardcopy

The atmospheric flow at the Alcantara Launching Center (CLA), which is localized near a 50 m cliff, was studied through (i) the analysis of wind data that were measured during the periods from 1995 to 1999 (base years) and from 2004 to 2005 (for validation), at six levels of a 70 m anemometric tower (TA), which is placed 200 m downwind of the cliff, near a rocket launching pad, and (ii) wind tunnel (TV) experiments, using a 1:1000 geometric scale and floor level configurations to represent the cliff and its downwind roughness. The data at the TA determined that the roughness velocity u* was equal to 0.32 +/- 0.13 m/s 0.46 +/- 0.11 m/s) during the rainy (dry) period, while the roughness length z0 equaled 0.19 +/- 0.32 m (0.06 +/- 0.05 m) for the rainy (dry) period, thus showing the seasonality of the wind profiles. The exponent of the velocity power law varied along the yearly months from 0.19 to 0.27, with R2s between 0.88 and 0.99; alpha decreased with the altitude zn. For a rainy month, the validation of with 2004 2005 wind data showed estimated velocities greater than the ones observed at the

TA, which was possibly due a weaker atmospheric neutrality; however, for a dry month, these velocities were equivalent, thus implying a neutral atmosphere. Finally, the predominant wind direction was from the Northeast, followed by the ones from the North and the East. The TV experiments, with 90 deg and 70 deg steps representing the cliff, both with and without additional downwind roughness, did show: (i) a perfect emulation of the ocean wind profile (alpha = 0.15) above the position of the step representing the cliff, through the use of a upwind carpeted fetch to provide the necessary roughness; (ii) that the highest Reynolds number possible, based on the height of the cliff, was 6.52 x 10(exp 4) inside this TV, while it reached 3 x10(exp 7) at the CLA - thus, a more powerful tunnel is needed to emulate this last situation; (iii) that the values of alpha nearest to the ones obtained at the CLA resulted from the 90 deg step experiment without any extra covering over the floor, except the upwind carpet; (iv) that the fixing of cubes downwind of the step resulted roughnesses much greater than the ones observed over the CLA vegetation, so possibly emulating urban or industrial situations; (v) that typical characteristics which occur downwind a step were emulated, such as the detachment and the posterior reattachment of the flow, plus the formation of circulation bubbles; (vi) that the use of more powerfull TVs would certainly permit the emulation of the atmospheric behavior of the CLA. Finally, with the use of a more powerfull TV, besides the replication of the experiments of the present work, experiments with wind incidences on the step with angles other than 90 deg should be recommended.
Author
Air Flow; Wind Tunnel Tests; Launching Sites; Test Facilities

20080033033 NASA Marshall Space Flight Center, Huntsville, AL, USA
NaK Plugging Meter Design for the Feasibility Test Loops
Pearson, J. Boise; Godfroy, Thomas J.; Reid, Robert S.; Polzin, Kurt A.; June 08, 2008; 7 pp.; In English; 2008 International Congress on Advances in Nuclear Power Plants (ICAPP '08), 8-12 Jun. 2008, Anaheim, CA, USA; Original contains black and white illustrations
Report No.(s): Paper 8288; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033033

The design and predicted performance of a plugging meter for use in the measurement of NaK impurity levels are presented. The plugging meter is incorporated into a Feasibility Test Loop (FTL), which is a small pumped-NaK loop designed to enable the rapid, small-scale evaluation of techniques such as in situ purification methods and to permit the measurement of bulk material transport effects (not mechanisms) under flow conditions that are representative of a fission surface power reactor. The FTL operates at temperatures similar to those found in a reactor, with a maximum hot side temperature of 900 K and a corresponding cold side temperature of 860 K. In the plugging meter a low flow rate bypass loop is cooled until various impurities (primarily oxides) precipitate out of solution. The temperatures at which these impurities precipitate are indicative of the level of impurities in the NaK. The precipitates incrementally plug a small orifice in the bypass loop, which is detected by monitoring changes in the liquid metal flow rate.
Author
Sodium; Potassium; Impurities; Plugging; Flowmeters; Liquid Metals; Feasibility Analysis

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*.

20080032789 NASA Marshall Space Flight Center, Huntsville, AL, USA
Operational Concept for the NASA Constellation Program's Ares I Crew Launch Vehicle
Best, Joel; Chavers, Greg; Richardson, Lea; Cruzen, Craig; May 15, 2008; 12 pp.; In English; SpaceOps 2008, 12-16 May 2008, Heidelberg, Germany; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032789

Ares I design brings together innovation and new technologies with established infrastructure and proven heritage hardware to achieve safe, reliable, and affordable human access to space. NASA has 50 years of experience from Apollo and Space Shuttle. The Marshall Space Flight Center's Mission Operations Laboratory is leading an operability benchmarking

effort to compile operations and supportability lessons learned from large launch vehicle systems, both domestically and internationally. Ares V will be maturing as the Shuttle is retired and the Ares I design enters the production phase. More details on the Ares I and Ares V will be presented at SpaceOps 2010 in Huntsville, Alabama, U.S.A., April 2010.
Author
Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Launch Vehicles; Flight Operations; Lessons Learned

20080032813 NASA Marshall Space Flight Center, Huntsville, AL, USA
Development Status of the J-2X
Kynard, Mike; Vilja, John; May 05, 2008; 18 pp.; In English; Space Propulsion 2008/ESA, CNES, DLR, and other European Space Agencies, 5-9 May 2008, Heraklion, Greece; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In June 2006, the NASA Marshall Space Flight Center (MSFC) and Pratt & Whitney Rocketdyne began development of an engine for use on the Ares I crew launch vehicle and the Ares V cargo launch vehicle. The development program will be completed in December 2012 at the end of a Design Certification Review and after certification testing of two flight configuration engines. A team of over 600 people within NASA and Pratt & Whitney Rocketdyne are currently working to prepare for the fall 2008 Critical Design Review (CDR), along with supporting an extensive risk mitigation test program. The J-2X will power the Ares I upper stage and the Ares V earth departure stage (EDS). The initial use will be in the Ares I, used to launch the Orion crew exploration vehicle. In this application, it will power the upper stage after being sent aloft on a Space Shuttle-derived. 5-segment solid rocket booster first stage. In this mission. the engine will ignite at altitude and provide the necessary acceleration force to allow the Orion to achieve orbital velocity. The Ares I upper stage, along with the J-2X. will then be expended. On the Ares V. first stage propulsion is provided by five RS-68B engines and two 5-segment boosters similar to the Ares I configuration. In the Ares V mission. the J-2X is first started to power the EDS and its payload. the Altair lunar lander. into earth orbit, then shut-down and get prepared for its next start. The EDS/Altair will remain in a parking orbit, awaiting rendezvous and docking with Orion. Once the two spacecraft are mated, the J-2X will be restarted to achieve earth departure velocity. After powering the Orion and Altair, the EDS will be expended. By using the J-2X Engine in both applications, a significant infrastructure cost savings is realized. Only one engine development is required, and the sustaining engineering and flight support infrastructures can be combined. There is also flexibility for changing, the production and flight manifest because a single production line can support both missions with minimal differences between each engine configuration kit.
Derived from text
Rocket Engine Design; J-2 Engine; Fabrication; X-33 Reusable Launch Vehicle; Test Facilities

20080033459 Air Force Research Lab., Edwards AFB, CA USA
Performance Feedback & Control of Solar Concentrators Using Wave Front Sensing Techniques (Preprint)
Beasley, Jason N; Sep 7, 2007; 128 pp.; In English
Contract(s)/Grant(s): Proj-4847015N
Report No.(s): AD-A480829; AFRL-PR-ED-TP-2007-418; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The major requirement for using concentrating Solar Thermal devices is the proper placement of the focal spot on the absorber to provide heating of the working fluid to produce thrust or to generate electricity. Without proper placement of the focal spot, either in a spacecraft or ground unit, solar energy is not transferred to the propellant or working fluid or at best case, a significantly smaller proportion of the incident energy is transferred to the fluid. A control system is needed for ground units to track the Sun across the sky or to track the Sun as the spacecraft maneuvers. The control system would use a fine focus controller after acquiring a general location for the Sun. Optimal focus was defined for a space-based system as 0.1 degree and 0.1 inch in x, y, and z. The research problem is to: (1) develop a sensor that provides information about the location of the focus beam from the concentrator that also can tolerate the extreme temperatures involved in providing solar heating, and (2) develop the mathematics of a control system that will focus the concentrator in an optimal fashion based on the sensor measurements. The sensor developed in this dissertation solves the temperature issues by using the absorber as a wave front Sensor and imaging that device with a Charge Coupled Device (CCD) to determine the location of the focal beam.
DTIC
Control; Detection; Feedback Control; Image Processing; Solar Collectors; Solar Heating; Solar Thermal Propulsion

20080034492 NASA Langley Research Center, Hampton, VA, USA

Orion Crew Exploration Vehicle Launch Abort System Guidance and Control Analysis Overview

Davidson, John B.; Kim, Sungwan; Raney, David L.; Aubuchon, Vanessa V.; Sparks, Dean W.; Busan, Ronald C.; Proud, Ryan W.; Merritt, Deborah S.; August 18, 2008; 22 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 457280; Copyright; Avail.: CASI: A03, Hardcopy

Aborts during the critical ascent flight phase require the design and operation of Orion Crew Exploration Vehicle (CEV) systems to escape from the Crew Launch Vehicle (CLV) and return the crew safely to the Earth. To accomplish this requirement of continuous abort coverage, CEV ascent abort modes are being designed and analyzed to accommodate the velocity, altitude, atmospheric, and vehicle configuration changes that occur during ascent. Aborts from the launch pad to early in the flight of the CLV second stage are performed using the Launch Abort System (LAS). During this type of abort, the LAS Abort Motor is used to pull the Crew Module (CM) safely away from the CLV and Service Module (SM). LAS abort guidance and control studies and design trades are being conducted so that more informed decisions can be made regarding the vehicle abort requirements, design, and operation. This paper presents an overview of the Orion CEV, an overview of the LAS ascent abort mode, and a summary of key LAS abort analysis methods and results.

Author

Crew Exploration Vehicle; Launch Vehicles; Ascent; Service Modules; Spacecraft Modules

20080034659 NASA Langley Research Center, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA

L1 Adaptive Control Law for Flexible Space Launch Vehicle and Proposed Plan for Flight Test Validation

Kharisov, Evgeny; Gregory, Irene M.; Cao, Chengyu; Hovakimyan, Naira; August 18, 2008; 20 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNX08AB97A; NNX08AC81A; AFOSR FA9550-08-1-0135; WBS 457280

Report No.(s): AIAA Paper 2008-7128; Copyright; Avail.: CASI: A03, Hardcopy

This paper explores application of the L1 adaptive control architecture to a generic flexible Crew Launch Vehicle (CLV). Adaptive control has the potential to improve performance and enhance safety of space vehicles that often operate in very unforgiving and occasionally highly uncertain environments. NASA s development of the next generation space launch vehicles presents an opportunity for adaptive control to contribute to improved performance of this statically unstable vehicle with low damping and low bending frequency flexible dynamics. In this paper, we consider the L1 adaptive output feedback controller to control the low frequency structural modes and propose steps to validate the adaptive controller performance utilizing one of the experimental test flights for the CLV Ares-I Program.

Author

Spacecraft Launching; Control Theory; Feedback Control; Adaptive Control; Flight Tests; 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*.

20080034516 NASA Langley Research Center, Hampton, VA, USA

MISSE 6-Testing Materials in Space

Prasad, Narasimha S; Kinard, William H.; August 10, 2008; 6 pp.; In English; SPIE Optics and Photonics 2008, 10-15 Aug. 2008, San Diego, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 478643.02.02.02.15

Report No.(s): 7095-13; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034516

The objective of the Materials International Space Station Experiment (MISSE) is to study the performance of novel materials when subjected to the synergistic effects of the harsh space environment by placing them in space environment for several months. In this paper, a few materials and components from NASA Langley Research Center (LaRC) that have been flown on MISSE 6 mission will be discussed. These include laser and optical elements for photonic devices. The pre-characterized MISSE 6 materials were packed inside a ruggedized Passive Experiment Container (PEC) that resembles a

suitcase. The PEC was tested for survivability due to launch conditions. Subsequently, the MISSE 6 PEC was transported by the STS-123 mission to International Space Station (ISS) on March 11, 2008. The astronauts successfully attached the PEC to external handrails and opened the PEC for long term exposure to the space environment.
Author
Space Transportation System; Space Shuttle Missions; Aerospace Environments; International Space Station; Optical Equipment

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*.

20080033043 NASA Glenn Research Center, Cleveland, OH, USA
Communication and Navigation Networks in Space System of Systems
Bhasin, Kul B.; Hayden, Jeffrey L.; [2008]; 35 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 141141.02.02.03; Copyright; Avail.: Other Sources

Space System of Systems are being planned to address the new challenges of space exploration, defense, communications, navigation, Earth observation, and science. Communication and navigation networks provide critical services in the operation, system management, information transfer, and situation awareness to the space system of systems. In addition, space systems of systems are requiring system interoperability, enhanced reliability, common interfaces, dynamic operations, and autonomy in system management. New approaches to communications and navigation networks are required to enable the interoperability needed to satisfy the complex goals and dynamic operations and activities of the space system of systems. Historically space systems had direct links to Earth ground communication systems, or they required a space communication satellite infrastructure to achieve higher coverage around the Earth. It is becoming increasingly apparent that many systems of systems may include communication networks that are also systems of systems. These communication and navigation networks must be as nearly ubiquitous as possible and accessible on the demand of the user, much like the cell phone link is available at any time to an Earth user in range of a cell tower. The new demands on communication and navigation networks will be met by space Internet technologies. It is important to bring Internet technologies, Internet Protocols (IP), routers, servers, software, and interfaces to space networks to enable as much autonomous operation of those networks as possible. These technologies provide extensive savings in reduced cost of operations. The more these networks can be made to run themselves, the less humans will have to schedule and control them. The Internet technologies also bring with them a very large repertoire of hardware and software solutions to communication and networking problems that would be very expensive to replicate under a different paradigm. Higher bandwidths are needed to support the expected voice, video, and data transfer traffic for the coordination of activities at each stage of an exploration mission.
Author
Communication Networks; Space Communication; Space Navigation; Aerospace Systems; Systems Engineering

20080033045 NASA Glenn Research Center, Cleveland, OH, USA
Lunar Communication Terminals for NASA Exploration Missions: Needs, Operations Concepts and Architectures
Bhasin, Kul B.; Warner, Joseph D.; Anderson, Lynn M.; June 10, 2008; 24 pp.; In English; International Communications Satellite Systems Conference (ICSSC), 10-12 Jun. 2008, San Diego, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 141141.02.02.03; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033045

NASA is conducting architecture studies prior to deploying a series of short- and long-duration human and robotic missions for the exploration of the Moon and Mars under the Vision for Space Exploration Initiative. A key objective of these missions is to establish and expand, through a series of launches, a system of systems approach to exploration capabilities and science return. The systems identified were Crew Exploration Vehicles, crew and cargo launch vehicles, crew EVA suits, crew and cargo landers, habitats, mobility carriers, and small, pressurized rovers. Multiple space communication networks and systems, deployed over time, will support these space exploration systems of systems. Each deployment phase will support interoperability of components and provide 20 years of legacy systems. In this paper, we describe the modular lunar communications terminals needed for the emerging lunar mission operational scenarios. These lunar communication terminals require flexibility for use in stationary, integrated, and mobile environments. They will support links directly to Earth, to lunar relay satellites, to astronauts and to fixed and mobile lunar surface systems. The operating concepts and traffic models are

presented for these terminals within variety of lunar scenarios. A preliminary architecture is outlined, providing for suitable long-duration operations in the harsh lunar environment.
Author
Lunar Exploration; Communication Networks; Lunar Communication; Architecture (Computers); Complex Systems; Systems Integration; Systems Engineering; Space Communication

20080033109 American Inst. of Aeronautics and Astronautics, USA
Integrated Network Architecture for NASA's Orion Missions
Bhasin, Kul B.; Hayden, Jeffrey L.; Sartwell, Thomas; Miller, Ronald A.; Hudiburg, John J.; May 12, 2008; 16 pp.; In English; SpaceOps 2008 Conference, 12-16 May 2008, Heidelberg, Germany; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

NASA is planning a series of short and long duration human and robotic missions to explore the Moon and then Mars. The series of missions will begin with a new crew exploration vehicle (called Orion) that will initially provide crew exchange and cargo supply support to the International Space Station (ISS) and then become a human conveyance for travel to the Moon. The Orion vehicle will be mounted atop the Ares I launch vehicle for a series of pre-launch tests and then launched and inserted into low Earth orbit (LEO) for crew exchange missions to the ISS. The Orion and Ares I comprise the initial vehicles in the Constellation system of systems that later includes Ares V, Earth departure stage, lunar lander, and other lunar surface systems for the lunar exploration missions. These key systems will enable the lunar surface exploration missions to be initiated in 2018. The complexity of the Constellation system of systems and missions will require a communication and navigation infrastructure to provide low and high rate forward and return communication services, tracking services, and ground network services. The infrastructure must provide robust, reliable, safe, sustainable, and autonomous operations at minimum cost while maximizing the exploration capabilities and science return. The infrastructure will be based on a network of networks architecture that will integrate NASA legacy communication, modified elements, and navigation systems. New networks will be added to extend communication, navigation, and timing services for the Moon missions. Internet protocol (IP) and network management systems within the networks will enable interoperability throughout the Constellation system of systems. An integrated network architecture has developed based on the emerging Constellation requirements for Orion missions. The architecture, as presented in this paper, addresses the early Orion missions to the ISS with communication, navigation, and network services over five phases of a mission: pre-launch, launch from T0 to T+6.5 min, launch from T+6.5 min to 12 min, in LEO for rendezvous and docking with ISS, and return to Earth. The network of networks that supports the mission during each of these phases and the concepts of operations during those phases are developed as a high level operational concepts graphic called OV-1, an architecture diagram type described in the Department of Defense Architecture Framework (DoDAF). Additional operational views on organizational relationships (OV-4), operational activities (OV-5), and operational node connectivity (OV-2) are also discussed. The system interfaces view (SV-1) that provides the communication and navigation services to Orion is also included and described. The challenges of architecting integrated network architecture for the NASA Orion missions are highlighted.
Author
Crew Exploration Vehicle; Communication Networks; Space Communication; Space Navigation; Architecture (Computers); Complex Systems; Systems Engineering; Aerospace Systems; Systems Integration; Constellation Program

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SPACECRAFT DESIGN, TESTING AND PERFORMANCE

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

20080032733 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Gyroless Safehold Control Law Using Angular Momentum as an Inertial Reference Vector
Stoneking, Eric; Lebsock, Ken; August 18, 2008; 12 pp.; In English; AIAA GNC Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A novel safehold control law was developed for the nadir-pointing Vegetation Canopy Lidar (VCL) spacecraft, necessitated by a challenging combination of constraints. The instrument optics did not have a recloseable cover to protect them form potentially catastrophic damage if they were exposed to direct sunlight. The baseline safehold control law relied

on a single-string inertial reference unit. A gyroless safehold law was developed to give a degree of robustness to gyro failures. Typical safehold solutions were not viable; thermal constraints made spin stabilization unsuitable, and an inertial hold based solely on magnetometer measurements wandered unaceptably during eclipse. The novel approach presented here maintains a momentum bias vector not for gyroscopic stiffness, but to use as an inertial reference direction during eclipse. The control law design is presented. The effect on stability of the rank-deficiency of magnetometer-based rate derivation is assessed. The control law's performance is evaluated by simulation.
Author
Angular Momentum; Canopies (Vegetation); Optical Radar; Spacecraft Design; Control Systems Design

20080032821 NASA Marshall Space Flight Center, Huntsville, AL, USA; Intermec Worldwide Headquarters, Everett, WA, USA
Part Marking and Identification Materials on MISSE
Finckenor, Miria M.; Roxby, Donald L.; June 23, 2008; 1 pp.; In English; National Space and Missile Materials Symposium, 23 - 27 Jun. 2008, Nevada, USA; Copyright; Avail.: Other Sources; Abstract Only

Many different spacecraft materials were flown as part of the Materials on International Space Station Experiment (MISSE), including several materials used in part marking and identification. The experiment contained Data Matrix symbols applied using laser bonding, vacuum arc vapor deposition, gas assisted laser etch, chemical etch, mechanical dot peening, laser shot peening, and laser induced surface improvement. The effects of ultraviolet radiation on nickel acetate seal versus hot water seal on sulfuric acid anodized aluminum are discussed. These samples were exposed on the International Space Station to the low Earth orbital environment of atomic oxygen, ultraviolet radiation, thermal cycling, and hard vacuum, though atomic oxygen exposure was very limited for some samples. Results from the one-year exposure on MISSE-3 and MISSE-4 are compared to those from MISSE-1 and MISSE-2, which were exposed for four years. Part marking and identification materials on the current MISSE -6 experiment are also discussed.
Author
International Space Station; Aerospace Environments; Materials; Coatings; Marking; Identifying

20080032843 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Multi-Evaporator Miniature Loop Heat Pipe for Small Spacecraft Thermal Control
Ku, Jentung; Ottenstein, Laura; Douglas, Donya; April 07, 2008; 13 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Illinois, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032843

This paper presents the development of the Thermal Loop experiment under NASA's New Millennium Program Space Technology 8 (ST8) Project. The Thermal Loop experiment was originally planned for validating in space an advanced heat transport system consisting of a miniature loop heat pipe (MLHP) with multiple evaporators and multiple condensers. Details of the thermal loop concept, technical advances and benefits, Level 1 requirements and the technology validation approach are described. An MLHP breadboard has been built and tested in the laboratory and thermal vacuum environments, and has demonstrated excellent performance that met or exceeded the design requirements. The MLHP retains all features of state-of-the-art loop heat pipes and offers additional advantages to enhance the functionality, performance, versatility, and reliability of the system. In addition, an analytical model has been developed to simulate the steady state and transient operation of the MHLP, and the model predictions agreed very well with experimental results. A protoflight MLHP has been built and is being tested in a thermal vacuum chamber to validate its performance and technical readiness for a flight experiment.
Author
Evaporators; Miniaturization; Temperature Control; Mathematical Models; Thermal Protection; Thermoelectricity

20080033125 NASA Langley Research Center, Hampton, VA, USA
Advances in POST2 End-to-End Descent and Landing Simulation for the ALHAT Project
Davis, Jody L.; Striepe, Scott A.; Maddock, Robert W.; Hines, Glenn D.; Paschall, Stephen, II; Cohanim, Babak E.; Fill, Thomas; Johnson, Michael C.; Bishop, Robert H.; DeMars, Kyle J.; Sostaric, Ronald r.; Johnson, Andrew E.; August 18, 2008; 14 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 079749.04.03.04; Copyright; Avail.: CASI: A03, Hardcopy

Program to Optimize Simulated Trajectories II (POST2) is used as a basis for an end-to-end descent and landing trajectory

simulation that is essential in determining design and integration capability and system performance of the lunar descent and landing system and environment models for the Autonomous Landing and Hazard Avoidance Technology (ALHAT) project. The POST2 simulation provides a six degree-of-freedom capability necessary to test, design and operate a descent and landing system for successful lunar landing. This paper presents advances in the development and model-implementation of the POST2 simulation, as well as preliminary system performance analysis, used for the testing and evaluation of ALHAT project system models.
Author
Descent Trajectories; Landing Simulation; Lunar Landing; Degrees of Freedom; Hazards; Landing Aids; Reliability Analysis

20080033127 NASA Langley Research Center, Hampton, VA, USA
Low-Speed Flight Dynamic Tests and Analysis of the Orion Crew Module Drogue Parachute System
Hahne, David E.; Fremaux, C. Michael; August 18, 2008; 13 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 644423.06.31.04.03.04; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033127

A test of a dynamically scaled model of the NASA Orion Crew Module (CM) with drogue parachutes was conducted in the NASA-Langley 20-Foot Vertical Spin Tunnel. The primary test objective was to assess the ability of the Orion Crew Module drogue parachute system to adequately stabilize the CM and reduce angular rates at low subsonic Mach numbers. Two attachment locations were tested: the current design nominal and an alternate. Experimental results indicated that the alternate attachment location showed a somewhat greater tendency to attenuate initial roll rate and reduce roll rate oscillations than the nominal location. Comparison of the experimental data to a Program To Optimize Simulated Trajectories (POST II) simulation of the experiment yielded results for the nominal attachment point that indicate differences between the low-speed pitch and yaw damping derivatives in the aerodynamic database and the physical model. Comparisons for the alternate attachment location indicate that riser twist plays a significant role in determining roll rate attenuation characteristics. Reevaluating the impact of the alternate attachment points using a simulation modified to account for these results showed significantly reduced roll rate attenuation tendencies when compared to the original simulation. Based on this modified simulation the alternate attachment point does not appear to offer a significant increase in allowable roll rate over the nominal configuration.
Author
Dynamic Tests; Low Speed; Flight Tests; Drag Chutes; Spacecraft Modules; Aerodynamic Characteristics; Angular Velocity

20080033129 NASA Langley Research Center, Hampton, VA, USA
Design of Launch Abort System Thrust Profile and Concept of Operations
Litton, Daniel; O'Keefe, Stephen A.; Winski, Richard G.; Davidson, John B.; August 18, 2008; 11 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 644423.06.34.03.15.04; Copyright; Avail.: CASI: A03, Hardcopy

This paper describes how the Abort Motor thrust profile has been tailored and how optimizing the Concept of Operations on the Launch Abort System (LAS) of the Orion Crew Exploration Vehicle (CEV) aides in getting the crew safely away from a failed Crew Launch Vehicle (CLV). Unlike the passive nature of the Apollo system, the Orion Launch Abort Vehicle will be actively controlled, giving the program a more robust abort system with a higher probability of crew survival for an abort at all points throughout the CLV trajectory. By optimizing the concept of operations and thrust profile the Orion program will be able to take full advantage of the active Orion LAS. Discussion will involve an overview of the development of the abort motor thrust profile and the current abort concept of operations as well as their effects on the performance of LAS aborts. Pad Abort (for performance) and Maximum Drag (for separation from the Launch Vehicle) are the two points that dictate the required thrust and shape of the thrust profile. The results in this paper show that 95% success of all performance requirements is not currently met for Pad Abort. Future improvements to the current parachute sequence and other potential changes will mitigate the current problems, and meet abort performance requirements.
Author
Active Control; Launch Vehicles; Abort Apparatus; Trajectories; Thrust; Probability Theory; Parachutes; Launching; Crew Exploration Vehicle

20080033131 NASA Langley Research Center, Hampton, VA, USA

Initial Investigation of Reaction Control System Design on Spacecraft Handling Qualities for Earth Orbit Docking

Bailey, Randall E.; Jackson, E. Bruce; Goodrich, Kenneth H.; Ragsdale, W. Al; Neuhaus, Jason; Barnes, Jim; August 18, 2008; 19 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 018306.01.12; Copyright; Avail.: CASI: A03, Hardcopy

A program of research, development, test, and evaluation is planned for the development of Spacecraft Handling Qualities guidelines. In this first experiment, the effects of Reaction Control System design characteristics and rotational control laws were evaluated during simulated proximity operations and docking. Also, the influence of piloting demands resulting from varying closure rates was assessed. The pilot-in-the-loop simulation results showed that significantly different spacecraft handling qualities result from the design of the Reaction Control System. In particular, cross-coupling between translational and rotational motions significantly affected handling qualities as reflected by Cooper-Harper pilot ratings and pilot workload, as reflected by Task-Load Index ratings. This influence is masked but only slightly by the rotational control system mode. While rotational control augmentation using Rate Command Attitude Hold can reduce the workload (principally, physical workload) created by cross-coupling, the handling qualities are not significantly improved. The attitude and rate deadbands of the RCAH introduced significant mental workload and control compensation to evaluate when deadband firings would occur, assess their impact on docking performance, and apply control inputs to mitigate that impact.

Author

Control Systems Design; Spacecraft Control; Spacecraft Design; Spacecraft Docking

20080033689 NASA Langley Research Center, Hampton, VA, USA

Hovering Dual-Spin Vehicle Groundwork for Bias Momentum Sizing Validation Experiment

Rothhaar, Paul M.; Moerder, Daniel D.; Lim, Kyong B.; August 18, 2008; 19 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 457280; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033689

Angular bias momentum offers significant stability augmentation for hovering flight vehicles. The reliance of the vehicle on thrust vectoring for agility and disturbance rejection is greatly reduced with significant levels of stored angular momentum in the system. A methodical procedure for bias momentum sizing has been developed in previous studies. This current study provides groundwork for experimental validation of that method using an experimental vehicle called the Dual-Spin Test Device, a thrust-levitated platform. Using measured data the vehicle's thrust vectoring units are modeled and a gust environment is designed and characterized. Control design is discussed. Preliminary experimental results of the vehicle constrained to three rotational degrees of freedom are compared to simulation for a case containing no bias momentum to validate the simulation. A simulation of a bias momentum dominant case is presented.

Author

Angular Momentum; Bias; Hovering; Dual Spin Spacecraft; Control Systems Design

20080033690 NASA Langley Research Center, Hampton, VA, USA

Entry, Descent, and Landing Operations Analysis for the Mars Phoenix Lander

Prince, Jill L.; Desai, Prasun N.; Queen, Eric M.; Grover, Myron R.; August 18, 2008; 10 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 526282.01.07.05.05; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033690

The Mars Phoenix lander was launched August 4, 2007 and remained in cruise for ten months before landing in the northern plains of Mars in May 2008. The one-month Entry, Descent, and Landing (EDL) operations phase prior to entry consisted of daily analyses, meetings, and decisions necessary to determine if trajectory correction maneuvers and environmental parameter updates to the spacecraft were required. An overview of the Phoenix EDL trajectory simulation and analysis that was performed during the EDL approach and operations phase is described in detail. The evolution of the Monte Carlo statistics and footprint ellipse during the final approach phase is also provided. The EDL operations effort accurately delivered the Phoenix lander to the desired landing region on May 25, 2008.

Author

Descent; Landing; Mars Surface; Phoenix Mars Lander; Trajectory Analysis; Monte Carlo Method

20080033693 NASA Langley Research Center, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA
Flight Validation of a Metrics Driven L(sub 1) Adaptive Control
Dobrokhodov, Vladimir; Kitsios, Ioannis; Kaminer, Isaac; Jones, Kevin D.; Xargay, Enric; Hovakimyan, Naira; Cao, Chengyu; Lizarraga, Mariano I.; Gregory, Irene M.; August 18, 2008; 22 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL08AA12I; NNX08AB97A; NNX08AC81A; KAE 0482/EF11-410; WBS 457280
Report No.(s): AIAA Paper 2008-6987; Copyright; Avail.: CASI: A03, Hardcopy

The paper addresses initial steps involved in the development and flight implementation of new metrics driven L1 adaptive flight control system. The work concentrates on (i) definition of appropriate control driven metrics that account for the control surface failures; (ii) tailoring recently developed L1 adaptive controller to the design of adaptive flight control systems that explicitly address these metrics in the presence of control surface failures and dynamic changes under adverse flight conditions; (iii) development of a flight control system for implementation of the resulting algorithms onboard of small UAV; and (iv) conducting a comprehensive flight test program that demonstrates performance of the developed adaptive control algorithms in the presence of failures. As the initial milestone the paper concentrates on the adaptive flight system setup and initial efforts addressing the ability of a commercial off-the-shelf AP with and without adaptive augmentation to recover from control surface failures.
Author
Adaptive Control; Flight Control; Flight Tests; Flight Conditions; Control Systems Design; Control Surfaces

20080033977 NASA Dryden Flight Research Center, Edwards, CA, USA
Platform Precision Autopilot Overview and Flight Test Results
Lin, V.; Strovers, B.; Lee, J.; Beck, R.; August 18, 2008; 21 pp.; In English; 2008 AIAA Guidance, Navigation, and Control Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2008-6460; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033977

The Platform Precision Autopilot is an instrument landing system interfaced autopilot system, developed to enable an aircraft to repeatedly fly nearly the same trajectory hours, days, or weeks later. The Platform Precision Autopilot uses a novel design to interface with a NASA Gulfstream III jet by imitating the output of an instrument landing system approach. This technique minimizes, as much as possible, modifications to the baseline Gulfstream III jet and retains the safety features of the aircraft autopilot. The Platform Precision Autopilot requirement is to fly within a 5-m (16.4-ft) radius tube for distances to 200 km (108 nmi) in the presence of light turbulence for at least 90 percent of the time. This capability allows precise repeat-pass interferometry for the Uninhabited Aerial Vehicle Synthetic Aperture Radar program, whose primary objective is to develop a miniaturized, polarimetric, L-band synthetic aperture radar. Precise navigation is achieved using an accurate differential global positioning system developed by the Jet Propulsion Laboratory. Flight-testing has demonstrated the ability of the Platform Precision Autopilot to control the aircraft within the specified tolerance greater than 90 percent of the time in the presence of aircraft system noise and nonlinearities, constant pilot throttle adjustments, and light turbulence.
Author
Automatic Pilots; Synthetic Aperture Radar; Instrument Landing Systems; Navigation; Flight Tests; Global Positioning System; Polarimetry

20080034444 NASA Langley Research Center, Hampton, VA, USA
Heating Augmentation in Laminar Flow Due to Heat-Shield Cavities on the Project Orion CEV
Hollis, Brian R.; August 18, 2008; 13 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 52628201070405; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034444

An experimental study has been conducted to assess the effects of compression pad cavities on the aeroheating environment of the Project Orion CEV heat-shield at laminar conditions. Testing was conducted in Mach 6 and Mach 10 perfect-gas wind tunnels to obtain heating measurements on and around the compression pads using global phosphor thermography. Consistent trends in heating augmentation levels were observed in the data and correlations of average and maximum heating at the cavities were formulated in terms of the local boundary-layer parameters and cavity dimensions.

Additional heating data from prior testing of Genesis and Mars Science Laboratory models were also examined to extend the parametric range of cavity heating correlations.
Author
Heat Shielding; Aerodynamic Heating; Compressibility Effects; Crew Exploration Vehicle; Cavities; Phosphors; Thermography

20080034446 NASA Langley Research Center, Hampton, VA, USA
Analysis of Effectiveness of Phoenix Entry Reaction Control System
Dyakonov, Artem A.; Glass, Christopher E.; Desai, Prasun, N.; VanNorman, John W.; August 18, 2008; 14 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 439654.02.08; Copyright; Avail.: CASI: A03, Hardcopy

Interaction between the external flowfield and the reaction control system (RCS) thruster plumes of the Phoenix capsule during entry has been investigated. The analysis covered rarefied, transitional, hypersonic and supersonic flight regimes. Performance of pitch, yaw and roll control authority channels was evaluated, with specific emphasis on the yaw channel due to its low nominal yaw control authority. Because Phoenix had already been constructed and its RCS could not be modified before flight, an assessment of RCS efficacy along the trajectory was needed to determine possible issues and to make necessary software changes. Effectiveness of the system at various regimes was evaluated using a hybrid DSMC-CFD technique, based on DSMC Analysis Code (DAC) code and General Aerodynamic Simulation Program (GASP), the LAURA (Langley Aerothermal Upwind Relaxation Algorithm) code, and the FUN3D (Fully Unstructured 3D) code. Results of the analysis at hypersonic and supersonic conditions suggest a significant aero-RCS interference which reduced the efficacy of the thrusters and could likely produce control reversal. Very little aero-RCS interference was predicted in rarefied and transitional regimes. A recommendation was made to the project to widen controller system deadbands to minimize (if not eliminate) the use of RCS thrusters through hypersonic and supersonic flight regimes, where their performance would be uncertain.
Author
Flow Distribution; Controllers; Hypersonic Flight; Supersonic Flight; Rarefied Gas Dynamics; Lateral Control; Hypersonic Flow; Trajectories

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*.

20080033028 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Ball Aerospace and Technologies Corp., Broomfield, CO, USA
GMI Status
Krimchansky, Sergey; Newell, David; August 04, 2008; 10 pp.; In English; NASA Precipitation Measurement Missions (PMM) Science Team Meeting, 4-8 Aug. 2008, Colorado, USA; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy

This viewgraph presentation is concerned with the status of the Global Precipitation Measurement-Microwave Imager (GMI). Included in the presentation is an overview that shows a diagram of the craft, the improvements over other precipitation measurement satellites, and information about the calibration approach.
CASI
Precipitation (Meteorology); Precipitation Measurement; Satellite Design; Satellite Observation; Microwave Imagery

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*.

20080032762 NASA Marshall Space Flight Center, Huntsville, AL, USA; Pratt and Whitney Rocketdyne, Canoga Park, CA, USA; NASA Johnson Space Center, Houston, TX, USA

Summary of Propulsion System Needs in Support of Project Constellation

Sumrall, Phil; Lorier, Terry; Baine, Michael; May 05, 2008; 2 pp.; In English; Space Propulsion 2008, 5-9 May 2008, Heraklion, Greece; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

In January 2004, the President of the USA established the Vision for Space Exploration (VSE) to return man to the moon and ultimately to extend manned space travel to Mars. This paper will summarize the manned space flight liquid propulsion system needs in support of Project Constellation over the next 10 years. It will include all engine needs to return man to the moon. An overview of engines currently under contract, those baselined but not yet under contract, and those engine needs that hav.e yet to be initiated. Project Constellation includes the components as shown Figure 1. Liquid propulsion systems supporting the manned portion of these elements include the following: the Crew Exploration Vehicle named Orion (crew module reaction control system (CMRCS), service module Orion Main Engine (OME), service module auxiliary RCS, and service module reaction control system (SMRCS)), the Crew Launch Vehicle named Ares 1 (J2X upper stage, first stage roll control system, second stage reaction control system, and the Ares I-X roll control system), the Heavy Lift Launch Vehicle named Ares V (RS68B first stage booster, J-2X upper stage, roll control systems, and the Earth Departure Stage (EDS) (powered by the same Ares V Upper Stage J-2X), and the Lunar Lander named Altair with both descent and ascent stages (lunar orbit insertion and descent main engine, ascent main engine, and attitude control systems for both stages). In addition, there may be additional engine needs for early demonstrators, but those will not be speculated on as part of this paper. Also, other portions of the VSE architecture, including the planned Orion abort demonstrations and the Lunar Precursor Robotic Program, are not addressed here as they either use solid motors or are focused on unmanned precursor missions.

Author

Propulsion System Configurations; Orbit Maneuvering Engine (Space Shuttle); Spacecraft Modules; Manned Space Flight; Space Exploration; Service Modules; Propulsion System Performance; Attitude Control; Lateral Control; Launch Vehicles

20080032764 NASA Stennis Space Center, Stennis Space Center, MS, USA

Altitude Testing of Large Liquid Propellant Engines

Maynard, Bryon; Raines, Nickey; June 23, 2008; 31 pp.; In English; 26th AIAA Aerodynamic Measurement Technology and Testing Conference Devel. of Test Facilities Sess., 23-26 Jun. 2008, Seattle, WA, USA; Original contains color illustrations

Report No.(s): EB-2008-06-00011-SSC; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080032764

Altitude Testing of the J2-X engine at 100,000 feet (start capability). Chemical Steam Generation for providing vacuum. Project Started Mar 07. Test Stand Activation around Late 2010. J-2X Testing around early 2011.

Derived from text

J-2 Engine; Liquid Propellant Rocket Engines; Test Stands; Altitude; Engine Design

20080032766 NASA Stennis Space Center, Stennis Space Center, MS, USA

An Overview of the A-3 Subscale Diffuser Test Project

Ryan, James E.; Mulkey, Christopher; Raines, Nickey; Saunders, Grady P.; June 26, 2008; 24 pp.; In English; 26th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 23-26 Jun. 2008, Seattle, WA, USA; Original contains color and black and white illustrations

Report No.(s): SSTI-2220-0167; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080032766

The Subscale Diffuser Test (SDT) Project comprised a series of tests of a subscale model of SSC s A-3 Test Stand diffuser. SDT was conducted at NASA s Stennis Space Center (SSC) Apr 2007 - Jan 2008. Purpose of SDT was to mitigate design risk for the A-3 diffuser. Initial scope of the SDT project successfully completed in Jan 2008. Follow-on A-3 risk mitigation testing being planned/considered. This presentation presents an overview of the SDT project.

Derived from text

Thrust Chambers; Test Stands; Risk; Ejectors; Injection; Test Chambers; Cooling Systems

20080032790 Idaho National Engineering Lab., Idaho Falls, ID, USA

Hot Hydrogen Test Facility. Space Technology and Applications International Forum STAIR-2007

Swank, W. D.; Carmack, J.; Werner, J. E.; Pink, R. J.; Haggard, D. C.; Feb. 2007; 10 pp.; In English

Report No.(s): DE2007-911907; INL/CON-06-11610; No Copyright; Avail.: Department of Energy Information Bridge

The core in a nuclear thermal rocket will operate at high temperatures and in hydrogen. One of the important parameters in evaluating the performance of a nuclear thermal rocket is specific impulse, ISp. This quantity is proportional to the square root of the propellants absolute temperature and inversely proportional to square root of its molecular weight. Therefore, high temperature hydrogen is a favored propellant of nuclear thermal rocket designers. Previous work has shown that one of the life-limiting phenomena for thermal rocket nuclear cores is mass loss of fuel to flowing hydrogen at high temperatures. The hot hydrogen test facility located at the Idaho National Lab (INL) is designed to test suitability of different core materials in 2500DGC hydrogen flowing at 1500 liters per minute. The facility is intended to test non-uranium containing materials and therefore is particularly suited for testing potential cladding and coating materials. In this first installment the facility is described. Automated Data acquisition, flow and temperature control, vessel compatibility with various core geometries and overall capabilities are discussed.

NTIS

Aerospace Engineering; Hydrogen; Nuclear Rocket Engines; Technology Utilization; Test Facilities

20080032803 Britt (Trask), Salt Lake City, UT, USA

Reactive Material Enhanced Projectiles and Related Methods

Rose, M. T., Inventor; Doll, D. W., Inventor; Hodgson, J. R., Inventor; Goodell, R. K., Inventor; Busky, R. T., Inventor; 14 Mar 05; 12 pp.; In English

Contract(s)/Grant(s): N00178-01-D-1015; DAAE30-01-9-0800

Patent Info.: Filed Filed 14 Mar 05; US-Patent-Appl-SN-11-079-925

Report No.(s): PB2008-100067; No Copyright; Avail.: CASI: A03, Hardcopy

A projectile having a reactive material disposed therein is provided. The projectile includes a housing which defines a cavity, the cavity being open at one end of thereof. A reactive material is disposed within the cavity. A tip is coupled with the housing and substantially encloses the opening of the cavity. The housing, the reactive material and the tip are cooperatively positioned and configured so as to define a void space between a surface of the tip and a surface of the reactive material. Upon impact with a target, the tip of the projectile is designed to become displaced within the cavity until it contacts the reactive material and transfers kinetic energy thereto thereby causing ignition of the reactive material. The void space may be defined to provide a desired amount of time between initial impact of the projectile with a target and the subsequent ignition of the reactive material.

NTIS

Patent Applications; Projectiles; Reactivity

20080033025 NASA Marshall Space Flight Center, Huntsville, AL, USA

Magnetohydrodynamic Augmented Propulsion Experiment

Litchford, Ron J.; May 30, 2008; 43 pp.; In English; 2008 Annual Technical Meeting, 30-31 May 2008, Yamanakako, Japan; Original contains color and black and white illustrations

Contract(s)/Grant(s): SAA8-05786; SAA8-05952; Copyright; Avail.: CASI: A03, Hardcopy

Over the past several years, efforts have been under way to design and develop an operationally flexible research facility for investigating the use of cross-field MHD accelerators as a potential thrust augmentation device for thermal propulsion systems. The baseline configuration for this high-power experimental facility utilizes a 1.5-MWe multi-gas arc-heater as a thermal driver for a 2-MWe MHD accelerator, which resides in a large-bore 2-tesla electromagnet. A preliminary design study using NaK seeded nitrogen as the working fluid led to an externally diagonalized segmented MHD channel configuration based on an expendable heat-sink design concept. The current status report includes a review of engineering/design work and performance optimization analyses and summarizes component hardware fabrication and development efforts, preliminary testing results, and recent progress toward full-up assembly and testing

Author

Magnetohydrodynamics; Propulsion System Configurations; Propulsion System Performance; Arc Heating; Thrust Augmentation; Heat Sinks; Design Optimization

20080033037 NASA Marshall Space Flight Center, Huntsville, AL, USA

General Purpose Heat Source Simulator

Emrich, William J., Jr.; June 08, 2008; 4 pp.; In English; International Congress on Advances in Nuclear Power Plants (ICAPP '08, 8-12 Jun. 2008, Anaheim, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033037

The General Purpose Heat Source (GPHS) project seeks to combine the development of an electrically heated, single GPHS module simulator with the evaluation of potential nuclear surface power systems. The simulator is designed to match the form, fit, and function of actual GPHS modules which normally generate heat through the radioactive decay of Pu238. The use of electrically heated modules rather than modules containing Pu238 facilitates the testing of the subsystems and systems without sacrificing the quantity and quality of the test data gathered. Current GPHS activities are centered on developing robust heater designs with sizes and weights which closely match those of actual Pu238 fueled GPHS blocks. Designs are being pursued which will allow operation up to 1100 C.

Author

Radioisotope Heat Sources; Heaters; Nuclear Fission; Space Power Reactors; Modules; Simulators

20080033095 NASA Marshall Space Flight Center, Huntsville, AL, USA

Transient Three-Dimensional Side Load Analysis of a Film Cooled Nozzle

Wang, Ten-See; Guidos, Mike; June 23, 2008; 16 pp.; In English; 38th AIAA Fluid Dynamics Conference and Exhibit, 23-26 Jun. 2008, Seattle, WA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Transient three-dimensional numerical investigations on the side load physics for an engine encompassing a film cooled nozzle extension and a regeneratively cooled thrust chamber, were performed. The objectives of this study are to identify the three-dimensional side load physics and to compute the associated aerodynamic side load using an anchored computational methodology. The computational methodology is based on an unstructured-grid, pressure-based computational fluid dynamics formulation, and a transient inlet history based on an engine system simulation. Ultimately, the computational results will be provided to the nozzle designers for estimating of effect of the peak side load on the nozzle structure. Computations simulating engine startup at ambient pressures corresponding to sea level and three high altitudes were performed. In addition, computations for both engine startup and shutdown transients were also performed for a stub nozzle, operating at sea level. For engine with the full nozzle extension, computational result shows starting up at sea level, the peak side load occurs when the lambda shock steps into the turbine exhaust flow, while the side load caused by the transition from free-shock separation to restricted-shock separation comes at second; and the side loads decreasing rapidly and progressively as the ambient pressure decreases. For the stub nozzle operating at sea level, the computed side loads during both startup and shutdown becomes very small due to the much reduced flow area.

Author

Three Dimensional Models; Transient Response; Dynamic Loads; Structural Analysis; Nozzle Design; Rocket Engines; Computational Fluid Dynamics

20080033114 NASA Glenn Research Center, Cleveland, OH, USA

Overview of Multi-kilowatt Free-Piston Stirling Power Conversion Research at GRC

Geng, Steven M.; Mason, Lee S.; Dyson, Rodger W.; Penswick, L. Barry; February 10, 2008; 17 pp.; In English; STAIF-2008- Enabling Space Exploration, 10-14 Feb. 2008, New Mexico, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

As a step towards development of Stirling power conversion for potential use in Fission Surface Power (FSP) systems, a pair of commercially available 1 kW class free-piston Stirling convertors and a pair of commercially available pressure wave generators (which will be plumbed together to create a high power Stirling linear alternator test rig) have been procured for in-house testing at Glenn Research Center. Delivery of both the Stirling convertors and the linear alternator test rig is expected by October, 2007. The 1 kW class free-piston Stirling convertors will be tested at GRC to map and verify performance. The convertors will later be modified to operate with a NaK liquid metal pumped loop for thermal energy input. The high power linear alternator test rig will be used to map and verify high power Stirling linear alternator performance and to develop power management and distribution (PMAD) methods and techniques. This paper provides an overview of the multi-kilowatt free-piston Stirling power conversion work being performed at GRC.

Author

Stirling Cycle; Free-Piston Engines; Energy Conversion; Performance Tests; Nuclear Electric Power Generation; Spacecraft Power Supplies

20080033115 NASA Glenn Research Center, Cleveland, OH, USA

Upgrades to the NESS (Nuclear Engine System Simulation) Code

Fittje, James E.; July 08, 2007; 11 pp.; In English; 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, 8-11 Jul. 2007, Ohio, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNC06BA07B; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033115

In support of the President's Vision for Space Exploration, the Nuclear Thermal Rocket (NTR) concept is being evaluated as a potential propulsion technology for human expeditions to the moon and Mars. The need for exceptional propulsion system performance in these missions has been documented in numerous studies, and was the primary focus of a considerable effort undertaken during the 1960's and 1970's. The NASA Glenn Research Center is leveraging this past NTR investment in their vehicle concepts and mission analysis studies with the aid of the Nuclear Engine System Simulation (NESS) code. This paper presents the additional capabilities and upgrades made to this code in order to perform higher fidelity NTR propulsion system analysis and design.

Author

Nuclear Engine For Rocket Vehicles; Propulsion System Performance; Technology Assessment; Engine Design; Systems Engineering

20080033120 NASA Glenn Research Center, Cleveland, OH, USA

Sensor Selection and Data Validation for Reliable Integrated System Health Management

Garg, Sanjay; Melcher, Kevin J.; May 19, 2008; 24 pp.; In English; Responsive Access to Space Technology Exchange (RASTE), 19-23 May, Ohio, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033120

For new access to space systems with challenging mission requirements, effective implementation of integrated system health management (ISHM) must be available early in the program to support the design of systems that are safe, reliable, highly autonomous. Early ISHM availability is also needed to promote design for affordable operations; increased knowledge of functional health provided by ISHM supports construction of more efficient operations infrastructure. Lack of early ISHM inclusion in the system design process could result in retrofitting health management systems to augment and expand operational and safety requirements; thereby increasing program cost and risk due to increased instrumentation and computational complexity. Having the right sensors generating the required data to perform condition assessment, such as fault detection and isolation, with a high degree of confidence is critical to reliable operation of ISHM. Also, the data being generated by the sensors needs to be qualified to ensure that the assessments made by the ISHM is not based on faulty data. NASA Glenn Research Center has been developing technologies for sensor selection and data validation as part of the FDDR (Fault Detection, Diagnosis, and Response) element of the Upper Stage project of the Ares 1 launch vehicle development. This presentation will provide an overview of the GRC approach to sensor selection and data quality validation and will present recent results from applications that are representative of the complexity of propulsion systems for access to space vehicles. A brief overview of the sensor selection and data quality validation approaches is provided below. The NASA GRC developed Systematic Sensor Selection Strategy (S4) is a model-based procedure for systematically and quantitatively selecting an optimal sensor suite to provide overall health assessment of a host system. S4 can be logically partitioned into three major subdivisions: the knowledge base, the down-select iteration, and the final selection analysis. The knowledge base required for productive use of S4 consists of system design information and heritage experience together with a focus on components with health implications. The sensor suite down-selection is an iterative process for identifying a group of sensors that provide good fault detection and isolation for targeted fault scenarios. In the final selection analysis, a statistical evaluation algorithm provides the final robustness test for each down-selected sensor suite. NASA GRC has developed an approach to sensor data qualification that applies empirical relationships, threshold detection techniques, and Bayesian belief theory to a network of sensors related by physics (i.e., analytical redundancy) in order to identify the failure of a given sensor within the network. This data quality validation approach extends the state-of-the-art, from red-lines and reasonableness checks that flag a sensor after it fails, to include analytical redundancy-based methods that can identify a sensor in the process of failing. The focus of this effort is on understanding the proper application of analytical redundancy-based data qualification methods for onboard use in monitoring Upper Stage sensors.

Author

Spacecraft Propulsion; Propulsion System Performance; Systems Health Monitoring; Aerospace Systems; Systems Engineering; Systems Integration; Sensors; Data Processing

20080033400 Department of the Navy, Washington, DC USA

Propelled Tow Body

Ruffa, Anthony A, Inventor; Apr 28, 2008; 18 pp.; In English

Report No.(s): AD-D020363; No Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/100.2/ADD020363

The patent application discloses a tow body that is provided with an attachment point to connect to a tow cable. The attachment point is positioned nominally at a nonzero angle relative to the length of the tow body. Propulsion components of the body generate thrust. The body is capable of accepting electric power for a propulsion motor within the body. The motor provides the power for the propeller or other propulsion equipment. The power for the motor can also be provided by a tow cable. The addition of forward thrust by the propeller decreases cable scope (the need for long lengths of cable) and required winch volume for storing the cable.

DTIC

Cables (Ropes); Electric Propulsion; Patent Applications; Towed Bodies; Towing; Underwater Propulsion

20080033545 Ross (Sheridan) PC, Denver, CO, USA

Fiber Laser Coupled Optical Spark Delivery System

Yalin, A., Inventor; Willson, B., Inventor; Defoort, M., Inventor; Joshi, S., Inventor; Reynolds, A., Inventor; 4 Aug 05; 29 pp.; In English

Contract(s)/Grant(s): DE-FC26-02NT41335

Patent Info.: Filed Filed 4 Aug 05; US-Patent-Appl-SN-11-197 832

Report No.(s): PB2008-100674; No Copyright; Avail.: CASI: A03, Hardcopy

A spark delivery system for generating a spark using a laser beam is provided, and includes a laser light source and a laser delivery assembly. The laser delivery assembly includes a hollow fiber and a launch assembly comprising launch focusing optics to input the laser beam in the hollow fiber. The laser delivery assembly further includes exit focusing optics that demagnify an exit beam of laser light from the hollow fiber, thereby increasing the intensity of the laser beam and creating a spark. Other embodiments use a fiber laser to generate a spark. Embodiments of the present invention may be used to create a spark in an engine. Yet other embodiments include collecting light from the spark or a flame resulting from the spark and conveying the light for diagnostics. Methods of using the spark delivery systems and diagnostic systems are provided.

NTIS

Fiber Lasers; Patent Applications; Sparks

20080033745 Southern Methodist Univ., Dallas, TX USA

Seismic and Infrasound Energy Generation and Propagation at Local and Regional Distances Phase 1 - Divine Strake Experiment

Stump, Brian; Burlacu, Relu; Hayward, Chris; Pankow, Kristine; Nava, Sue; Bonner, Jessie; Hock, Sebastin; Whiteman, David; Fisher, Aileen; Kim, Tae-Sung; Oct 11, 2007; 40 pp.; In English

Contract(s)/Grant(s): FA8718-06-C-0028; FA2521-06-C-8007; Proj-1010

Report No.(s): AD-A480216; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480216

Eleven single infrasound systems and six infrasound arrays were deployed at existing seismic sites in Utah in order to gather a comprehensive set of seismic and infrasound recordings from rocket motor explosions. These preliminary efforts have resulted in the identification of regular (over 21 recorded) and large (40,000-80,000 lbs) surface explosions at the Utah Test and Training Range (UTTR) of the Hill AFB. The rocket motor explosions occur about every week providing an opportunity to develop seismic and infrasound recordings under a wide range of atmospheric conditions. Cooperation with the AF provided the necessary atmospheric data needed for modeling and was supplemented by additional profiles collected by our consortium. Additional sources of infrasound such as mining explosions were also documented. Infrasound, seismic and atmospheric data recorded during this experiment that took place during the month of August 2007 are summarized in this final report. Limited preliminary analysis of the data is also included. The complete data set has now been delivered to the IRIS DMC.

DTIC

Distance; Infrasonic Frequencies; Rocket Engines; Seismic Energy; Strakes

20080033966 ASRC Aerospace Corp., Cleveland, OH, USA

NASA/GE Highly-Loaded Turbine Research Program

Giel, Paul W.; May 08, 2008; 19 pp.; In English; AIAA Turbine Engine Testing Working Group (TETWoG) Meeting, 8-9 May 2008, Cleveland, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNC06BA07B; WBS 561581.02.08.03.21.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033966

An overview of the NASA/GE Highly-Loaded Turbine Research Program at the NASA Glenn Research Center is presented. The program is sponsored by the Subsonic Fixed Wing Project of the Fundamental Aeronautics Program. The goals of the turbine research program are presented along with their relationship to the higher-level program goals. Two turbine research programs are described; the highly-loaded, single-stage high pressure turbine (HPT) and the highly loaded low pressure turbine (LPT). The HPT program is centered on an extremely high pressure ratio single-stage turbine with an engine stage pressure ratio of 5.5. It was designed with a 33% increase in stage loading. It has shown performance levels 2 points better than current engines operating at the higher work level. Some advantages of the turbine include reduced weight and parts count. Optimization of the blade shape to reduce shock losses is described. The LPT program utilizes a four-stage low pressure turbine with an integral first stage vane/transition duct strut; counterrotation; low-solidity blading; fully optimized flowpath including vanes, blades, and endwalls; and a fluidically controlled turbine vane frame/exit guide vane. The implementation of the LPT into GE s and NASA s test facilities is described. A description of NASA s Single Spool Turbine Facility that is currently under renovation is given. The new, upgraded facility is compared to its predecessor. Renovation design requirements are outlined. Facility limits on pressures, temperatures, flow rates, rotational speeds, and power absorption are described. The current renovation status is given.

Author

Low Pressure; High Pressure; Pressure Ratio; Turbines; Ducted Flow; Flow Velocity; Guide Vanes

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CHEMISTRY AND MATERIALS (GENERAL)

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

20080032798 NASA Marshall Space Flight Center, Huntsville, AL, USA

Technology Developments in Radiation-Hardened Electronics for Space Environments

Keys, Andrew S.; Howell, Joe T.; June 2008; 5 pp.; In English; 26th International Symposium on Space Technology and Science, 1-8 Jun. 2008, Hamamatsu City, Japan; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080032798

The Radiation Hardened Electronics for Space Environments (RHESE) project consists of a series of tasks designed to develop and mature a broad spectrum of radiation hardened and low temperature electronics technologies. Three approaches are being taken to address radiation hardening: improved material hardness, design techniques to improve radiation tolerance, and software methods to improve radiation tolerance. Within these approaches various technology products are being addressed including Field Programmable Gate Arrays (FPGA), Field Programmable Analog Arrays (FPAA), MEMS, Serial Processors, Reconfigurable Processors, and Parallel Processors. In addition to radiation hardening, low temperature extremes are addressed with a focus on material and design approaches. System level applications for the RHESE technology products are discussed.

Author

Radiation Hardening; Microelectromechanical Systems; Aerospace Environments; Hardness

20080032851 California Univ., Berkeley, CA, USA

Polycrystalline Optical Window Materials from Nanoceramics

Zhan, G., Inventor; Mukherjee, A. K., Inventor; Risbud, S. H., Inventor; 14 Jul 04; 6 pp.; In English

Contract(s)/Grant(s): DAAD19-00-1-0185

Patent Info.: Filed Filed 14 Jul 04; US-Patent-Appl-SN-10-892 517

Report No.(s): PB2008-100072; No Copyright; Avail.: CASI: A02, Hardcopy

Optical windows for protecting infrared sensing instruments are manufactured from nano-sized crystallites by compressing the crystallites into a continuous mass under high pressure in the presence of a pulsed electric current, preferably

one produced by spark plasma sintering. The resulting materials have excellent optical and mechanical properties that make them favorable as replacements for the conventional single-crystal sapphire.
NTIS
Crystallites; Optical Materials; Patent Applications; Polycrystals; Windows (Apertures)

20080032880 National Science Foundation, Washington, DC USA
Ion-Sensitive Fluorescence Optical Sensor
Kostov, I. V., Inventor; 30 Jun 04; 9 pp.; In English
Patent Info.: Filed Filed 30 Jun 04; US-Patent-Appl-SN-10-879 351
Report No.(s): PB2008-100056; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention relates to optical ion sensors, including fluorescence optical ion sensors for use in liquid media in the fields of biology, biotechnology, chemistry, medicine, etc. The present invention provides for optical ion sensors that may be attached to dry hydrophilic or hydrophobic surfaces so as to allow continuous sensing. The optical sensors of the present invention may be sterilized and stored for extended periods of time before use.
NTIS
Fluorescence; Ion Optics; Optical Measuring Instruments; Patent Applications; Sensitivity

20080032882 National Science Foundation, Washington, DC USA
High Speed Materials SOrting Using X-Ray Fluorescence
Sommer, E. J., Inventor; Parrish, R. H., Inventor; 22 Sep 05; 25 pp.; In English
Patent Info.: Filed Filed 22 Sep 05; US-Patent-Appl-SN-11-232 574
Report No.(s): PB2008-100048; No Copyright; Avail.: CASI: A03, Hardcopy

A system and process for classifying a piece of material of unknown composition at high speeds, where the system connected to a power supply. The piece is irradiated with first x-rays from an x-ray source, causing the piece to fluoresce x-rays. The fluoresced x-rays are detected with an x-ray detector, and the piece of material is classified from the detected fluoresced x-rays. Detecting and classifying may be cumulatively performed in less than one second. An x-ray fluorescence spectrum of the piece of material may be determined from the detected fluoresced x-rays, and the detection of the fluoresced x-rays may be conditioned such that accurate determination of the x-ray fluorescence spectrum is not significantly compromised, slowed or complicated by extraneous x-rays. The piece of material may be classified by recognizing the spectral pattern of the determined x-ray fluorescence spectrum. The piece of material may be flattened prior to irradiation and detection. The x-ray source may irradiate the first x-rays at a high intensity, and the x-ray source may be an x-ray tube.
NTIS
High Speed; Patent Applications; X Ray Fluorescence

20080032908 Army Research Office, Washington, DC, USA; National Inst. of Health, Bethesda, MD USA
Functional Nano-Scale Gels
Libera, M. R., Inventor; Sukhishvili, S. A., Inventor; Krsko, P., Inventor; Hong, Y., Inventor; 31 May 05; 20 pp.; In English
Patent Info.: Filed Filed 31 May 05; US-Patent-Appl-SN-11-141 339
Report No.(s): PB2008-100030; No Copyright; Avail.: CASI: A03, Hardcopy

Nanometer-scale hydrogels are formed from a polymer film by exposing said film to a focused electron beam of 1 to 10 nm diameter. The hydrogels may be formed in regular patterns, such as arrays, or in irregular patterns. The hydrogels have a plurality of functional groups that can form covalent bonds with proteins while preserving the natural functionality of the proteins. Such functionalized nanohydrogels may serve as a substrate for attachment of other proteins or cells, or may be used in other biological applications.
NTIS
Gels; Patent Applications; Substrates

20080033046 Kirsch (Alan D.), Idaho Falls, ID, USA
Polybenzimidazole Compounds, Polymeric Media, and Methods of Post-Polymerization Modifications (PAT-APPL-10-969 456)
Klaehn, J. R., Inventor; Peterson, E. S., Inventor; Orme, C. J., Inventor; Jones, M. G., Inventor; Wertsching, A. K., Inventor; 19 Oct 04; 21 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727

Patent Info.: Filed Filed 19 Oct 04; US-Patent-Appl-SN-10-969-456
Report No.(s): PB2007-110652; No Copyright; Avail.: CASI: A03, Hardcopy

A PBI compound includes imidazole nitrogens at least a portion of which are substituted with a moiety containing a carbonyl group, the substituted imidazole nitrogens being bonded to carbon of the carbonyl group. At least 85% of the nitrogens may be substituted. The carbonyl-containing moiety may include RCO--, where R is alkoxy or haloalkyl. The PBI compound may exhibit a first temperature marking an onset of weight loss corresponding to reversion of the substituted PBI that is less than a second temperature marking an onset of decomposition of an otherwise identical PBI compound without the substituted moiety. The PBI compound may be included in separatory media. A substituted PBI synthesis method may include providing a parent PBI in a less than 5 wt % solvent solution. Substituting may use more than 5 equivalents in relation to the imidazole nitrogens to be substituted.

NTIS

Imidazoles; Patent Applications; Polybenzimidazole; Polymerization

20080033047 BBWI, Idaho Falls, ID, USA

Polybenzimidazole Compounds, Polymeric Media, and Methods of Post-Polymerization Modifications (PAT-APPL-10-862 921)

Klaehn, J. R., Inventor; Peterson, E. S., Inventor; Wertsching, A. K., Inventor; Orme, C. J., Inventor; Luther, T. A., Inventor; 7 Jun 04; 20 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727
Patent Info.: Filed Filed 7 Jun 04; US-Patent-Appl-SN-10-862-921
Report No.(s): PB2007-110650; No Copyright; Avail.: CASI: A03, Hardcopy

A PBI compound includes imidazole nitrogens at least a portion of which are substituted with an organic-inorganic hybrid moiety. At least 85% of the imidazole nitrogens may be substituted. The organic-inorganic hybrid moiety may be an organosilane moiety, for example, (R)Me(sub 2)SiCH(sub 2)--where R is selected from among methyl, phenyl, vinyl, and allyl. The PBI compound may exhibit similar thermal properties in comparison to the unsubstituted PBI. The PBI compound may exhibit a solubility in an organic solvent greater than the solubility of the unsubstituted PBI. The PBI compound may be included in separatory media. A substituted PBI synthesis method may include providing a parent PBI in a less than 5 wt % solvent solution. Substituting may occur at about room temperature and/or at about atmospheric pressure. Substituting may use at least 5 equivalents in relation to the imidazole nitrogens to be substituted or, preferably, about 15.

NTIS

Imidazoles; Patent Applications; Polybenzimidazole; Polymerization

20080033057 Christian (Stephen R.), Idaho Falls, ID, USA

Composite Media for Ion Processing

Mann, N. R., Inventor; Wood, D. J., Inventor; Todd, T. A., Inventor; Sebesta, F., Inventor; 15 Jun 05; 16 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID-13727; DE-AC07-05ID14517
Patent Info.: Filed Filed 15 Jun 05; US-Patent-Appl-SN-11-154 976
Report No.(s): PB2008-100718; No Copyright; Avail.: CASI: A03, Hardcopy

Composite media, systems, and devices for substantially removing, or otherwise processing, one or more constituents of a fluid stream. The composite media comprise a plurality of beads, each having a matrix substantially comprising polyacrylonitrile (PAN) and supporting one or more active components which are effective in removing, by various mechanisms, one or more constituents from a fluid stream. Due to the porosity and large surface area of the beads, a high level of contact is achieved between composite media of the present invention and the fluid stream being processed. Further, the homogeneity of the beads facilitates use of the beads in high volume applications where it is desired to effectively process a large volume of flow per unit of time.

NTIS

Patent Applications; Polyacrylonitrile

20080033073 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Shape Memory Polymers

Wilson, T. S., Inventor; Bearinger, J. P., Inventor; 12 Aug 05; 16 pp.; In English
Contract(s)/Grant(s): DE-W7405-ENG-48

Patent Info.: Filed Filed 12 Aug 05; US-Patent-Appl-SN-11-203 025
Report No.(s): PB2008-100945; No Copyright; Avail.: CASI: A03, Hardcopy

A shape memory polymer comprising a polymer composition which physically forms a network structure wherein the polymer composition has shape-memory behavior and can be formed into a permanent primary shape, re-formed into a stable secondary shape, and controllably actuated to recover the permanent primary shape.

NTIS

Patent Applications; Shapes; Polymers

20080033107 BBWI, Idaho Falls, ID, USA

ION Exchange Materials Method of Forming Ion Exchange Materials, and Methods of Treating Liquids

Wertsching, A. K., Inventor; Peterson, E. S., Inventor; Wey, J. E., Inventor; 18 Aug 04; 8 pp.; In English
Contract(s)/Grant(s): DE-AC07-991D13727
Patent Info.: Filed Filed 18 Aug 04; US-Patent-Appl-SN-10-920 932
Report No.(s): PB2008-100969; No Copyright; Avail.: CASI: A02, Hardcopy

The invention includes an ion affinity material having an organic component which is sulfonated and which is chemically bonded to an inorganic substrate component. The invention includes a method of forming a metal binding material. A solid support material comprising surface oxide groups is provided and an organic component having at least one alkyl halide is covalently linked to at least some of the surface oxide groups to form a modified support material. The at least one alkyl halide is subsequently converted into an alkyl sulfonate. The invention further includes a method and system for extracting ions from a liquid. An ion exchange material having a sulfonated alkyl silane component covalently bonded to a metal oxide support material is provided and a liquid is exposed to the ion exchange material.

NTIS

Ion Exchanging; Liquids; Patent Applications

20080033417 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Selecting the Best Thermal Building Insulation Using a Multi-Attribute Decision Model

Sotoropolis, Theodore J; Mar 2008; 118 pp.; In English
Report No.(s): AD-A480723; AFIT/GEM/ENV/08-M17; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Thermal building insulation has traditionally been viewed as a means to reduce thermal conductivity through the building envelope. Builders typically choose the least expensive material which meets the specifications in order to remain competitive. Other factors regarding long term health and environmental consequences are typically dismissed. However, a recent shift toward sustainability requires that architects and engineers take a more responsible approach to building design. This research takes a holistic approach to selecting thermal building insulation through the use of a multi-attribute decision model. Several types of insulating products from a variety of manufacturers were investigated in order to determine the best insulation alternative for the new Air Force Institute of Technology (AFIT) academic facility at Wright-Patterson Air Force Base based upon the objectives of an Air Force decision-maker. Human health and environmental impacts were considered in addition to those traditionally associated with thermal building insulation. A multi-attribute decision model was chosen for this research because of the numerous alternatives and competing objectives. The results show that polystyrene ranks highest according to value; however, polystyrene has the highest upfront cost. Wet spray cellulose ranks lower but a low upfront cost give it highest value per cost ratio in climate zone 3. Climate appears to be a significant factor in extreme climates.

DTIC

Buildings; Decision Making; Thermal Insulation

20080033480 AETC, Inc., San Diego, CA USA

Novel Acoustic Technique for UXO Discrimination

Bell, Thomas; Gucunski, Nenad; Jun 30, 2001; 19 pp.; In English
Contract(s)/Grant(s): DACA72-00-P-0059
Report No.(s): AD-A480899; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent demonstrations have shown that magnetic and electromagnetic induction technology can reliably detect most buried unexploded ordnance (UXO). Unfortunately, current technology is unable to reliably discriminate between UXO and other items that pose no risk, and typical survey methods currently deployed have an excessive level of false alarms (i.e. marking of sub-surface anomalies that do not correspond to UXO). There is a need for systems that, when cued by standard

survey technologies, can cost effectively, non-invasively interrogate the suspected item and discriminate. One distinguishing characteristic of UXO is its shape: projectiles, mortars, bombs and rockets are characteristically long and slender. Over the past few years, several Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) sponsored projects have shown varying degrees of success in developing techniques for using magnetics and electromagnetic induction to discriminate between different target shapes [1]. This report documents the results of a SERDP Exploratory Development (SEED) project that applies a complementary sensor technology to the problem. The objective of the project was to demonstrate that relatively simple seismic technology routinely used for pavement and soil mechanical analysis can be used for classification and discrimination of buried objects. This report has six sections. Following this introduction, section 2 gives the background for the project, and the basic concept is described in section 3. Details of the experimental work done for this project are documented in section 4, and our conclusions are presented in section 5. Section 6 lists references cited in the report. Because of shortcomings of the instrumentation used in this project, the results are not conclusive. We measured signals that are qualitatively similar to those expected on the basis of numerical studies, but the spatial and freque

DTIC

Ammunition; Instruments

20080033483 Army Research Lab., Aberdeen Proving Ground, MD USA

Recycling Propellants in Nonpolluting Supercritical Fluids: Novel Computational Chemistry Models for Predicting Effective Solvents

Rice, Betsy M; Chabalowski, Cary F; Jan 1998; 31 pp.; In English

Report No.(s): AD-A480910; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The conventional methods of demilitarization of energetic components of the demilitarization inventory, open burning or open detonation (OB/OD), are being restricted due to the resulting generation of pollution Additionally, OB/OD destroys valuable energetic materials that could otherwise be reused if extracted from the stockpiles. An alternative demilitarization procedure to OB/OD is supercritical fluid (SF) extraction of the energetic materials. In addition to eliminating pollution, SF extraction allows for the recycling of the recovered ingredients, provided the process is nondestructive. A particularly attractive nondestructive solvent is carbon dioxide, a low-cost environmentally benign solvent with easily accessed critical parameters.

DTIC

Computational Chemistry; Extraction; Mathematical Models; Propellants; Recycling; Solvents; Supercritical Fluids

20080033609 Army Construction Engineering Research Lab., Champaign, IL USA

Technology Demonstration of the Zero Emissions Chromium Electroplating System

Hay, K J; Maloney, Stephen W; Cannon, John J; Phelps, Max R; Modrell, Jason; Feb 2008; 161 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480675; ERDC/CERL-TR-08-5-VOL-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480675

This report documents the demonstration of a technology developed by PRD, Inc, for control of chromium emissions during hard chromium electroplating, the Zero Emissions System. The technology involves placing a blanket of a proprietary fluid, called PRD-EL1, on top of the plating bath. This fluid blanket prevents the formation of aerosols, which is the mechanism by which chromium is emitted from the plating bath to the air. The majority of the testing was directed at demonstration of the effectiveness of chromium plating in the presence of the immiscible blanket. Testing was conducted at Benet Laboratories on coupons and actual parts from Army vehicles. The results indicate that PRD-EL1 may cause deleterious effects on the plating process, as some of the parts failed qualitative tests performed at Benet. However, some parts, which were plated without the fluid blanket present as a baseline control, also failed the tests. Air sampling results indicate that the presence of the PRD-EL1 fluid reduced the chromium emissions to below the standard and the indoor air concentration below the previously established exposure limit but near the new exposure limit. Overall, the results indicate that the use of the PRD process would require additional testing before it could be accepted for use in Army production and maintenance operations.

DTIC

Air Pollution; Chromium; Electroplating; Emission

20080033841 BBWI, Idaho Falls, ID, USA

Apparatus and Method for Sealing a Container

Larsen, E. D., Inventor; Watkins, A. D., Inventor; Pace, D. P., Inventor; Bitsoi, R. J., Inventor; McJunkin, T. R., Inventor; 4 Oct 04; 10 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID13727

Patent Info.: Filed Filed 4 Oct 04; US-Patent-Appl-SN-10-958 513

Report No.(s): PB2008-100616; No Copyright; Avail.: CASI: A02, Hardcopy

An apparatus and method for sealing a container is described and which includes multiple work stations which are positioned on a moveable carousel, and wherein the individual work stations are operable to form a seal on a container which encloses hazardous waste and wherein the seal can be readily inspected and repaired, if a defective seal has been formed. NTIS

Patent Applications; Sealing; Seals (Stoppers); Containers

20080034582 National Academy of Sciences - National Research Council, Washington, DC, USA

Visualizing Chemistry. The Progress and Promise of Advanced Chemical Imaging

January 2007; 222 pp.; In English

Report No.(s): DE2007-903289; No Copyright; Avail.: National Technical Information Service (NTIS)

Scientists have long relied on the power of imaging techniques to help them see things invisible to the naked eye and thus advance scientific knowledge. In medicine, X-ray imaging and magnetic resonance imaging (MRI) have added a level of insight beyond traditional lab tests into the workings of the human body and identification of disease at its earliest stages. Microscopy, which has been in use since the sixteenth century, is now powerful enough to detect, identify, track, and manipulate single molecules on surfaces, in solutions, and even inside living cells. Despite these advances, todays demands on imaging have grown well beyond traditional photographic imaging such as medical X-ray applications. The new frontiers in microelectronics, disease detection and treatment, and chemical manufacturing demand the ability to visualize and understand molecular structures, chemical composition, and interactions in materials and reactions (see example in Box 1). In fact, in many areas, including new material development and understanding of cellular function in disease and health, the great leaps forward will depend upon the development of new and innovative imaging techniques. As a result, scientists and engineers are constantly pushing the limits of technology in pursuit of chemical imaging the ability to visualize molecular structures and chemical composition in time and space as actual events unfold from the smallest dimension of a biological system to the widest expanse of a distant galaxy. NTIS

Imaging Techniques; Molecular Structure

20080034607 Idaho National Engineering Lab., Idaho Falls, ID, USA

Materials Degradation Studies for High Temperature Steam Electrolysis Systems

Demkowicz, P.; Medvedev, P.; DeWall, K.; Lessing, P.; Sachdev, P.; Jun. 2007; 6 pp.; In English

Report No.(s): DE2007-912900; INL/CON/07-12114; No Copyright; Avail.: National Technical Information Service (NTIS)

Experiments are currently in progress to assess the high temperature degradation behavior of materials in solid oxide electrolysis systems. This research includes the investigation of various electrolysis cell components and balance of plant materials under both anodic and cathodic gas atmospheres at temperatures up to 850DGC. Current results include corrosion data for a high temperature nickel alloy used for the air-side flow field in electrolysis cells and a commercial ferritic stainless steel used as the metallic interconnect. Three different corrosion inhibiting coatings were also tested on the steel material. The samples were tested at 850oC for 500 h in both air and H2O/H2 atmospheres. The results of this research will be used to identify degradation mechanisms and demonstrate the suitability of candidate materials for long-term operation in electrolysis cells. NTIS

Degradation; Electrolysis; Electrolytic Cells; Fuel Cells; High Temperature; Hydrogen Production; Solid Electrolytes; Steam; Steels

24
COMPOSITE MATERIALS

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

20080032747 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

A Comparative Study Between Alumina-Tetragonal Zirconia Composites and Alumina-Niobia Ceramics for Structural Applications

KruszynskideAssis, Joao Marcos; January 2008; 116 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15150-TDI/1282; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

The main goal of this work is to study the effects of the Zirconia particles addition on the structure of a composition of Alumina Niobia that has been studied at the Marimba s Project in CTA. This study also investigated the respective influence on the mechanical properties of such material looking for applications as structural material. Four types of Zirconia were used: 1-nanometric Tetragonal Zirconia Policristals (TZP) and stabilized with Yttria; 2- nanometric monoclinic Zirconia; 3-submicrometric monoclinic Zirconia (SC15); and 4- micrometric monoclinic Zirconia (SC30). Niobia with 15 % and 20 % in weight, were used to stabilize this monoclinic Zirconia as a tetragonal phase. After, they were added in different percentages to Alumina and sintering with vitreous phase, in two chosen temperatures: 1250 C: four compositions with addiction of 18 % in weight of nanometric Monoclinic Zirconia or TZP Zirconia. 1450 C: six compositions with addiction of 7 and 14% in weight of Zirconia. Particles size and distribution analysis were performed on powders and a Scanning Electron Microscopy were applied to study of the surface and powders morphology. X-rays diffraction were used to investigate the present phases. To structural characterization micro hardness, fracture toughness and four point bend strength were measured. During this investigation Dilatometric analysis were made on compositions produced with Nanometric monoclinic zirconia showing that at 1250 C the sintering rate was higher. Even with this high rate sintering the results indicated that this route and temperature were not enough to promote a good densification mainly due to the grain growth and a probable formation of different phases to be studied. The compositions with monoclinic Zirconia addition (SC15 and SC30) showed lower mechanical properties. Only Alumina Zirconia TZP composites sintering at 1450 C, has the same flexural strength when compared to Alumina Niobia and despite its low fracture toughness, its high Weibull modulus and hardness shows a great potential to be used as structural material, in special in ballistic applications.

Author

Aluminum Oxides; Ceramics; Mechanical Properties; Zirconium Oxides; Composite Materials

20080032749 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Processing and Characterization of Fully and Partial Nanostructured Alumina Powders and Ceramics

daFonseca, Tamara Solange; January 2008; 92 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15153-TDI/1285; Copyright; Avail.: CASI: C01, CD-ROM: A05, Hardcopy

The research and development of nanostructured materials have received much attention during the last years because of the potential better properties that these materials can have in comparison to microstructured materials. This work shows and discusses the production of nanosized Al2O3 powder from chemical synthesis methods. The objective is to improve the densification (by conventional method of the pressing and sintering) and reduce the sintering temperature for the alumina ceramics obtained from this powder. For this, the particles packing of the bimodal mixtures of nanosized powder and commercial microsized powder was studied. The nanosized Al2O3 powder was obtained by calcination of nanosized aluminum hydroxide (Al2O3.3H2O). The Al2O3.3H2O powder was produced by precipitation technique from aqueous solution containing aluminum nitrate with ammonium hydroxide. For the particles packing study, several mixtures of nano and microsized powders were carried out, varying in 20% the participation of each component, resulting in six different samples. The microsized powder (OP1000 - Alcan do Brasil) was introduced during the precipitation of the Al2O3.3H2O, resulting in homogenous mixtures of nano and microsized powders. The commercial microsized alumina powder was characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD), specific surface area, particle size distribution and density. The nanosized powder was characterized by SEM, XRD, specific surface area, transmission electron microscopy (TEM), thermal gravimetric and differential thermal analysis (TGA/DTA) and density. To determinate the processing ceramic parameters, the powder mixtures were compacted by uniaxial (70 MPa) and isostatic (400 MPa) pressing producing cylindrical samples. The sintering parameters were determined by dilatometry. The sintered ceramics characterization was carried out using apparent density and SEM of fracture surfaces. SEM analyses showed that the Al2O3.3H2O powder is formed by particles

agglomerates in the nanometric scale. The results of the sample L specific surface area showed that its value is high (approximately 250 square meters per gram), confirming the agglomeration presence. The X-rays diffraction analyses before calcination showed that this powder was composed by Al2O3.3H2O. After calcination at 450 C / 1 h, the following phases were identified: Al2O3 - eta and Al2O3 - gamma. Relative density values and fracture surface analyses showed that the densification of the ceramics formed by 80% nanosized and 20% microsized powders reached a satisfactory result of sintering temperature and densification in relation to other mixtures. It was possible to achieve at 1400 C for 3 hours a densification equal to 85%.
Author
Aluminum Oxides; Ceramics; Characterization; Powder (Particles); Nanostructure (Characteristics); Microstructure

20080032750 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Processing, Physical and Mechanical Characterization of Total and Partially Nanostructured Zirconia-Yttria Ceramics
Mineiro, Sergio Luiz; January 2008; 198 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15156-TDI/1288; Copyright; Avail.: CASI: C01, CD-ROM: A09, Hardcopy

In this work the behavior of nanostructured and partially nanostructured zirconia-yttria ceramics is analyzed during the compacting and sintering processes. The evaluation of the mechanical properties (flexure strength, fracture toughness and hardness) also is presented. They were studied two groups: one composed by a microparticulate powder obtained through chemical chloride coprecipitation (MICRO-cloretos) that was mixed with a commercial nanoparticulate powder (ZYNC), and another one composed by the same MICRO-cloretos powder mixed with a powder synthesized by Pechini method (PECH). All of the powders were stabilized with 3 mol% of Y2O3 and the X-ray diffractions patterns showed the majority presence of the tetragonal phase of the zirconia. SEM analyses and particle size distribution showed that the MICRO-cloretos powder is formed by particles and agglomerates in the micrometric scale, while the ZYNC powder presented agglomerated particles with the majority sizes below 300 nm. The PECH powder presented particles with the equivalent diameters smaller than the ZYNC powder, in spite of their curves of particle size distributions be similar. The mixtures of the two powder groups were accomplished in a centrifugal ball mill with different mass concentrations of nano and microparticulate powder. The powder mixtures behavior of the ZYNC/MICRO-cloretos group in the compaction curves and in the dilatometry analysis showed to be dependent of the amount of nanoparticulate powder incorporate to the mixture, increasing the green density, and consequently the final density of the ceramic, as the content of the ZYNC powder is increased. The combination of 80% of ZYNC nanoparticulate powder with 20% of MICRO-cloretos powder resulted in the highest measurements in mechanical properties characterizations, with values of 404 MPa in the flexure strength, 12 GPa in the Vickers hardness and 4.29 MPa.m(exp 1/2) in the fracture toughness. The prepared mixtures starting from the PECH/MICRO-cloretos powders presented a small improvement during compaction in relation to the totally microparticulate powder, not being significant the difference among the behavior of the compaction curves of the mixtures, in spite of the different amount of PECH powder present in each mixture. The PECH powder presented a low sinterability, caused by the state of aggregation of their particles. The residual porosity observed in the microstructures of the PECH ceramic and of their mixtures determined the low values obtained in the characterization of their mechanical properties.
Author
Yttria-Stabilized Zirconia; Ceramics; Nanostructure (Characteristics); Mechanical Properties; Physical Properties; Compacting; Sintering

20080033072 Woodcock Washburn, LLP, Philadelphia, PA, USA
Dispersion Method
Winey, K. I., Inventor; Du, F., Inventor; Haggenmueller, R., Inventor; 29 Oct 04; 22 pp.; In English
Contract(s)/Grant(s): ONR-N00014-00-1-0720; ONR-R13572-41600001
Patent Info.: Filed Filed 29 Oct 04; US-Patent-Appl-SN-10-977 641
Report No.(s): PB2008-100944; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed are methods of dispersing discrete fillers in a polymer matrix to form a composite. Also disclosed are composites having discrete fillers dispersed in a polymer matrix.
NTIS
Fillers; Patent Applications

20080033105 NASA Glenn Research Center, Cleveland, OH, USA

Bonding and Integration of C-C Composite to Cu-Clad-Molybdenum for Thermal Management Applications

Asthana, R.; Singh, M.; Shpargel, T.P.; January 27, 2008; 12 pp.; In English; 32nd International Conference & Exposition on Advanced Ceramics and Composites, 27 Jan. - 1 Feb. 2008, Florida, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNC07TB09T; Copyright; Avail.: CASI: A03, Hardcopy

Two- and three-dimensional carbon-carbon composites with either resin-derived matrix or CVI matrix were joined to Cu-clad-Mo using active Ag-Cu braze alloys for thermal management applications. The joint microstructure and composition were examined using Field-Emission Scanning Electron Microscopy and Energy-Dispersive Spectroscopy, and the joint hardness was characterized using the Knoop microhardness testing. Observations on the infiltration of the composite with molten braze, dissolution of metal substrate, and solute segregation at the C-C surface have been discussed. The thermal response of the integrated assembly is also briefly discussed.

Author

Carbon-Carbon Composites; Temperature Effects; Microstructure; Cladding; Brazing; Microhardness; Temperature Control; Scanning Electron Microscopy; Three Dimensional Composites

20080033108 Min, Hsieh and Hack, LLP, McLean, VA, USA

Fabrication of an Anisotropic Super Hydrophobic/Hydrophilic Nanoporous Membranes

Lopez, G. P., Inventor; Atanassov, P. B., Inventor; Brevnov, D. A., Inventor; Barela, M., Inventor; 21 Oct 04; 9 pp.; In English

Contract(s)/Grant(s): ARO-DAAD190210085; AFOSR-F49620-01-1-0168

Patent Info.: Filed Filed 21 Oct 04; US-Patent-Appl-SN-10-969 341

Report No.(s): PB2008-100964; No Copyright; Avail.: CASI: A02, Hardcopy

Anisotropic hydrophobic/hydrophilic nanoporous membranes and methods of forming anisotropic hydrophobic/hydrophilic nanoporous membranes are disclosed. The method of forming the nanoporous membrane includes growing a nanoporous oxide film on a substrate. A nanoporous membrane having a top side and a bottom side can then be formed by partially separating the nanoporous oxide film from the substrate. A fluorocarbon film can be deposited on the top side of the nanoporous membrane by plasma polymerization. The disclosed anisotropic hydrophobic/hydrophilic nanoporous membranes can have extremely different hydrophobicity between the top side and the bottom side of the nanoporous membrane.

NTIS

Anisotropy; Fabrication; Hydrophobicity; Membranes; Oxide Films; Patent Applications; Porous Materials

20080033117 NASA Glenn Research Center, Cleveland, OH, USA

Modeling Creep Effects within SiC/SiC Turbine Components

DiCarlo, J. A.; Lang, J.; March 16, 2008; 17 pp.; In English; International Conference on Computational and Experimental Engineering and Sciences (ICCES'08), 19 Mar. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.16.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033117

Anticipating the implementation of advanced SiC/SiC ceramic composites into the hot section components of future gas turbine engines, the primary objective of this on-going study is to develop physics-based analytical and finite-element modeling tools to predict the effects of constituent creep on SiC/SiC component service life. A second objective is to understand how to possibly select and manipulate constituent materials, processes, and geometries in order to minimize these effects. In initial studies aimed at SiC/SiC components experiencing through-thickness stress gradients, creep models were developed that allowed an understanding of detrimental residual stress effects that can develop globally within the component walls. It was assumed that the SiC/SiC composites behaved as isotropic visco-elastic materials with temperature-dependent creep behavior as experimentally measured in-plane in the fiber direction of advanced thin-walled 2D SiC/SiC panels. The creep models and their key results are discussed assuming state-of-the-art SiC/SiC materials within a simple cylindrical thin-walled tubular structure, which is currently being employed to model creep-related effects for turbine airfoil leading edges subjected to through-thickness thermal stress gradients. Improvements in the creep models are also presented which focus on constituent behavior with more realistic non-linear stress dependencies in order to predict such key creep-related SiC/SiC properties as time-dependent matrix stress, constituent creep and content effects on composite creep rates and rupture times, and stresses on fiber and matrix during and after creep.

Author

Creep Properties; Ceramic Matrix Composites; Time Dependence; Temperature Dependence; Stress Distribution; Residual Stress; Finite Element Method; Composite Structures

20080033118 NASA Glenn Research Center, Cleveland, OH, USA

Current Computational Challenges for CMC Processes, Properties, and Structures

DiCarlo, James; March 16, 2008; 17 pp.; In English; International Conference on Computational and Experimental Engineering and Sciences (ICCES-08), 19 Mar. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.16.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033118

In comparison to current state-of-the-art metallic alloys, ceramic matrix composites (CMC) offer a variety of performance advantages, such as higher temperature capability (greater than the approx.2100 F capability for best metallic alloys), lower density (approx.30-50% metal density), and lower thermal expansion. In comparison to other competing high-temperature materials, CMC are also capable of providing significantly better static and dynamic toughness than un-reinforced monolithic ceramics and significantly better environmental resistance than carbon-fiber reinforced composites. Because of these advantages, NASA, the Air Force, and other U.S. government agencies and industries are currently seeking to implement these advanced materials into hot-section components of gas turbine engines for both propulsion and power generation. For applications such as these, CMC are expected to result in many important performance benefits, such as reduced component cooling air requirements, simpler component design, reduced weight, improved fuel efficiency, reduced emissions, higher blade frequencies, reduced blade clearances, and higher thrust. Although much progress has been made recently in the development of CMC constituent materials and fabrication processes, major challenges still remain for implementation of these advanced composite materials into viable engine components. The objective of this presentation is to briefly review some of those challenges that are generally related to the need to develop physics-based computational approaches to allow CMC fabricators and designers to model (1) CMC processes for fiber architecture formation and matrix infiltration, (2) CMC properties of high technical interest such as multidirectional creep, thermal conductivity, matrix cracking stress, damage accumulation, and degradation effects in aggressive environments, and (3) CMC component life times when all of these effects are interacting in a complex stress and service environment. To put these computational issues in perspective, the various modeling needs within these three areas are briefly discussed in terms of their technical importance and their key controlling mechanistic factors as we know them today. Emphasis is placed primarily on the SiC/SiC ceramic composite system because of its higher temperature capability and enhanced development within the CMC industry. A brief summary is then presented concerning on-going property studies aimed at addressing these CMC modeling needs within NASA in terms of their computational approaches and recent important results. Finally an overview perspective is presented on those key areas where further CMC computational studies are needed today to enhance the viability of CMC structural components for high-temperature applications.

Author

Composite Materials; Ceramic Matrix Composites; Creep Properties; Metal Matrix Composites; Structural Design; Thermal Expansion; Matrix Materials; Carbon Fibers

20080033119 NASA Glenn Research Center, Cleveland, OH, USA

Thermoelectric Properties of Self Assemble TiO2/SnO2 Nanocomposites

Dynys, Fred; Sayir, Ali; Sehirlioglu, Alp; January 27, 2008; 14 pp.; In English; 32nd International Conference & Exposition on Advanced Ceramics & Composites, 27 Jan - 1 Feb 2008, Florida, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNC05AA10A; Copyright; Avail.: CASI: A03, Hardcopy

Recent advances in improving efficiency of thermoelectric materials are linked to nanotechnology. Thermodynamically driven spinodal decomposition was utilized to synthesize bulk nanocomposites. TiO2/SnO2 system exhibits a large spinodal region, ranging from 15 to 85 mole % TiO2. The phase separated microstructures are stable up to 1400 C. Semiconducting TiO2/SnO2 powders were synthesized by solid state reaction between TiO2 and SnO2. High density samples were fabricated by pressureless sintering. Self assemble nanocomposites were achieved by annealing at 1000 to 1350 C. X-ray diffraction reveal phase separation of (Ti(x)Sn(1-x))O2 type phases. The TiO2/SnO2 nanocomposites exhibit n-type behavior; a power factor of 70 (mu)W/m sq K at 1000 C has been achieved with penta-valent doping. Seebeck, thermal conductivity, electrical resistivity and microstructure will be discussed in relation to composition and doping.

Author

Titanium Oxides; Thermoelectric Materials; Nanocomposites; Thermal Conductivity; Nanotechnology; Annealing

20080033305 Montana State Univ., Bozeman, MT USA
Bio-Inspired Nanomaterials: Protein Cage Nano-Architectures
Douglas, Trevor; Apr 2008; 73 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-06-1-1016
Report No.(s): AD-A480636; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480636

The vision for the Center for Bio-Inspired Nanomaterials (CBIN) at Montana State University builds upon a strong scientific foundation and a proven multidisciplinary team in the development of protein cage architectures as templates for nanomaterials synthesis and applications in nanotechnology. The exterior interface, the interior interface, and the interface between protein subunits can all be manipulated in the pursuit of refined nanoparticle properties. The synthesis and characterization capabilities of CBIN will be developed as a foundation to provide nanomaterials with novel optical, electronic, magnetic, and acoustic properties. These materials will be investigated as the basis for applications in magnetic sensing, biofilm antifouling, and nanocatalysis. Our previous success in utilizing protein cages as size and shape constrained templates for synthesis of a wide range of nanostructures has led to an understanding that protein cage dynamics plays an important role in the overall properties of the materials. The long-term goal is to use this knowledge to guide the development of a new generation of active and responsive nanomaterials. The directed program objectives of CBIN are: (1) To use protein cages and architectures for the formation of nano-materials with applications in magnetic sensing. (2) To use protein cages and architectures to create nano-catalysts with high specificity and efficiency for hydrogen production and metal ion remediation. (3) To use the library of protein cages and architectures to create nanomaterials for targeting biofilms for imaging and anti-fouling.

DTIC
Proteins

20080033473 Naval Air Warfare Center, China Lake, CA USA
Investigation of Metastable Interstitial Composite (MIC) Materials for Electrically Initiated Lead Free Primers
Dixon, George P; Jul 15, 2004; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MIPR-W74RDV10253924
Report No.(s): AD-A480874; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of Environmental Research and Development Program (SERDP) Project Number PP 1183, Investigation of Metastable Interstitial Composite (MIC) Materials for Electrically Initiated Lead Free Primers, was to demonstrate the feasibility of eliminating lead styphnate based energetic materials in medium caliber electric primers through the use of MIC based energetic materials. Before the end of this SERDP Exploratory Development Program (SEED), the Navy was able to demonstrate the ability to fire 20mm all up rounds (AURs) using these experimental MIC-based Lead Free Electric Primers (LFEPs). This adequately demonstrated the feasibility of the Navy's proposed LFEP configuration and provided the impetus to prepare proposals for follow-on research into this technology.

DTIC
Composite Materials; Interstitials; Metastable State

20080034512 NASA Marshall Space Flight Center, Huntsville, AL, USA
Chromated Material Obsolescence
Segars, Matt G.; May 13, 2008; 5 pp.; In English; Aerospace Chrome Elimination Team Conference, 13-14 May 2008, Wichita, KS, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS9-20000; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034512

This viewgraph presentation describes the obsolescence of chrome and cadmium papers. The supplier obsolescence of the Randolph TT-P-1757 zinc chromate primer and continental coatings zinc chromate paste is also presented.

CASI
Chromates; Composite Materials; Pastes; Paper (Material); Primers (Coatings)

20080034680 Klauber and Jackson, Hackensack, NJ, USA

Nano-Composite Energetic Powders Prepared by Arrested Reactive Milling

Dreizin, E. L., Inventor; Schoenitz, M., Inventor; 12 Nov 04; 12 pp.; In English

Patent Info.: Filed Filed 12 Nov 04; US-Patent-Appl-SN-10-988 183

Report No.(s): PB2008-101237; No Copyright; Avail.: CASI: A03, Hardcopy

A method is disclosed for producing an energetic metastable nano-composite material. Under pre-selected milling conditions a mixture of powdered components are reactively milled. These components will spontaneously react at a known duration of the pre-selected milling conditions. The milling is stopped at a time at which the components have been compositionally homogenized to produce nanocomposite powder, but prior to said known duration, and thereby before the spontaneous reaction occurs. The milled powder is recovered as a highly reactive nanostructured composite for subsequent use by controllably initiating destabilization thereof.

NTIS

Composite Materials; Metastable State; Patent Applications; Powder (Particles); Reactivity

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20080032791 Idaho National Engineering Lab., Idaho Falls, ID, USA

Data for First Responder Use of Photoionization Detectors for Vapor Chemical Constituents

Daum, K. A.; Watrous, M. G.; Neptune, M. D.; Michael, D. I.; Hull, K. J.; Nov. 2006; 78 pp.; In English

Report No.(s): DE2007-911902; INL/EXT-05-00165; No Copyright; Avail.: Department of Energy Information Bridge

First responders need appropriate measurement technologies for evaluating incident scenes. This report provides information about photoionization detectors (PIDs), obtained from manufacturers and independent laboratory tests, and the use of PIDs by first responders, obtained from incident commanders in the USA and Canada. PIDs are valued for their relatively low cost, light weight, rapid detection response, and ease of use. However, it is clear that further efforts are needed to provide suitable instruments and decision tools to incident commanders and first responders for assessing potential hazardous chemical releases. Information provided in this report indicates that PIDs should always be part of a decision-making context in which other qualitative and more definitive tests and instruments are used to confirm a finding. Possible amelioratory actions ranging from quick and relatively easy fixes to those requiring significant additional effort are outlined in the report.

NTIS

Chemical Composition; Measuring Instruments; Photoionization; Transponders; Vapors

20080032799 Idaho National Engineering Lab., Idaho Falls, ID, USA

Ceramic Waste Form Process at the Idaho National Laboratory. International Pyroprocessing Research Conference

Priebe, S.; Bateman, K.; Aug. 2006; 17 pp.; In English

Report No.(s): DE2007-911669; INL/CON-06-11606; No Copyright; Avail.: National Technical Information Service (NTIS)

The treatment of spent nuclear fuel for disposition using an electrometallurgical technique results in two high-level waste forms: a ceramic waste form (CWF) and a metal waste form (MWF). The CWF is a composite of sodalite and glass, which stabilizes the active fission products (alkali, alkaline earths, and rare earths) and transuranic (TRU) elements. Reactive metal fuel constituents, including all the TRU metals and the majority of the fission products remain in the salt as chlorides and are processed into the CWF. The solidified salt is containerized and transferred to the CWF process where it is ground in an argon atmosphere. Zeolite 4A is dried in a mechanically-fluidized dryer to about 0.1 wt% moisture and ground to a particle-size range of 45 micron to 250 micron. The salt and zeolite are mixed in a V-mixer and heated to 500 degrees C for about 18 hours. During this process, the salt occludes into the structure of the zeolite. The salt-loaded zeolite (SLZ) is cooled and then mixed with borosilicate glass frit with a comparable particle-size range. The SLZ/glass mixture is transferred to a crucible, which is placed in a furnace and heated to 925 degrees C. During this process, known as pressureless consolidation, the zeolite is

converted to the final sodalite form and the glass thoroughly encapsulates the sodalite, producing a dense, leach-resistant final waste form.
NTIS
Ceramics; Conferences; Radioactive Wastes

20080032804 Los Alamos National Lab., NM USA; California Univ., Berkeley, CA USA
Microwave Heating of Energetic Materials
Perry, W. L., Inventor; Son, S. F., Inventor; Asay, B. W., Inventor; 30 Jun 04; 8 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36
Patent Info.: Filed Filed 30 Jun 04; US-Patent-Appl-SN-10-883 277
Report No.(s): PB2008-100066; No Copyright; Avail.: CASI: A02, Hardcopy

Mixtures of high explosives with materials that readily absorb microwaves ignite more readily when exposed to microwave energy than the corresponding neat explosives. A charge of HMX (0.5 gram) mixed with carbon nanotubes (1 percent by mass) ignited with 7.5 joules at an average rate of 750 W for 10 milliseconds. To raise a charge of the same mass of neat HMX to an autoignition temperature of 200 degrees Celsius would require much more energy (about 110 joules) for a longer duration (about 150 milliseconds).
NTIS
Combustion; Explosives; Heating; Microwaves; Patent Applications; Pyrolysis

20080032806 NASA Marshall Space Flight Center, Huntsville, AL, USA
In-situ Thermal Treatment of Trichloroethene at Marshall Space Flight Center
Cole, Jason; McElroy, William J.; Glasgow, Jason; Heron, Gorm; Galligan, Jim; Parker, Ken; Davis, E. F.; May 19, 2008; 29 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNM05AB44C; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation describes the in-situ thermal treatment of trichloroethene at Marshall space Flight Center. The contents include: 1) Background 1 and 2; 2) Source Area-13; 3) In-situ Thermal Treatment; 4) SA-13 Lithology; 5) SA-13 In-Situ Thermal TS; 6) SA-13 ISTD System Components; 7) ISTD Overview; 8) Heaters; 9) SA-13 ISTD Wellfield Layout; 10) SA-13 Well Field; 11) ISTD Process and Instrumentation; 12) Treatment Zone Temperature; 13) SA-13 System Removals; 14) SA-13 DNAPL (typical photos); 15) Treatment Results 1-5; and 16) SA-13 TCE Removal Summary.
CASI
Trichloroethylene; Heat Treatment; In Situ Measurement; Treatment

20080032817 Idaho National Engineering Lab., Idaho Falls, ID, USA
Report to the DOE on the Crud II Project
Janney, D. E.; Porter, D. L.; Earle, O. K.; Demmer, R.; Giglio, J. J.; Sep. 2006; 96 pp.; In English
Report No.(s): DE2007-911680; INL/EXT-06-11742; No Copyright; Avail.: Department of Energy Information Bridge

This report documents SEM, TEM, and chemical analyses from crud samples from a commercially operating reactor.
NTIS
Chemical Analysis; Corrosion; Scanning Electron Microscopy; Transmission Electron Microscopy

20080032819 Los Alamos National Lab., NM USA; California Univ., Berkeley, CA USA
Ice Method for Production of Hydrogen Clathrate Hydrates
Lokshin, K., Inventor; Zhao, Y., Inventor; 7 Jul 04; 9 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36
Patent Info.: Filed Filed 7 Jul 04; US-Patent-Appl-SN-10-886 229
Report No.(s): PB2008-100092; No Copyright; Avail.: CASI: A02, Hardcopy

The present invention includes a method for hydrogen clathrate hydrate synthesis. First, ice and hydrogen gas are supplied to a containment volume at a first temperature and a first pressure. Next, the containment volume is pressurized with hydrogen gas to a second higher pressure, where hydrogen clathrate hydrates are formed in the process.
NTIS
Clathrates; Hydrates; Hydrogen; Hydrogen Production; Ice; Patent Applications

20080032828 Sparkman (Klarquist), LLP, Portland, OR, USA
Multi-Layer Seal for Electrochemical Devices
Chou, Y. S., Inventor; Meinhardt, K. D., Inventor; Stevenson, J. W., Inventor; 12 Sep 05; 32 pp.; In English
Contract(s)/Grant(s): DE-AC0676RLO1830
Patent Info.: Filed Filed 12 Sep 05; US-Patent-Appl-SN-11-224 881
Report No.(s): PB2008-100075; No Copyright; Avail.: CASI: A03, Hardcopy

Multi-layer seals are provided that find advantageous use for reducing leakage of gases between adjacent components of electrochemical devices. Multi-layer seals of the invention include a gasket body defining first and second opposing surfaces and a compliant interlayer positioned adjacent each of the first and second surfaces. Also provided are methods for making and using the multi-layer seals, and electrochemical devices including said seals.
NTIS
Patent Applications; Electrochemistry; Seals (Stoppers)

20080032861 Department of Energy, Washington, DC USA
Method and Apparatus for Non-Destructive Testing
Akers, D. W., Inventor; 15 Jun 04; 14 pp.; In English
Patent Info.: Filed Filed 15 Jun 04; US-Patent-Appl-SN-10-869 794
Report No.(s): PB2008-100059; No Copyright; Avail.: CASI: A03, Hardcopy

Non-destructive testing apparatus may comprise a photon source and a source material that emits positrons in response to bombardment of the source material with photons. The source material is positionable adjacent the photon source and a specimen so that when the source material is positioned adjacent the photon source it is exposed to photons produced thereby. When the source material is positioned adjacent the specimen, the specimen is exposed to at least some of the positrons emitted by the source material. A detector system positioned adjacent the specimen detects annihilation gamma rays emitted by the specimen. Another embodiment comprises a neutron source and a source material that emits positrons in response to neutron bombardment.
NTIS
Nondestructive Tests; Patent Applications; Photons; Positrons

20080032891 BBWI, Idaho Falls, ID, USA
Phosphazene Membranes for Gas Separations
Stewart, F. F., Inventor; Harrup, M. K., Inventor; Orme, C. J., Inventor; Luther, T. A., Inventor; 13 May 04; 12 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727
Patent Info.: Filed Filed 13 May 04; US-Patent-Appl-SN-10-846 195
Report No.(s): PB2008-100613; No Copyright; Avail.: CASI: A03, Hardcopy

A polyphosphazene having a glass transition temperature (T(sub g)) of approximately -20 degrees C. or less. The polyphosphazene has at least one pendant group attached to a backbone of the polyphosphazene, whereinthe pendant group has no halogen atoms. In addition, no aromatic groups are attached to an oxygen atom that is bound to a phosphorus atom of thebackbone. The polyphosphazene may have a T(sub g) ranging from approximately -100 degrees C. to approximately -20 degrees C. The polyphosphazene may be selected from the group consisting of poly(bis-3-phenyl-1-propoxy phosphazene), poly(bis-(2-phenyl- 1-ethoxy)phosphazene), poly(bis-(dodecanoxypol yethoxy)phosphazene), and poly(bis-(2-(2- (2-omega-undecylenylo xyethoxy)ethoxy) ethoxy)phosphazene).The polyphosphazene may be used in a separation membrane to selectively separate individual gases from a gas mixture, such as to separate polar gases from nonpolar gases in the gas mixture.
NTIS
Membranes; Patent Applications; Phosphazene

20080032915 Arizona State Dept. of Health, Phoenix, AZ, USA
Health Consultation: Evaluation of Water Flows in the Nogales Wash, Nogales, Santa Cruz County, Arizona. EPA Facility ID: AZD982007403
Aug. 21, 2006; 18 pp.; In English
Report No.(s): PB2007-114257; No Copyright; Avail.: CASI: A03, Hardcopy

The Santa Cruz County Health Department and the sheriffs office, along with the USA (US) Border Patrol have expressed concerns regarding incidental contact with the water in Nogales Wash, Arizona. The officers of the sheriffs department and the

border patrol often come into contact with the water in the wash during water rescues, and local and federal law enforcement issues. The public has expressed significant concern about direct public exposure to waters flowing in the wash. The Arizona Department of Health Services (ADHS) completed this health consultation to evaluate the levels of organic and inorganic chemicals at the request of the Santa Cruz County Health Department.
NTIS
Arizona; Health; Medical Services; Water Flow

20080032918 Battelle Columbus Labs., OH USA
Arsenic Removal from Drinking Water by Adsorptive Media U.S. EPA Demonstration Project at Chateau Estates Mobile Home Park in Springfield, OH. Final Performance Evaluation Report
McCall, S. E.; Chen, A. S. C.; Wang, L.; Aug. 2007; 84 pp.; In English
Report No.(s): PB2007-113823; No Copyright; Avail.: National Technical Information Service (NTIS)
This report documents the activities performed for and the results obtained from the arsenic removal treatment technology demonstration project at the Chateau Estates Mobile Home Park in Springfield, OH. The objectives of the project are to evaluate the effectiveness of AdEdge Technologies AD-33 media in removing arsenic to meet the new arsenic maximum contaminant level (MCL) of 10 ig/L. Additionally, this project evaluates (1) the reliability of the treatment system, (2) the required system operation and maintenance (O&M) and operator skill levels, and (3) the capital and O&M cost of the technology. The project also characterizes the water in the distribution system and process residuals produced by the treatment process.
NTIS
Adsorptivity; Arsenic; Contaminants; Evaluation; Performance Tests; Potable Water

20080032919 Battelle Columbus Labs., OH USA
Demonstration Evaluation of Biodegradable Degreaser
Mar. 2007; 118 pp.; In English
Report No.(s): PB2007-113822; No Copyright; Avail.: National Technical Information Service (NTIS)
The objective of this project was to evaluate a bio-based parts-degreasing fluid called Eagle Kleen manufactured by Hydra-Tone Chemicals, Inc. (HTCI). Performance tests of this methyl-ester/surfactant, ready-to-use, micro-emulsion degreaser indicated that it was effective in removing oil and grease contami-nation from bare metal and painted surfaces, and its degreasing power is similar to alkaline and solvent cleaners. The project included the preparation of the Quality Assurance Project Plan (QAPP) and conducting the following three Tasks: (1) Laboratory Testing, (2) Site Testing (conducted at the Vehicle Shop at Robins Air Force Base (AFB), the Gas Turbine Engine (GTE) Shop at Hill AFB, and an equipment supplier), and (3) Engineering Cost Assessment.
NTIS
Biodegradability; Cleaners; Methyl Compounds; Performance Tests; Solvents

20080032924 Dunlap, Codding and Rogers, P.C, Oklahoma, OK, USA
Hyaluronan Synthase Gene and Uses Thereof
Weigel, P. H., Inventor; Kumari, K., Inventor; DeAngelis, P., Inventor; 16 Sep 05; 54 pp.; In English
Contract(s)/Grant(s): NIH-GM35978
Patent Info.: Filed Filed 16 Sep 05; US-Patent-Appl-SN-11-228 079
Report No.(s): PB2007-111594; No Copyright; Avail.: CASI: A04, Hardcopy
The present invention relates to a nucleic acid segment having a coding region segment encoding enzymatically active hyaluronate synthase (HAS), and to the use of this nucleic acid segment in the preparation of recombinant cells which produce hyaluronate synthase and its hyaluronic acid product. Hyaluronate is also known as hyaluronic acid or hyaluronan.
NTIS
Patent Applications; Nucleic Acids; Coding

20080032929 Idaho National Engineering Lab., Idaho Falls, ID, USA
Long-Term Underground Corrosion of Stainless Steels. NACE 2007
Flitton, M. K. A.; Yoder, T. S.; Mar. 2007; 13 pp.; In English
Report No.(s): DE2007-911925; INL/CON-06-11963; No Copyright; Avail.: Department of Energy Information Bridge
In 1970, the National Institute of Standards and Technology (NIST) implemented the most ambitious and comprehensive

long-term corrosion behavior test to date for stainless steels in soil environments. Over thirty years later, one of the six test sites was targeted to research subsurface contamination and transport processes in the vadose and saturated zones. This research directly applies to environmental management operational corrosion issues and long term stewardship scientific needs for understanding the behavior of waste forms and their near-field contaminant transport of chemical and radiological contaminants at nuclear disposal sites. This paper briefly describes the ongoing research and the corrosion analysis results of the stainless steel plate specimens recovered from the partial recovery of the first test site.
NTIS
Corrosion; Stainless Steels

20080032939 Foley and Lardner, LLP, Washington, DC, USA; Assistant Secretary of the Air Force (Acquisition), Washington, DC, USA
Fabrication of Sub-50 NM Solid-State Nanostructures Based on Nanolithography
Zhang, H., Inventor; Mirkin, C. A., Inventor; Weinberger, D., Inventor; Hong, S., Inventor; 3 Dec 03; 45 pp.; In English
Patent Info.: Filed Filed 3 Dec 03; US-Patent-Appl-SN-10-725 939
Report No.(s): PB2008-100027; No Copyright; Avail.: CASI: A03, Hardcopy

Combination of nanolithography and wet chemical etching including the fabrication of nanoarrays of sub-50 nm gold dots and line structures with deliberately designed approximately 12-100 nm gaps. These structures were made by initially using direct write nanolithography to pattern the etch resist, 16-mercaptohexadecanoic acid (MHA), on Au/Ti/SiO.sub.x/Si substrates and then wet chemical etching to remove the exposed gold. These are the smallest Au structures prepared by a wet chemical etching strategy. Also, Dip-Pen Nanolithography (DPN) has been used to generate resist layers on Au, Ag, and Pd that when combined with wet chemical etching can lead to nanostructures with deliberately designed shapes and sizes. Monolayers of mercaptohexadecanoic acid (MHA) or octadecanethiol (ODT), patterned by DPN, were explored as etch resists. They work comparably well on Au and Ag, but ODT is the superior material for Pd. MHA seems to attract the FeCl.sub.3 etchant and results in nonuniform etching of the underlying Pd substrate. Dots, lines, triangles and circles, ranging in size from sub-100 to several hundred nm have been fabricated on these substrates. These results show how one can use DPN as an alternative to more complex and costly procedures like electron beam lithography to generate nanostructures from inorganic materials.
NTIS
Chemical Engineering; Etching; Lithography; Nanofabrication; Nanostructures (Devices); Nanotechnology; Patent Applications; Solid State

20080032941 Kansas Dept. of Transportation, Topeka, KS USA
Evaluation of Silica Fume in Bridge Deck Concrete Overlays
Montney, R. A.; Wojakowski, J. B.; Jan. 2007; 14 pp.; In English
Report No.(s): PB2008-100019; FHWA-KS-07-3; No Copyright; Avail.: CASI: A03, Hardcopy

Chlorides that are used for ice control on the Kansas highways cause serious corrosion of the reinforcing steel in concrete bridges. The Kansas Department of Transportation (KDOT) has tried various methods to prevent chloride from penetrating the concrete on bridge decks. In 1990 two silica fume bridge deck overlays were placed on I-470 in Shawnee County along side of two control bridges. While the silica fume overlays have successfully inhibited the chloride penetration of the concrete, extensive cracking occurred in the silica fume overlays. Most of the cracking occurred in the first five years of the bridge deck life. KDOT has made significant changes in curing methods since 1990 to control the early cracking in the silica fume overlays.
NTIS
Concretes; Corrosion; Fumes; Silicon Dioxide; Steels

20080033051 Agency for Toxic Substances and Disease Registry, Atlanta, GA, USA
Health Consultation: Remediation of U.S. Forgecraft Corporation Site, 95 South 3rd Street, Fort Smith, Sebastian County, Arkansas 72478. EPA Facility ID: ARD006341747. Arkansas Facility Identification Number: 66-00145
Nov. 27, 2006; 18 pp.; In English
Report No.(s): PB2007-114373; No Copyright; Avail.: National Technical Information Service (NTIS)

In response to a request from the Environmental Protection Agency (EPA) Region 6, the Arkansas Division of Health (ADOH) of the Arkansas Department of Health and Human Services has evaluated EPAs proposed action levels (PALs) for the contaminants of concern identified during the removal assessment for U.S. Forgecraft Corporation (USFC). The

contaminants of concern at the site are arsenic, lead, cadmium, chromium, and polycyclic aromatic hydrocarbons (PAHs).
NTIS
Arkansas; Contaminants; Health; Polycyclic Aromatic Hydrocarbons; Streets

20080033085 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; California Univ., Berkeley, CA, USA
Process for Preparing a Deuterated or Tritiated Compound
Bergman, R. C., Inventor; Kiel, S. R., Inventor; 4 Oct 05; 8 pp.; In English
Contract(s)/Grant(s): DE-AC03-76F-00098
Patent Info.: Filed Filed 4 Oct 05; US-Patent-Appl-SN-11-243 852
Report No.(s): PB2008-100952; No Copyright; Avail.: CASI: A02, Hardcopy
A process for labeling organic compounds with deuterium and tritium is described using specific catalysts.
NTIS
Catalysts; Deuterium Compounds; Patent Applications; Transition Metals

20080033247 Naval Research Lab., Washington, DC USA
Development of Electron Beam Pumped KrF Lasers for Fusion Energy
Sethian, J D; Friedman, M; Giuliani, J; Lehmberg, R H; Myers, M; Obenschain, S P; Wolford, M; Kepple, P; Hegeler, F; Swanekamp, S; Jan 2008; 18 pp.; In English
Report No.(s): AD-A480476; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480476
Direct drive with krypton fluoride (KrF) lasers is an attractive approach to inertial fusion energy (IFE): KrF lasers have outstanding beam spatial uniformity, which reduces the seed for hydrodynamic instabilities; they have short wavelength (248 nm) that increases the rocket efficiency and raises the threshold for deleterious laser-plasma instabilities; they have the capability for zooming , i.e. decreasing the spot size to follow an imploding pellet and thereby increase efficiency; and they have a modular architecture, which reduces development costs. Numerical 1-D simulations have shown that a target driven by a KrF laser can have a gain above 125 [1,2], which is ample for a fusion system. Simulations of the pellet burn in 2-D and 3-D are underway. In addition to these laser-target advantages, the Sombrero Power Plant study showed a KrF based system could lead to an economically attractive power plant [3]. In view of these advances, several world-wide programs are underway to develop KrF lasers for fusion energy. These include programs in Japan [4, 5], China [6], Russia [7], and The UK [8]. There was also a large program in the USA [9]. The paper here concentrates on current research in the US with two lasers at the Naval Research Laboratory: The Electra laser [10] is a 400-700 J repetitively pulsed system that is being used to develop the technologies that meet the fusion requirements for rep-rate, durability, efficiency and cost. The Nike laser [11] is a 3-5 kJ single shot device that is used to study KrF issues with full-scale electron beam diodes.
DTIC
Diodes; Electron Beams; Krypton; Lasers

20080033276 Pennsylvania State Univ., University Park, PA USA
Development of Multifunctional Ultra-Nonlinear Liquids and Liquid Crystals for Sensor Protection Applications
Khoo, I C; Mar 2008; 25 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0307
Report No.(s): AD-A480562; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480562
A multi-prong program of study has been conducted that encompassed nonlinear optical material synthesis, quantitative characterization, design and proof of concept demonstration of practical devices for eye/sensor protection against agile frequency lasers in the entire visible spectrum. Significant breakthroughs have been achieved in developing supra-nonlinear liquid crystalline films that possess extraordinarily large photorefractive responses, low switching thresholds and useful properties not available in other existing photorefractive materials. A class of multifunctional nonlinear organic liquids that are optically transparent in the entire visible spectrum for low level light, but possess large and very broadband multi-photon absorption and excited-state-absorption coefficients has been developed. These properties enable the construction of image transmission fiber arrays that could function as optical limiters against visible picoseconds - nanoseconds lasers with low operation power threshold and large dynamic operation range. Paralleling these material and devices studies, complete quantitative models for the molecular photonics, nonlinear laser propagation and device operational principles have been

developed. The models accounted for all the nonlinear multi-photon absorption processes, as well as nonlinear scattering and concomitant thermal/density effects that are useful for longer time scales limiting applications, and enable identification of the optimal material composition and design of high performance all-optical devices.
DTIC
Liquid Crystals; Liquids; Nonlinearity; Protection

20080033277 Northwestern Univ., Evanston, IL USA
Fundamental Electronic Structure Characteristics and Mechanical Behavior of Aerospace Materials
Freeman, Arthur J; Kontsevoi, Oleg Y; Gornostyrev, Yuri N; Medvedeva, Nadezhda I; Apr 2008; 22 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0013
Report No.(s): AD-A480563; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480563

To fulfill the great potential of intermetallic alloys for high temperature structural applications, it is essential to understand the mechanisms controlling their mechanical behavior on the microscopic level. We focus on the mechanical behavior of homogeneous intermetallics with LI 2 and B2 structures, two-phase ′ly' alloys, and bcc transition metals and their alloys. Based on highly-accurate total energy calculations and large-scale Peierls-Nabarro and atomistic modeling, we investigated the relation between electronic structure, dislocation properties, and brittle-ductile behavior in these metals and alloys. We demonstrated that Ir- and Rh-based alloys are intrinsically brittle and established the dislocation structure in Ir and Rh-based LI2 alloys. We determined the temperature dependence of the lattice misfit parameter in y/y' superalloys, and established its simple relation with the alloy phase diagram. We studied the structure of dislocations in bcc Nb, Ta, Mo and W alloys, analyzed the effect of alloying with 3d and Sd transition metal elements on dislocation energetics, and established the electronic origins of the solid solution softening/hardening phenomena. We investigated the effect of topologically close packed phase formation on the solubility of interstitial impurities in Cr- and Mo-based alloys and demonstrated their effect in preventing the formation of embrittling phases. We showed that Co- and Y-based B2 intermetallics are intrinsically ductile, established the dislocation structure in Co-based alloys, analyzed the origins of their unusual mechanical behavior, and identified the microscopic origins of the yield stress anomaly.
DTIC
Aircraft Construction Materials; Crack Propagation; Electronic Structure; Mechanical Properties; Refractory Metal Alloys; Spacecraft Construction Materials

20080033279 Houston Univ., TX USA
Fundamental Investigations of the Tribological Properties of Biological Interfaces
Perry, Scott S; Nov 2007; 12 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0394
Report No.(s): AD-A480566; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480566

During the course of this project, we have focused on developing a molecular level understanding of the tribological properties of polymer brush systems and the relationship between these properties and issue of surface chemistry and solvation. Studies have been conducted on the microscopic length scale. Success has been realized through the control of polymer architecture via synthetic routes and has provided the means for systematic and fundamental studies of polymer properties in aqueous media. Work has incorporated a broad range of experimental tools, providing a detailed picture of these interfaces and the basis for molecular level interpretations. The specific results of these studies and their potential impact are described in the following sections of this report.
DTIC
Polymers; Tribology

20080033286 California Inst. of Tech., Pasadena, CA USA
Femtosecond Diffraction and Spectroscopy of Chemical Reactions
Zewail, Ahmed H; Mar 31, 2008; 8 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0070
Report No.(s): AD-A480580; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480580

In the past five years, we have proposed to use this grant to undertake research in the following areas: 1) Direct imaging

of structural changes using ultrafast electron diffraction. 2) Neutral and ionic elementary reactions: high energy and solvation effects. Our goal was to relate these dynamics to features of bonding and mechanisms and to explore the influence of high energy and solvation of reactivity. Theoretical studies in our group and in collaboration with colleagues elsewhere are an important part of this research.
DTIC
Chemical Reactions; Diffraction; Spectroscopy

20080033287 Northwestern Univ., Evanston, IL USA
Diatomaceous Fungal and Bacterial Building Blocks for Material Synthesis
Mirkin, Chad A; Apr 8, 2008; 19 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0054
Report No.(s): AD-A480582; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480582

This final report provides a summary of the scientific and technological breakthroughs achieved during the 3 years of this project. It includes a list of publications, participation in scientific meetings, workshops, and lectures, and invention disclosures. The project was extremely productive as the highlights of the scientific and technological accomplishments in this report will show. The objectives of this project were: (I) To develop methods for controlling the interaction between nanoparticles and microorganism templates to allow the rational assembly of micro- and macroscopic materials with properties tailored at the nanoparticle level; (2) to align and organize nanoparticle!microorganism composite materials three-dimensionally on surfaces to allow full exploitation of their unique properties; (3) to develop novel nanoparticle structures with unusual properties that can be used in materials assembly, and (4) to characterize and evaluate the electrical transport, photovoltaic, and spectroscopic enhancement properties. During the three years of this grant significant progress was made towards all four objectives. With respect to using diatoms as templates for the development of new nanomaterials, a method was developed to generate nanostructured metallic microshells using microorganism precursors. The electronic properties of these metallic microshells were investigated, and a method developed to assemble various nanoparticles onto microorganism surfaces to exploit the properties of these nanoparticles for applications in microelectronics. It was also shown that these microshells can serve as substrates for the detection of analytes using surface enhanced Raman scattering (SERS).
DTIC
Algae; Bacteria; Fungi; Microorganisms; Raman Spectra

20080033301 Naval Research Lab., Bay Saint Louis, MS USA
Valence Determination by Electron Energy Loss Spectroscopy of the Multi-Valence Metal Chromium
Daulton, T L; Little, B J; Aug 2005; 3 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480622; XB-NRL/FR/7320; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480622

Chromium is a redox active 3d transition metal with a wide range of valences (-2 to +6) that control the geochemistry and toxicity of the element. A variety of Cr-bearing minerals are found in meteorites of all petrographic classes lunar basalts, Martian rocks, and the Earth, recording valuable information concerning geochemical conditions of mineralization. Natural weathering of Cr- bearing minerals and fallout of volcanic ash release Cr into the terrestrial environment. Furthermore, Cr compounds are widely used in numerous industrial processes which can discharge toxic Cr complexes in soils/sediments and surface/ground waters, as well as the atmosphere in the form of aerosols. Therefore, techniques that measure Cr valence are important biogeochemical tools. Until now, all established methods to determine Cr valence were bulk techniques with many specific to a single, or at best, only a few oxidation state(s). We report electron energy loss spectroscopy (EELS) techniques that, unlike other methods, can determine Cr valence at high-spatial resolution (nm-scale) over a wide valence range, Cr(O) to Cr(VI).
DTIC
Chromium; Electron Energy; Energy Dissipation; Spectroscopy; Valence

20080033336 Naval Research Lab., Washington, DC USA
The Electra KrF Laser Program
Sethian, J D; Hegeler, F; Myers, M; Friedman, M; Obenschain, S; Lehmberg, R; Giuliani, J; Kepple, P; Swanekamp, S; Smith, I; Jun 2002; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480681; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480681

Electra is a repetitively pulsed, electron-beam pumped, Krypton Fluoride 'KrF' laser that will develop the technologies

that can meet the Inertial Fusion Energy 'IFE' requirements for durability, efficiency, and cost. Electra will have a 30 cm x 30 cm optical aperture, an output of 400-900 Joules, and run at 5 Hz. The main amplifier will be pumped with two 30 cm x 100 cm e-beams, each with V = 500 kV, I = 110 kA, and t = 100 nsec 'flat top'. The components that need to be developed are: a durable and efficient pulsed power system; a durable electron beam emitter; a long life, transparent pressure foil structure 'hibachi"; a laser gas recirculator; and long life optical windows. The technologies developed on Electra will be directly scalable to a full size fusion power plant beam line. We have built a first generation pulsed power system that can produce the necessary pulsed power parameters and repetition rate. This system has operated at 5 Hz for 90,000 shots 'e.g. five hours', which is more than ample to develop the laser components. This paper gives an overview of the Electra program, and then concentrate on the results of our research on electron beam generation, transport, and deposition. This includes evaluation of various cathode and hibachi structures, as well as KrF laser modeling.
DTIC
Electron Beams; Fluorides; Krypton; Lasers; Optical Equipment

20080033411 Army Research Lab., Aberdeen Proving Ground, MD USA
Characterization of Solution Synthesis of Zinc Complexes With Iron
Whitt, Amirh; Sands, James M; Apr 2008; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-AH84-COMP02
Report No.(s): AD-A480700; ARL-TN-309; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this report is to demonstrate the impact of process and materials variables on the characteristics of a Curie-limited susceptor based upon Co(2-2x)Zn2xBa2Fe12O22 formed using a solution-processing approach. Zn2Ba2Fe12O22 (Zn2Y) was the focus of this report, which has a Curie temperature of approximately 130 C. The prepared particles were characterized using x-ray diffraction, environmental-scanning microscopy, x-ray photoelectron spectroscopy, and a vibrating sample magnetometer (VSM). Some basic observations and experimental results are provided for each method. VSM was determined to be among the most sensitive methods for characterization. Process variations produced significant product variations, but sources and causes were not fully isolated through this study. An ongoing effort to determine process controls for optimization and scale-up of particle processing of zinc-based compounds will be the focus of future works.
DTIC
Characterization; Iron; Zinc; Zinc Compounds

20080033412 Delaware Univ., Newark, DE USA
(Nanotechnology Iniatitive) Multicolor Nanostructured High Efficiency Photovoltaic Devices
Honsberg, Christiana; Bremner, S P; Liu, G M; Ban, K Y; Jun 30, 2007; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-06-1-0447
Report No.(s): AD-A480706; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of the project 'Multicolor Nanostructured High Efficiency Photovoltaic Devices,' is to experimentally demonstrate the fundamental physical mechanisms required for high performance photovoltaics, focusing on the conditions which maximize simultaneous radiative coupling between multiple energy levels. A material which has multiple quasi-Fermi levels is predicted to display a range of unique properties, including highly nonlinear absorption coefficients which depend on light intensity, absorption and emission properties which can be tuned by shining different wavelengths of light on the material, and the ability to alter the mobility of one type of carrier while leaving the other unaffected. While these properties allow a range on new devices, the focus of the material choices and theory is on ultra-high efficiency photovoltaics. Other potential new devices include efficient broad-band emitters, and lasers and photodetectors which are multicolor and switchable between the operating wavelengths.
DTIC
Nanotechnology; Quantum Dots

20080033418 Applied Thin Films, Inc., Evanston, IL USA
A New Coating Process for Production of Coated Magnesium Powders
Apr 16, 2008; 20 pp.; In English
Contract(s)/Grant(s): N00164-07-R-6068
Report No.(s): AD-A480729; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This scientific and technical report covers the work carried out during the originally specified 6 month period of performance from July 6, 2007 through January 6, 2008 and during the no-cost extension from January 6, 2008 through April

6, 2008. The work performed under this project is documented according to the project tasks as outlined in the contract and outlined in the task plan below. In brief, Task 1 involved the construction and assembly of the coating system and supporting infrastructure, which was used for the scale-up and production of 1-lb batches of coated magnesium powder. Task 2 focused on the process development required to scale batch sizes from the Phase II batch size of 30g to the desired pre-production batch size of 1-lb. The powder produced in task 2 was analyzed in task 3 to determine the characteristics of the as-coated material and the moisture-induced aging behavior. Finally, task 4 focused on the delivery of the 1-lb batches of coated magnesium, which constituted the final deliverable of the Phase III project. During the course of the original period of performance, initial 1-lb batches of each powder type were prepared at the end of the scale-up process, Task 2. A 3-month no-cost extension was requested in order to characterize the aging behavior of those powders over a time sufficient to benchmark their performance and provide a baseline for the production batches. During this time a strong effort was also placed on improvement of the performance of coated ground magnesium, and a major improvement of performance was achieved.
DTIC
Coating; Coatings; Magnesium; Metal Powder; Powder (Particles)

20080033429 Army Research Lab., Adelphi, MD USA
Grain Boundary Conductivity in Crystalline LiTi2(PO4)3
Wolfenstine, Jeff; Apr 2008; 14 pp.; In English
Report No.(s): AD-A480755; ARL-TN-0313; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recently, there has been a renewed interest in the development of high energy Li-Air batteries. One configuration involves the use of a Li anode in a non-aqueous electrolyte, which is separated from an aqueous electrolyte containing the air cathode by a solid state Li-ion conducting membrane. Several solid state polycrystalline Li-ion conductors, based on pervoskite (1,2), garnet (3,4) and NASICON (Na super ion conductor) (5 through 12) structures, are under consideration as possible membrane materials. One of most widely investigated crystalline Liion conducting membrane materials, based on the NASICON structure, is LiTi2(PO4)3 (5 through 10). In order to sinter crystalline LiTi2(PO4)3 to the high relative densities required for use as a membrane and increase Li-ion conductivity, two approaches have been undertaken (5 through 10). The first it to use a doped material, LiMxTi2 x(PO4)3 (where M=Al, Sc, Y and La) (5,6,9,10). The second is to use LiTi2(PO4)3 containing a small amount of Li2O or Li3PO4 or Li3BO3 (5,7,8). Previous investigations have suggested the total Li-ion conductivity, based on analysis of ac impedance data, of M-doped LiTi2(PO4)3 (where M=Al, Sc, Y and La) and LiTi2(PO4)3 containing a small amount of Li2O or Li3PO4 or Li3BO3 was controlled by Li-ion grain boundary conductivity, which is about 1 to 2 orders of magnitude lower compared to Li-ion bulk conductivity (5 through 10). It has been suggested that for both polycrystalline M-doped LiTi2(PO4)3 (where M=Al, Sc, Y and La) and LiTi2(PO4)3 containing a small amount of Li2O or Li3PO4 or Li3BO3, that both approaches lead to the formation of a continous amorphous film around the grains (5 through 10). It is the transport of Li-ions through this amorphous film which controls the sintering rate (i.e., densification) and grain boundary Li-ion conductivity, and hence, total Li-ion conductivity of the material (5 through 10).
DTIC
Amorphous Materials; Crystallinity; Electrolytes; Grain Boundaries

20080033448 Air Force Research Lab., Edwards AFB, CA USA
Liquid Azide Salts (Preprint)
Schneider, Stefan; Rosander, Michael; Hudgens, Leslie; Warmoth, Greg; Hawkins, Tommy; Mills, Jeffrey; Brand, Adam; Vij, Ashwani; Sep 13, 2007; 39 pp.; In English
Contract(s)/Grant(s): Proj-23030423
Report No.(s): AD-A480799; AFRL-PR-ED-JA-2007-422; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ionic liquid azides from azidoethyl, alkyl and alkenyl substituted derivatives of 1,2,4- and 1,2,3-amino-triazoles, were prepared and examined for the first time in order to investigate their structural and physical properties. All reported salts possess melting points below 100 C. The unique character of these newly discovered ionic liquid azides is based upon the fact that these molecules are not simple protonated salts like previously reported substituted hydrazinium azides. The presence of quaternary nitrogen confers both thermal stability and negligible volatility.
DTIC
Azides (Inorganic); Azides (Organic)

20080033457 ATK Launch Systems, Brigham City, UT USA

Synthesis, Evaluation, and Formulation Studies on New Oxidizers as Alternatives to Ammonium Perchlorate in DoD Missile Propulsion Applications

Dewey, Michael A; Apr 23, 2007; 131 pp.; In English

Contract(s)/Grant(s): Proj-SERDP-WP1403

Report No.(s): AD-A480825; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Perchlorate is found in groundwater and drinking water throughout the USA. This contamination is primarily attributed to the use of ammonium perchlorate in the solid fuel for rockets and missiles. The objective of the program is to develop environmentally benign solid rocket propellant formulations that do not rely on the use of ammonium perchlorate (AP) as an oxidizer. This objective supports the goal of reducing future AP contamination in groundwater by reducing the need for production and use of AP as an oxidizer in solid rocket motors. The propellants developed must match current performance and hazards to meet the objective. To formulate propellants that don't rely on AP, combinations of oxidizers must be exploited. We selected four new supplemental oxidizers to focus on initially. These include the inorganic oxidizer ammonium di(nitramido) amine (ADNA); the cyclic nitramine/gem-dinitro compounds such as 1,3,5,5-tetranitrohexahydropyrimidine (DNNC) and 1,3,3,5,7,7-hexanitro-1,5- diazacyclooctane (HCO) and by adding the dinitroethylene attachment to nitramide functions as seen in diammonium di(nitramido) dinitroethylene (ADNDNE). The four compounds are predicted to have a low lipophilic nature. This favors migration to surface water or ground water but also indicates these compounds would not bioconcentrate into aquatic organisms or biomagnify within the food chain. Direct toxicity to aquatic organisms is also predicted to be very low.

DTIC

Alternatives; Ammonium Perchlorates; Missiles; Oxidizers; Propulsion; Rocket Oxidizers

20080033462 Applied Research Associates, Inc., Tyndall AFB, FL USA

Determination of In Situ-Generated Dimethyldioxirane From an Aqueous Matrix Using Selected Ion Monitoring

Delcomyn, Carrie A; MacLean, H S; Renard, Jean J; Henley, Michael V; Jul 2005; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F08637-03-C-6006; Proj-ARMT

Report No.(s): AD-A480840; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There is a growing interest in utilizing in situ-generated dimethyldioxirane (DMDO) as an oxidant for synthetic purposes and bleaching and decontamination applications, but the ability to quantify the organic cyclic peroxide species is often complicated by the presence of other reactive components, peroxymonosulfate and acetone, within the solution matrix. This paper is the first to report the use of a MS method for the quantitation of DMDO from these complex matrices by utilizing an isothermal 30◦C GC program in conjunction with selected ion monitoring(SIM). The volatile organic species is sampled from the headspace of closed batch system vials and quantified by measuring the abundance of m/z 74. The method achieves a practical quantitation limit (PQL) for DMDO of 0.033 mM, and methyl acetate is identified as a minor decomposition product from the aqueous sample matrix, contributing 9% towards the overall DMDO measurements. The spectroscopic method makes use of common analytical instrumentation and is capable of measuring other in situ-generated dioxiranes, such as those generated from 2-butanone and [2H6] acetone.

DTIC

Acetates; Methyl Compounds; Oxidizers

20080033465 Air Force Research Lab., Edwards AFB, CA USA

Design of Energetic Ionic Liquids (Preprint)

Boatz, Jerry A; Li, Hui; Gordon, Mark S; Aug 27, 2007; 8 pp.; In English

Contract(s)/Grant(s): Proj-23030423

Report No.(s): AD-A480853; AFRL-PR-ED-JA-2007-417; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An essential need of the US Air Force is the discovery, development, and fielding of new, energetic materials for advanced chemical propulsion in space and missile applications. Some of the key factors driving the requirement for new chemical propellants include: (a) improved performance in terms of increased specific impulse and density, (b) reduced sensitivity to external stimuli such as impact, friction, shock, and electrostatic discharge, and (c) mitigation of environmental and toxicological hazards (and the resulting costs) associated with currently used propellants.

DTIC

Chemical Properties; Liquids; Propulsion System Configurations; Propulsion System Performance; Toxic Hazards

20080033489 Naval Research Lab., Washington, DC USA

Formation of Primary Amines on Silicon Nitride Surfaces: a Direct, Plasma-Based Pathway to Functionalization

Stine Christina L /Cole, Rory; Ainslie, Kristy M; Mulvaney, Shawn P; Whitman, Lloyd J; Jan 19, 2007; 6 pp.; In English

Report No.(s): AD-A480927; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Silicon nitride is the most commonly used passivation layer in biosensor applications where electronic components must be interfaced with ionic solutions. Unfortunately, the predominant method for functionalizing silicon nitride surfaces, silane chemistry, suffers from a lack of reproducibility. As an alternative, we have developed a silane-free pathway that allows for the direct functionalization of silicon nitride through the creation of primary amines formed by exposure to a radio frequency glow discharge plasma fed with humidified air. The aminated surfaces can then be further functionalized by a variety of methods; here we demonstrate using glutaraldehyde as a bifunctional linker to attach a robust NeutrAvidin (NA) protein layer. Optimal amine formation, based on plasma exposure time, was determined by labeling treated surfaces with an amine-specific fluorinated probe and characterizing the coverage using X-ray photoelectron spectroscopy (XPS). XPS and radiolabeling studies also reveal that plasma-modified surfaces, as compared with silane-modified surfaces, result in similar NA surface coverage, but notably better reproducibility.

DTIC

Amines; Photoelectron Spectroscopy; Plasmas (Physics); Silicon Nitrides; X Ray Spectroscopy

20080033498 Air Force Research Lab., Edwards AFB, CA USA

ExB Measurements of a 200 W Xenon Hall Thruster (Preprint)

Ekholm, Jared M; Hargus, Jr, William A; Aug 28, 2007; 24 pp.; In English

Report No.(s): AD-A480956; AFRL-RZ-ED-JA-2007-402; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Angularly resolved ion species fractions of Xe+1, Xe+2, and Xe+3 in a low power xenon Hall thruster Busek BHT-200 plume were measured using an ExB probe under a variety of thruster operating conditions and background pressures. The thruster was operated at several operating conditions by varying the anode potential of the thruster from 200 V to 325 V in 25 V increments. Measurements of the ion species fractions were made 90 from thruster centerline 60 cm downstream of the exit plane. At reduced discharge voltages, the species fractions of multiply-charged xenon ions were lower, while at increased discharge voltages, Xe+2 and Xe+3 showed an increase in their respective ion species fractions. At angles greater than 35 , a low energy peak was observed suggesting additional collisions in the far-field produce a low energy ion population. Finally, measurements were directed toward characterizing chamber backpressure effects on the plume species fractions at oblique angles between 35-90 . In the presence of additional background neutrals, production of mutiply-charged ions increased throughout the plume as a result of increased collisions and scattering.

DTIC

Hall Thrusters; Ion Engines

20080033501 Naval Research Lab., Washington, DC USA

Laser Plasma Instability Experiments with KrF Lasers

Weaver, J L; Oh, J; Afeyan, B; Phillips, L; Seely, J; Feldman, U; Brown, C; Karasik,, M; Serlin, V; Aglitskiy, Y; Mostovych, A N; Jan 2007; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480964; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Deleterious effects of laser-plasma instability (LPI) may limit the maximum laser irradiation that can be used for inertial confinement fusion. The short wavelength (248 nm), large bandwidth, and very uniform illumination available with krypton-fluoride (KrF) lasers should increase the maximum usable intensity by suppressing LPI. The concomitant increase in ablation pressure would allow implosion of low aspect ratio pellets to ignition with substantial gain (>20) at much reduced laser energy. The proposed KrF laser based Fusion Test Facility (FTF) would exploit this strategy to achieve significant fusion power (150 MW) with a rep-rate system that has a per pulse laser energy well below 1 megajoule. Measurements of LPI using the Nike KrF laser are presented at and above intensities needed for the FTF (I~2x1015 W/cm2). The results to date indicate that LPI is indeed suppressed. With overlapped beam intensity above the planar, single beam intensity threshold for the two-plasmon decay instability, no evidence of instability was observed via measurements of 3/2 omega(o) and 1/2 omega(o) harmonic emissions.

DTIC

Krypton; Laser Beams; Laser Plasmas; Lasers; Magnetohydrodynamic Stability

20080033533 Quallion, LLC, Sylmar, CA, USA

Electrochemical Device Having An Electrolyte that Includes a Tetrasiloxane

West, R. C., Inventor; Amine, K., Inventor; Zhang, Z., Inventor; Wang, Q., Inventor; Vissers, D. R., Inventor; 21 Oct 04; 19 pp.; In English

Contract(s)/Grant(s): 70NANB04022

Patent Info.: Filed Filed 21 Oct 04; US-Patent-Appl-SN-10-971 926

Report No.(s): PB2008-101475; No Copyright; Avail.: CASI: A03, Hardcopy

The electrochemical device has an electrolyte that includes one or more tetrasiloxanes. The tetrasiloxanes have a backbone with two central silicons and two terminal silicons. A first one of the silicons is linked to a side chain that includes a poly(alkylene oxide) moiety. A second one of the silicons is linked to a side chain that includes a poly(alkylene oxide) moiety or to a side chain that includes a cyclic carbonate moiety. When each of the central silicons is linked to a side chain that includes a poly(alkylene oxide) moiety, each of the central silicons is directly linked to the poly(alkylene oxide) moiety.

NTIS

Electrochemical Cells; Electrolytes; Patent Applications

20080033548 Fulbright and Jaworski, LLP, Austin, TX, USA

Pharmaceutical Compositions from Ethnobotanicals

Shimasaki, C. D., Inventor; Ojwang, J. O., Inventor; 20 Jun 05; 24 pp.; In English

Contract(s)/Grant(s): NIH-R43-HI46848; NIH-R44-AI46848

Patent Info.: Filed Filed 20 Jun 05; US-Patent-Appl-SN-11-157 129

Report No.(s): PB2008-100667; No Copyright; Avail.: CASI: A03, Hardcopy

This invention relates to the field of drug discovery. Specifically, it describes a method ('Inverted Drug Screening' or 'IDS(Trade Name')) of identifying therapeutics from ethnobotanical (EB) preparations by repeatedly fractionating and testing fractions from EB sources. One aspect of the invention relates to quinic acid derivatives (e.g., derivatives of 3,5-dicaffeoyl quinic acid) for the treatment of respiratory syncytial virus (RSV) infection.

NTIS

Drugs; Pharmacology; Identifying; Fractionation

20080033557 Army Research Lab., Adelphi, MD USA

Biomimetic Approach to Solar Cells Based on TiO2 Nanotubes

Allen, Jan L; Lee, Ivan C; Wolfenstine, Jeff; Apr 2008; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480692; ARL-TN-312; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this research was to explore the use of nanotube titanium dioxide (TiO2) as an electrode material in dye-sensitized solar cells in order to further the development of solar cell technology. TiO2 nanotubes were successfully synthesized by hydrothermal methods, working solar cells were constructed, and comparisons were made between nanospherical TiO2 and nanotubular TiO2. The results showed an increase in the maximum photocurrent density, Jsc, at the expense of a lowered fill factor that led to a lowered cell efficiency. It is suggested that improvements can be realized by the use of aligned TiO2 nanotubes in order to enable a higher packing density of the nanotubes that would lead to a higher photocurrent density per square centimeter, thereby converting a portion of the incoming solar energy into electrical energy.

DTIC

Biomimetics; Nanotubes; Packing Density; Solar Cells; Titanium Oxides

20080033560 SemiSouth Labs., Inc., Starkville, MS USA

High-Density Power Supplies Using Silicon Carbide (SiC) Delivery Order 0001

Sheridan, David C; Mar 2008; 70 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-06-D-2608-0001; Proj-1168

Report No.(s): AD-A480687; AFRL-SSL-012-FR-2006-12; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This program was designed to improve the reliability and performance of electrical power systems and components, while reducing operational life cycle costs for a wide variety of aircraft and space electrical power-system generation, conditioning, and utilization equipment applications. To achieve these objectives, research efforts were conducted for the advancement of silicon carbide (SiC) power device technology in the technical areas of advanced design, manufacturability, and component reliability. This delivery order was successful in developing of a normally off enhancement mode vertical junction field effect

transistor (VJFET) switch that is capable of blocking 600V-1200V with a zero voltage gate bias. These devices were shown to operate and maintain blocking voltage up to 200 C, and could be used as a high temperature and harsh-environment capable transistor technology. Reliability of the VJFET device was also investigated showing excellent stability after initial infant mortality issues were screened.
DTIC
Silicon Carbides; Supplying

20080033610 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Development of a Screening Tool to Facilitate Technology Transfer of an Innovative Technology to Treat Perchlorate-Contaminated Water
Craig, Daniel A; Mar 2008; 145 pp.; In English
Report No.(s): AD-A480654; AFIT/GEM/ENV/08-M06; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480654

Perchlorate contamination of drinking water is a significant problem nationwide. The purpose of this study was to develop a tool to predict the cost and performance of tailored granular activated carbon (T-GAC), an innovative technology that is being evaluated as a cost-effective treatment for perchlorate-contaminated water. The ability to accurately predict performance and cost can facilitate the transfer and commercialization of innovative technologies. In the study, a model was developed to predict T-GAC performance and life-cycle costs for removing perchlorate under varying influent water quality and technology operating conditions. The model's design parameters were obtained from laboratory rapid small-scale column tests (RSSCTs) using inverse modeling. Cost data used in the model were based on conventional GAC installations, modified to account for tailoring. The parameterized model was used to predict the observed performance from a pilot-scale field demonstration at a water treatment plant in Southern California. The model over-predicted field performance; however, it predicted reasonably well the results of laboratory RSSCTs for two waters that were not used to calibrate the model. Using the screening model, it was found that annual operation and maintenance (O&M) costs are more significant than capital costs, and that costs associated with media regeneration or replacement dominate the O&M costs.
DTIC
Contamination; Perchlorates; Potable Water; Technology Transfer; Water; Water Treatment

20080033742 Air Force Research Lab., Kirkland AFB, NM USA
Effects of Electronic Quantum Interference, Photonic-Crystal Cavity, Longitudinal Field and Surface-Plasmon-Polariton for Optical Amplification
Cardimona, D A; Alsing, Paul M; Huang, Danhong; Apr 9, 2008; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480402; AFRL-RV-PS-TR-2008-1030; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480402

Some possibilities for coherent optical amplification of a normally-incident and weak radiation field are reviewed based on various physical mechanisms, such as electronic quantum interference induced by a coupling laser field in a three-level system, field enhancement through the cavity confinement of a radiation field in a photonic crystal and field concentration seen in a transmitted near field through a metallic surface grating due to excitation of surface-plasmon-polariton modes. Numerical results are presented and discussed to demonstrate these interesting effects. The important role played by a longitudinal field resulting from the absorption by an induced three-dimensional
DTIC
Amplification; Cavities; Crystal Field Theory; Crystals; Laser Cavities; Optical Properties; Plasmons; Polaritons; Polarity; Quantum Theory

20080033896 Greer, Burns and Crain, Chicago, IL, USA; Illinois Univ., Urbana-Champaign, IL, USA
Microplasma Devices Excited by Interdigitated Electrodes
Eden, J. G., Inventor; Kim, S. O., Inventor; 8 Nov 04; 8 pp.; In English
Contract(s)/Grant(s): AFOSR-F9620-00-1-0391
Patent Info.: Filed Filed 8 Nov 04; US-Patent-Appl-SN-10-984 022
Report No.(s): PB2008-100977; No Copyright; Avail.: CASI: A02, Hardcopy

A method for fabricating microplasma discharge devices and arrays. The method employs techniques drawn from

semiconductor device fabrication, such as chemical processing and photolithography, to produce arrays of devices inexpensively. An interdigitated electrode array is deposited on a first substrate. Cavities are formed in a second substrate by laser micromachining, etching, or by chemical (wet or dry) etching and the second substrate is overlaid on the electrode array. The inter-electrode spacing and electrode width are set so that each cavity has at least one pair of electrodes underneath it to excite a microplasma discharge in the cavity. The need to precisely register the two substrates is thus avoided.
NTIS
Electrodes; Microplasmas; Patent Applications; Plasma Jets

20080034537 Lawrence Livermore National Lab., Livermore, CA USA
Anodic Polarization Behavior of Titanium Grade 7 in Dust Deliquescence Salt Environments
Evans, K. J.; Rebak, R. B.; Mar. 12, 2007; 10 pp.; In English
Report No.(s): DE2007-914604; UCRL-PROC-228934; No Copyright; Avail.: Department of Energy Information Bridge

It is planned to use the highly corrosion resistant titanium grade 7 (Ti Gr 7) and a high strength titanium alloy (Ti Gr 29) to fabricate the drip shield for the Yucca Mountain repository. Ti Gr 7 contains 0.15% Palladium (Pd) to increase its corrosion performance, mainly under reducing conditions. It was important to determine the corrosion behavior of Ti Gr 7 in concentrated brines at temperatures higher than 100DGC, which may represent the behavior of dust deliquescence solutions. Tests were performed in concentrated NaCl + KCl solutions containing also nitrates and fluorides. Results show that Ti Gr 7 was highly resistant to general and localized corrosion. Some specimens were polarized to potentials higher than 4 volts. None of the tightly creviced specimens suffered crevice corrosion. The presence of fluoride promoted localized corrosion around the edges of the crevice former.
NTIS
Corrosion Resistance; Dust; Polarization (Charge Separation); Titanium

20080034539 Lawrence Livermore National Lab., Livermore, CA USA
Long-Term Corrosion Test Facility at the Lawrence Livermore National Laboratory
Fix, D. V.; Rebak, R. B.; Mar. 24, 2007; 9 pp.; In English
Report No.(s): DE2007-914600; UCRL-PROC-229377; No Copyright; Avail.: Department of Energy Information Bridge

The long-term corrosion test facility (LTCTF) at the Lawrence Livermore National Laboratory (LLNL) consisted of 22 vessels that housed more than 7,000 corrosion test specimens from carbon steels to highly corrosion resistant materials such Alloy 22 and Ti Grade 7. The specimens from LTCTF range from standard weight-loss coupons to U-bend specimens for testing susceptibility to environmentally assisted cracking. Each vessel contained approximately 1000 liters of concentrated brines at 60DGC or 90DGC. The LTCTF started its operations in late 1996. The thousands of specimens from the LTCTF were removed in August-September 2006. The specimens are being catalogued and stored for future characterization. Previously removed specimens (e.g. 1 and 5 years) are also archived for further studies.
NTIS
Corrosion Tests; Test Facilities

20080034550 Los Alamos National Lab., NM USA; Wisconsin Univ., Madison, WI, USA
Surface Treatment to Improve Corrosion Resistance in Lead-Alloy Coolants. Final Report
Allen, T. R.; Sridharan, K.; Machut, M. T.; Aug. 29, 2007; 44 pp.; In English
Contract(s)/Grant(s): DE-FG07-04ID14600
Report No.(s): DE2007-914530; DOEID-14708; No Copyright; Avail.: Department of Energy Information Bridge

One of the six proposed advanced reactor designs of the Generation IV Initiative, the Leadcooled Fast Reactor (LFR) possesses many characteristics that make it a desirable candidate for future nuclear energy production and responsible actinide management. These characteristics include favorable heat transfer, fluid dynamics, and neutronic performance compared to other candidate coolants. However, the use of a heavy liquid metal coolant presents a challenge for reactor designers in regards to reliable structural and fuel cladding materials in both a highly corrosive high temperature liquid metal and an intense radiation fieldi. Flow corrosion studies at the University of Wisconsin have examined the corrosion performance of candidate materials for application in the LFR concept as well as the viability of various surface treatments to improve the materials compatibility. To date this research has included several focus areas, which include the formulation of an understanding of corrosion mechanisms and the examination of the effects of chemical and mechanical surface modifications on the materials performance in liquid lead-bismuth by experimental testing in Los Alamos National Laboratorys DELTA Loop, as well as comparison of experimental findings to numerical and physical models for long term corrosion prediction. This report will first

review the literature and introduce the experiments and data that will be used to benchmark theoretical calculations. The experimental results will be followed by a brief review of the underlying theory and methodology for the physical and theoretical models. Finally, the results of theoretical calculations as well as experimentally obtained benchmarks and comparisons to the literature are presented.
NTIS
Coolants; Corrosion Resistance; Lead Alloys; Nuclear Reactors; Surface Treatment

20080034570 Lawrence Livermore National Lab., Livermore, CA USA
Long-Term Corrosion Potential Behavior of Alloy 22 in Hot 5 m CaC12 + 5 m Ca (NO3)2 Brines
Rodriquez, M. A.; Carranza, R. M.; Stuart, M. L.; Rebak, R. B.; Feb. 22, 2007; 12 pp.; In English
Report No.(s): DE2007-914605; UCRL-PROC-228250; No Copyright; Avail.: Department of Energy Information Bridge

Alloy 22 is a nickel base alloy highly resistant to all forms of corrosion. In very aggressive conditions (e.g. hot concentrated chloride containing brines) Alloy 22 could suffer localized attack, namely pitting and crevice corrosion. The occurrence of localized corrosion in a given environment is governed by the values of the critical potential (Ecrit) for crevice corrosion and the corrosion potential (Ecorr) that the alloy may establish in the studied environment. If Ecorr is equal or higher than Ecrit, localized corrosion may be expected. This paper discusses the evolution of Ecorr of Alloy 22 specimens in 5 m CaCl2 + 5 m Ca(NO3)2 brines at 100DGC and 120DGC. Two types of specimens were used, polished as-welded (ASW) creviced and noncreviced specimens and as-welded plus solution heat-treated (ASW+SHT) creviced specimens. The latter contained the black annealing oxide film on the surface. Results show that, for all types of Alloy 22 specimens the Ecorr was higher at 120DGC than at 100DGC, probably because a more protective film formed at the higher temperature. Specimens with the black oxide film on the surface showed more oscillations in the potential. None of the tested specimens suffered crevice corrosion probably because of the relatively high concentration of nitrate in the electrolyte, R = (NO3)/(Cl) = 1.
NTIS
Brines; Chlorides; Corrosion; Corrosion Resistance; Nickel Alloys

20080034585 Lawrence Livermore National Lab., Livermore, CA USA
Long Term Electrochemical Behavior of Creviced and Non-Creviced Alloy 22 in CaC12 + Ca(NO3)2 Brines at 155 degrees C
Rodgriquez, M. A.; Stuart, M. L.; Rebak, R. B.; Nov. 09, 2006; 24 pp.; In English
Report No.(s): DE2007-902348; UCRL-CONF-225959; No Copyright; Avail.: National Technical Information Service (NTIS)

Alloy 22 is a nickel base alloy highly resistant to all forms of corrosion. In very aggressive conditions (e.g. hot concentrated chloride containing brines) Alloy 22 could suffer localized attack, namely pitting and crevice corrosion. Chloride ion is known to be the most detrimental aggressive agent for Alloy 22 and is able to promote crevice corrosion when tight crevices exist in hot chloride containing solutions of different concentrations. Nitrate ion is an effective inhibitor of chloride induced crevice corrosion when present in a high enough (NO3 -)/(Cl-) ratio. The occurrence of localized corrosion in a given environment is governed by the values of the critical potential (Ecrit) for crevice corrosion and the corrosion potential (Ecorr) that the alloy may establish in the studied environment. If Ecorr is equal or higher than Ecrit, localized corrosion may be expected. This paper discusses the evolution of Ecorr and corrosion rate (CR) of Alloy 22 specimens in 18 m CaCl2 + 9 m Ca(NO3)2 and 18 m CaCl2 + 0.9 m Ca(NO3)2 brines at 155DGC. Two types of specimens were used, polished as-welded (ASW) creviced and non-creviced specimens and as-welded plus solution heat-treated (ASW+SHT) creviced specimens. The latter contained the black annealing oxide film on the surface. Results show that, in a few immersion days Ecorr reached a stable value higher than the open circuit potential of a platinum electrode in 18 m CaCl2 + 9 m Ca(NO3)2 for all specimens tested. Specimens tested in this solution did not suffer any type of localized attack. On the other hand, Ecorr showed oscillations of up to 600 mV in 18 m CaCl2 + 0.9 m Ca(NO3)2 during the entire immersion period. These oscillations were due to pitting corrosion development. Crevice corrosion was not observed in any testing case.
NTIS
Brines; Chlorides; Corrosion; Corrosion Resistance; Cracks; Nitrates

20080034587 Lawrence Livermore National Lab., Livermore, CA USA

Demonstration of Reduced Radiation Losses in Hohlraums Made from Cocktail Mixtures by Measuring Increased Radiation Temperatures

Jones, O.; Schein, J.; Rosen, M.; Suter, L.; Wallace, R.; Nov. 06, 2006; 48 pp.; In English

Report No.(s): DE2007-902238; UCRL-PROC-225891; No Copyright; Avail.: National Technical Information Service (NTIS)

We present results from experiments, numerical simulations, and analytic modeling that demonstrate enhanced radiation confinement of hohlraums made from cocktail materials. We summarize the results from several previous planar sample experiments that showed the potential promise of cocktails. We then discuss a series of more recent hohlraum experiments that attempted to demonstrate enhanced radiation confinement. Once we understood the importance of oxygen contamination in increasing the specific heat and wall losses of uranium-based cocktails, we implemented new manufacturing and handling techniques for cocktail hohlraums that led to our demonstration of a significant increase in radiation temperature (up to +7eV at 300 eV) compared to a pure Au hohlraum. This data agrees well with modeling and suggests we can expect an 18% reduction in wall loss (and 10% reduction in laser energy) for the current ignition design by switching to cocktail hohlraums. NTIS

Hohlraums; Oxygen

20080034591 Gordon Research Conferences, West Kingston, RI, USA

Electrochemistry, Gordon Research Conference

January 2006; 11 pp.; In English

Contract(s)/Grant(s): DE-FG02-06ER15774

Report No.(s): DE2007-901626; No Copyright; Avail.: Department of Energy Information Bridge

The Gordon Research Conference (GRC) on Electrochemistry was held at Ynez Valley Marriott, Buellton, California, February 12-17, 2006. The conference was well attended with 113 participants. The attendees represented the spectrum of endeavor in this field coming from academia, industry, and government laboratories, both U. S. and foreign scientists, senior researchers, young investigators, and students. In designing the formal speakers program, emphasis was placed on current unpublished research and discussion of the future target areas in this field. There was a conscious effort to stimulate lively discussion about the key issues in the field today. The Gordon Research Conferences provide an international forum for the presentation and discussion of frontier research in the biological, chemical, and physical sciences, and their related technologies.

NTIS

Conferences; Electrochemistry; Physical Sciences

20080034596 Georgia Inst. of Tech., Atlanta, GA USA

Gas-Expanded Liquids: Synergism of Experimental and Computational Determinations of Local Structure

Eckert, C. A.; Liotta, C. L.; Harnandez, R.; January 2007; 14 pp.; In English

Contract(s)/Grant(s): DE-FG02-04ER15521

Report No.(s): DE2007-910459; No Copyright; Avail.: National Technical Information Service (NTIS)

This project focuses on the characterization of a new class of solvent systems called gas expanded liquids (GXLs), targeted for green-chemistry processing. The collaboration has adopted a synergistic approach combining elements of molecular dynamics (MD) simulation and spectroscopic experiments to explore the local solvent behavior that could not be studied by simulation or experiment alone.

NTIS

Liquids; Solvents

20080034610 Sandia National Labs., Albuquerque, NM USA

NHI Component Technical Readiness Evaluation System. Global 2007

Sherman, S. R.; Wilson, D. F.; Pawel, S. J.; Sep. 2007; 8 pp.; In English

Report No.(s): DE2007-912439; INL/CON-07-12179; No Copyright; Avail.: Department of Energy Information Bridge

A decision process for evaluating the technical readiness or maturity of components (i.e., heat exchangers, chemical reactors, valves, etc.) for use by the U.S. DOE Nuclear Hydrogen Initiative is described. This system is used by the DOE NHI to assess individual components in relation to their readiness for pilot-scale and larger-scale deployment and to drive the

research and development work needed to attain technical maturity. A description of the evaluation system is provided, and examples are given to illustrate how it is used to assist in component R&D decisions.
NTIS
Hydrogen; Chemical Reactors; Heat Exchangers; Nuclear Energy

20080034625 Idaho National Engineering Lab., Idaho Falls, ID, USA
Chemical Gradients in Crud on Boiling Water Reactor Fuel Elements. Energy for the Future
Porter, D. L.; Janney, D. E.; Apr. 2007; 7 pp.; In English
Report No.(s): DE2007-915536; INL/CON-07-12474; No Copyright; Avail.: Department of Energy Information Bridge

Crud (radioactive corrosion products formed inside nuclear reactors) is a major problem in commercial power-producing nuclear reactors. Although there are numerous studies of simulated (non-radioactive) crud, characteristics of crud from actual reactors are rarely studied. This study reports scanning electron microscope (SEM) studies of fragments of crud from a commercially operating boiling water reactor. Chemical analyses in the SEM indicated that the crud closest to the outer surfaces of the fuel pins in some areas had Fe:Zn ratios close to 2:1, which decreased away from the fuel pin in some of the fragments. In combination with transmission electron microsope analyses (published elsewhere), these results suggest that the innermost layer of crud in some areas may consist of franklinite (ZnFe2O4, also called zinc spinel), while outer layers in these areas may be predominantly iron oxides.
NTIS
Boiling Water Reactors; Corrosion; Nuclear Fuels; Power Reactors

20080034629 Idaho National Engineering Lab., Idaho Falls, ID, USA
Hydrogen and Oxygen Gas Monitoring System Design and Operation. Safety and Technology of Nuclear Hydrogen Production, Control, and Management
Cadwallader, L. C.; DeWall, K. G.; Herring, J. S.; Jun. 2007; 15 pp.; In English
Report No.(s): DE2007-915528; INL/CON-07-12079; No Copyright; Avail.: Department of Energy Information Bridge

This paper describes pertinent design practices of selecting types of monitors, monitor unit placement, setpoint selection, and maintenance considerations for gas monitors. While hydrogen gas monitors and enriched oxygen atmosphere monitors as they would be needed for hydrogen production experiments are the primary focus of this paper, monitors for carbon monoxide and carbon dioxide are also discussed. The experiences of designing, installing, and calibrating gas monitors for a laboratory where experiments in support of the DOE Nuclear Hydrogen Initiative (NHI) are described along with codes, standards, and regulations for these monitors. Information from the literature about best operating practices is also presented. The NHI program has two types of activities. The first, near-term activity is laboratory and pilot-plant experimentation with different processes in the kilogram per day scale to select the most promising types of processes for future applications of hydrogen production. Prudent design calls for indoor gas monitors to sense any hydrogen leaks within these laboratory rooms. The second, longer-term activity is the prototype, or large-scale plants to produce tons of hydrogen per day. These large, outdoor production plants will require area (or fencepost) monitoring of hydrogen gas leaks. Some processes will have oxygen production with hydrogen production, and any oxygen releases are also safety concerns since oxygen gas is the strongest oxidizer. Monitoring of these gases is important for personnel safety of both indoor and outdoor experiments.
NTIS
Gas Analysis; Hydrogen; Hydrogen Production; Monitors; Nuclear Power Plants; Oxygen; Oxygen Supply Equipment; Production Management; Safety Devices; Systems Engineering

20080034672 Gibb Intellectural Property Law Firm, LLC, Annapolis, MD, USA
Dumbbell-Like Nanoparticles and a Process of Forming the Same
Sun, S., Inventor; Yu, H., Inventor; Wang, S. X., Inventor; 10 Sep 04; 30 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0885
Patent Info.: Filed Filed 10 Sep 04; US-Patent-Appl-SN-10-938 897
Report No.(s): PB2008-101240; No Copyright; Avail.: CASI: A03, Hardcopy

Dumbbell-shaped or flower-shaped nanoparticles and a process of forming the same, wherein the process comprises forming a mixture of a nanoparticle with a precursor in a first solvent, wherein the nanoparticle comprises a hydrophobic outer coating; heating the mixture; cooling the mixture to room temperature; modifying the hydrophobic outer coating into a hydrophilic outer coating; precipitating a solid product from the mixture, and dispersing the product in a second solvent. The nanoparticles comprise any of a semiconducting, magnetic, and noble metallic material, wherein the nanoparticles comprise

a first portion comprising any of PbSe, PbS, CdSe, CdS, ZnS, Au, Ag, Pd, and Pt, and wherein the precursor comprises any of a cationic, neutral or particulate Au, Ag, Pd, Pt, or transition metal (Fe, Co, Ni) precursors of Fe(CO)(sub 5), Co(CO)(sub 8), Ni(CO)(sub 4) or their analogues. The first and second solvents comprise any of alkanes, arenes, ethers, nitrites, ketones, and chlorinated hydrocarbons.
NTIS
Nanoparticles; Patent Applications

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METALS AND METALLIC MATERIALS

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

20080032797 Argonne National Lab., Idaho Falls, ID, USA
Microstructure Evolution During Spray Rolling and Heat Treatment of 2124 AI
McHugh, K. M.; Lin, Y.; Zhou, Y.; Johnson, S. B.; Delplanque, J. P.; Sep. 2006; 13 pp.; In English
Report No.(s): DE2007-911655; INL/CON-06-11193; No Copyright; Avail.: Department of Energy Information Bridge

Spray rolling is a strip casting technology that combines elements of spray forming and twin-roll casting. It consists of atomizing molten metal with a high velocity inert gas, quenching the resultant droplets in flight, and directing the spray between mill rolls. In-flight convection heat transfer from atomized droplets and conduction heat transfer at the rolls rapidly move an alloys latent heat. Hot deformation of the semi-solid material in the rolls results in fully consolidated, rapidly-solidified product. While similar in many ways to twin-roll casting, spray rolling is able to process a broader range of alloys and operates at a higher production rate. A laboratory-scale strip caster has been constructed at INL and used to evaluate the interplay of processing parameters and strip quality while producing strips up to 200 mm wide and 1.6--6.4 mm thick. Plans are underway to scale to 600 mm width and demonstrate steady-state operation. As-spray-rolled strip is characterized by a flat, uniformly thick profile with minimal porosity or segregation. This paper examines how processing parameters influence the microstructure transformations that take place during spray rolling and post-deposition heat treatment of 2124 Al.
NTIS
Aluminum; Coating; Heat Treatment; Microstructure; Sprayers

20080032811 NASA Marshall Space Flight Center, Huntsville, AL, USA
Modifications and Modeling of the Fission Surface Power Primary Test Circuit (FSP-PTC)
Garber, Anne E.; June 08, 2008; 1 pp.; In English; 2008 International Congress on Advances in Nuclear Power Plants (ICAPP), 8-12 Jun. 2008, California, USA; No Copyright; Avail.: Other Sources; Abstract Only

An actively pumped alkali metal flow circuit, designed and fabricated at the NASA Marshall Space Flight Center, underwent a range of tests at MSFC in early 2007. During this period, system transient responses and the performance of the liquid metal pump were evaluated. In May of2007, the circuit was drained and cleaned to prepare for multiple modifications: the addition of larger upper and lower reservoirs, the installation of an annular linear induction pump (ALIP), and the inclusion of a closeable orifice in the test section. Performance of the ALIP, provided by Idaho National Laboratory (INL), will be evaluated when testing resumes. Data from the first round of testing has been used to refine the working system model, developed using the Generalized Fluid System Simulation Program (GFSSP). This paper covers the modifications of the FSP-PTC and the updated GFSSP system model.
Author
Alkali Metals; Fission; Test Chambers; Liquid Metals; Circuits; Transient Response

20080032812 NASA Marshall Space Flight Center, Huntsville, AL, USA
High-precision Non-Contact Measurement of Creep of Ultra-High Temperature Materials for Aerospace
Rogers, Jan R.; Hyers, Robert; June 23, 2008; 1 pp.; In English; 2008 National Space and Missile Materials Symposium,, 23-27 Jun. 2008, Nevada, USA; Copyright; Avail.: Other Sources; Abstract Only

For high-temperature applications (greater than 2,000 C) such as solid rocket motors, hypersonic aircraft, nuclear electric/thermal propulsion for spacecraft, and more efficient jet engines, creep becomes one of the most important design factors to be considered. Conventional creep-testing methods, where the specimen and test apparatus are in contact with each other, are limited to temperatures approximately 1,700 C. Development of alloys for higher-temperature applications is limited by the availability of testing methods at temperatures above 2000 C. Development of alloys for applications requiring a long

service life at temperatures as low as 1500 C, such as the next generation of jet turbine superalloys, is limited by the difficulty of accelerated testing at temperatures above 1700 C. For these reasons, a new, non-contact creep-measurement technique is needed for higher temperature applications. A new non-contact method for creep measurements of ultra-high-temperature metals and ceramics has been developed and validated. Using the electrostatic levitation (ESL) facility at NASA Marshall Space Flight Center, a spherical sample is rotated quickly enough to cause creep deformation due to centrifugal acceleration. Very accurate measurement of the deformed shape through digital image analysis allows the stress exponent n to be determined very precisely from a single test, rather than from numerous conventional tests. Validation tests on single-crystal niobium spheres showed excellent agreement with conventional tests at 1985 C; however the non-contact method provides much greater precision while using only about 40 milligrams of material. This method is being applied to materials including metals and ceramics for non-eroding throats in solid rockets and next-generation superalloys for turbine engines. Recent advances in the method and the current state of these new measurements will be presented.
Author
Refractory Materials; Creep Tests; Thermal Protection; Spacecraft Construction Materials; Spacecraft Design; Engine Design; Aerospace Engineering

20080032820 NASA Marshall Space Flight Center, Huntsville, AL, USA
Analysis of International Space Station Materials on MISSE-3 and MISSE-4
Finckenor, Miria M.; Golden, Johnny L.; O'Rourke, Mary Jane; June 23, 2008; 1 pp.; In English; National Space and Missile Materials Symposium, 23-27 Jun. 2008, Nevada, USA; No Copyright; Avail.: Other Sources; Abstract Only

For high-temperature applications (> 2,000 C) such as solid rocket motors, hypersonic aircraft, nuclear electric/thermal propulsion for spacecraft, and more efficient jet engines, creep becomes one of the most important design factors to be considered. Conventional creep-testing methods, where the specimen and test apparatus are in contact with each other, are limited to temperatures ~1,700 deg. C. Development of alloys for higher-temperature applications is limited by the availability of testing methods at temperatures above 2000 C. Development of alloys for applications requiring a long service life at temperatures as low as 1500 C, such as the next generation of jet turbine superalloys, is limited by the difficulty of accelerated testing at temperatures above 1700 0c. For these reasons, a new, non-contact creep-measurement technique is needed for higher temperature applications. A new non-contact method for creep measurements of ultra-high-temperature metals and ceramics has been developed and validated. Using the electrostatic levitation (ESL) facility at NASA Marshall Space Flight Center, a spherical sample is rotated quickly enough to cause creep deformation due to centrifugal acceleration. Very accurate measurement of the deformed shape through digital image analysis allows the stress exponent n to be determined very precisely from a single test, rather than from numerous conventional tests. Validation tests on single-crystal niobium spheres showed excellent agreement with conventional tests at 1985 C; however the non-contact method provides much greater precision while using only about 40 milligrams of material. This method is being applied to materials including metals and ceramics for noneroding throats in solid rockets and next-generation superalloys for turbine engines. Recent advances in the method and the current state of these new measurements will be presented.
Author
Heat Resistant Alloys; Solid Propellant Rocket Engines; Creep Tests; Hypersonic Aircraft; Nuclear Electric Propulsion; Creep Properties; Electrostatics; Levitation; Temperature Measurement

20080032825 NASA Marshall Space Flight Center, Huntsville, AL, USA; Mississippi State Univ., Mississippi State, MS, USA
Effect of Weld Tool Geometry on Friction Stir Welded Ti-6Al-4V
Querin, Joseph A.; Schneider, Judy A.; June 02, 2008; 1 pp.; In English; Trends In Welding Conference, 2-6 Jun. 2008, Georgia, USA; Copyright; Avail.: Other Sources; Abstract Only

In this study, flat 0.250' thick Ti-6Al-4V panels were friction stir welded (FSWed) using weld tools with tapered pins. The five different pin geometries of the weld tools included: 0 degree (straight cylinder), 15 degree, 30 degree, 45 degree, and 60 degree angles on the frustum. All weld tools had a smooth 7 degree concave shoulder and were made from microwave sintered tungsten carbide. For each weld tool geometry, the FSW process parameters were optimized to eliminate internal defects. All the welds were produced in position control with a 2.5 degree lead angle using a butt joint configuration for the panels. The process parameters of spindle rpm and travel speed were varied, altering the hot working conditions imparted to the workpiece. Load cells on the FSWing machine allowed for the torque, the plunge force, and the plow force to be recorded during welding. Resulting mechanical properties were evaluated from tensile tests results of the FSWjoints. Variations in the material flow

were investigated by use of microstructural analysis including optical microscopy (OM), scanning electron microscopy (SEM), and orientation image mapping (aIM).
Author
Titanium Alloys; Welded Joints; Friction Stir Welding; Aluminum Alloys; Loads (Forces); Tensile Tests; Tungsten Carbides; Vanadium Alloys; Scanning Electron Microscopy

20080032829 Merchant and Gould, PC, Minneapolis, MN, USA
Monolithic Vertical Junction Field Effect Transistor and Schottky Barrier Diode Fabricated from Silicon Carbide and Method for Fabricating the Same
Mazzola, M. S., Inventor; Merrett, J. N., Inventor; 8 Jul 05; 20 pp.; In English
Contract(s)/Grant(s): F33615-01-D-2103
Patent Info.: Filed Filed 8 Jul 05; US-Patent-Appl-SN-11-176 625
Report No.(s): PB2008-100074; No Copyright; Avail.: CASI: A03, Hardcopy

A switching element combining a self-aligned, vertical junction field effect transistor with etched-implanted gate and an integrated antiparallel Schottky barrier diode is described. The anode of the diode is connected to the source of the transistor at the device level in order to reduce losses due to stray inductances. The SiC surface in the SBD anode region is conditioned through dry etching to achieve a low Schottky barrier height so as to reduce power losses associated with the turn on voltage of the SBD.
NTIS
Diodes; Fabrication; Field Effect Transistors; JFET; Patent Applications; Schottky Diodes; Silicon Carbides; Transistors

20080032942 NASA Marshall Space Flight Center, Huntsville, AL, USA
Transient Effects in Planar Solidification of Dilute Binary Alloys
Mazuruk, K.; Volz, M.P.; June 08, 2008; 1 pp.; In English; 21th AACGE-Western Section Conference on Crystal Growth and Epitaxy, 8-11 Jun. 2008, California, USA; Copyright; Avail.: Other Sources; Abstract Only

The initial transient during planar solidification of dilute binary alloys is studied in the framework of the boundary integral method that leads to the non-linear Volterra integral governing equation. An analytical solution of this equation is obtained for the case of a constant growth rate which constitutes the well-known Tiller's formula for the solute transient. The more physically relevant, constant ramping down temperature case has been studied both numerically and analytically. In particular, an asymptotic analytical solution is obtained for the initial transient behavior. A numerical technique to solve the non-linear Volterra equation is developed and the solution is obtained for a family of the governing parameters. For the rapid solidification condition, growth rate spikes have been observed even for the infinite kinetics model. When recirculating fluid flow is included into the analysis, the spike feature is dramatically diminished. Finally, we have investigated planar solidification with a fluctuating temperature field as a possible mechanism for frequently observed solute trapping bands.
Author
Binary Alloys; Solidification; Dilution; Boundary Integral Method

20080033100 NASA Marshall Space Flight Center, Huntsville, AL, USA
Deconvoluting the Friction Stir Weld Process for Optimizing Welds
Schneider, Judy; Nunes, Arthur C.; June 02, 2008; 1 pp.; In English; Trends in Welding Conference, 2-6 Jun. 2008, Pine Mountain, GA, USA; Copyright; Avail.: Other Sources; Abstract Only

In the friction stir welding process, the rotating surfaces of the pin and shoulder contact the weld metal and force a rotational flow within the weld metal. Heat, generated by the metal deformation as well as frictional slippage with the contact surface, softens the metal and makes it easier to deform. As in any thermo-mechanical processing of metal, the flow conditions are critical to the quality of the weld. For example, extrusion of metal from under the shoulder of an excessively hot weld may relax local pressure and result in wormhole defects. The trace of the weld joint in the wake of the weld may vary geometrically depending upon the flow streamlines around the tool with some geometry more vulnerable to loss of strength from joint contamination than others. The material flow path around the tool cannot be seen in real time during the weld. By using analytical 'tools' based upon the principles of mathematics and physics, a weld model can be created to compute features that can be observed. By comparing the computed observations with actual data, the weld model can be validated or adjusted to get better agreement. Inputs to the model to predict weld structures and properties include: hot working properties ofthe metal, pin tool geometry, travel rate, rotation and plunge force. Since metals record their prior hot working history, the hot working conditions imparted during FSW can be quantified by interpreting the final microstructure. Variations in texture and grain size

result from variations in the strain accommodated at a given strain rate and temperature. Microstructural data from a variety of FSWs has been correlated with prior marker studies to contribute to our understanding of the FSW process. Once this stage is reached, the weld modeling process can save significant development costs by reducing costly trial-and-error approaches to obtaining quality welds.
Author
Friction Stir Welding; Welded Joints; Deformation; Real Time Operation; Hot Working; Fluid Flow; Metals

20080033110 NASA Glenn Research Center, Cleveland, OH, USA
Effects of Solute Concentrations on Kinetic Pathways in Ni-Al-Cr Alloys
Booth-Morrison, Christopher; Weninger, Jessica; Sudbrack, Chantal K.; Mao, Zugang; Seidman, David N.; Noebe, Ronald D.; To be published in Acta Materialia Inc.; [2008]; Volume 56, No. 14, pp. 3422-3438; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NSF DMR-0241928; NSF-MRI DMR 0420532; ONR-DURIP N00014-0400798; ONR-DURIP N00014-0610539; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.actamat.2008.03.016

The kinetic pathways resulting from the formation of coherent gamma'-precipitates from the gamma-matrix are studied for two Ni-Al-Cr alloys with similar gamma'-precipitate volume fractions at 873 K. The details of the phase decompositions of Ni-7.5Al-8.5Cr at.% and Ni-5.2Al-14.2Cr at.% for aging times from 1/6 to 1024 h are investigated by atom-probe tomography, and are found to differ significantly from a mean-field description of coarsening. The morphologies of the gamma'-precipitates of the alloys are similar, though the degrees of gamma'-precipitate coagulation and coalescence differ. Quantification within the framework of classical nucleation theory reveals that differences in the chemical driving forces for phase decomposition result in differences in the nucleation behavior of the two alloys. The temporal evolution of the gamma'-precipitate average radii and the gamma-matrix supersaturations follow the predictions of classical coarsening models. The compositional trajectories of the gamma-matrix phases of the alloys are found to follow approximately the equilibrium tie-lines, while the trajectories of the gamma'-precipitates do not, resulting in significant differences in the partitioning ratios of the solute elements.
Author
Aluminum Alloys; Decomposition; Precipitates; Coalescing; Nickel Alloys

20080033299 Naval Research Lab., Bay Saint Louis, MS USA
Adaptation of Environmental Transmission Electron Microscopy (ETEM) and Electron Energy Loss Spectrometry (EELS) for Studies of Microbiologically Influenced Corrosion
Pope, Robert K; Daulton, Tyrone L; Ray, Richard I; Little, Brenda J; Aug 2000; 3 pp.; In English
Report No.(s): AD-A480616; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480616

Microbiologically influenced corrosion (MIC) is of wide concern in marine and non-marine environments. Biofilms and corrosion products associated with microorganisms cause numerous problems in aqueous environments, such as increased fluid frictional resistance, reduced heat transfer, and many types of corrosion, all of which can lead to materials failure. Corrosion of metals has been extensively examined using TEM, but examination of MIC with TEM has only just begun. Previous studies examining microbial colonization of copper surfaces and distribution throughout corrosion products demonstrate copper immobilization by bacterial biofilms. In the current study, Pseudomonas putida attachment to corroding iron particles was examined in a sealed environmental cell in a JEOL 3010 scanning transmission electron microscope (STEM).
DTIC
Corrosion; Electron Energy; Energy Dissipation; Iron; Microorganisms; Pseudomonas; Scanning Electron Microscopy; Spectrometers; Transmission Electron Microscopy

20080033415 Army Research Lab., Aberdeen Proving Ground, MD USA
Magnesium Repair by Cold Spray
Champagne, V K; Leyman, P F; Helfritch, D J; May 2008; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480713; ARL-TR-4438; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Army has experienced significant corrosion problems with magnesium alloys that are used to fabricate aircraft components. The most severe of these are associated with large and expensive transmission and gearbox housings for

rotorcraft, which have to be removed prematurely because of corrosion. Many of the parts cannot be reclaimed because there is not an existing technology that can restore them adequately for service. The U.S. Army Research Laboratory has developed a cold spray process to reclaim magnesium components that shows significant improvement over existing methods and is in the process of qualification for use on rotorcraft. The cold spray repair has been shown to have superior performance in the tests conducted to date, is inexpensive, can be incorporated into production, and has been modified for field repair, making it a feasible alternative over competing technologies. Cold spray trials were performed using aluminum powders at different deposition conditions with both helium and nitrogen carrier gas. Evaluations of the resultant cold spray aluminum coatings deposited on ZE-41A magnesium alloy substrates were conducted using microstructural analysis, hardness, bond strength, and corrosion testing.
DTIC
Magnesium; Magnesium Alloys; Maintenance; Sprayers

20080033586 Air Force Research Lab., Eglin AFB, FL USA
Orthotropic Yield Criteria for Description of the Anistropy in Tension and Compression of Sheet Metals
Plunkett, Brian; Cazacu, Oana; Barlat, Frederic; Aug 7, 2007; 22 pp.; In English
Contract(s)/Grant(s): Proj-2502
Report No.(s): AD-A480605; AFRL-RW-EG-TP-2008-7406; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480605

In this paper, yield functions describing the anisotropic behavior of textured metals are proposed. These yield functions are extensions to orthotropy of the isotropic yield function proposed by Cazacu et al. (Cazacu, O., Plunkett, B., Barlat, F., 2006. Orthotropic yield criterion for hexagonal close packed metals. Int. J. Plasticity 22, 1171-1194). Anisotropy is introduced using linear transformations of the stress deviator. It is shown that the proposed anisotropic yield functions represent with great accuracy both the tensile and compressive anisotropy in yield stresses and r-values of materials with hcp crystal structure and of metal sheets with cubic crystal structure. Furthermore, it is demonstrated that the proposed formulations can describe very accurately the anisotropic behavior of metal sheets whose tensile and compressive stresses are equal. It was shown that the accuracy in the description of the details of the flow and r-values anisotropy in both tension and compression can be further increased if more than two linear transformations are included in the formulation. If the in-plane anisotropy of the sheet in tension and compression is not very strong, the yield criterion CPB06ex2 provides a very good description of the main trends.
DTIC
Crystal Structure; Metals

20080033970 Army Research Lab., Cleveland, OH, USA
Development and Characterization of the Bonding and Integration Technologies Needed for Fabricating Silicon Carbide Based Injector Components
Halbig,Michael C.; Singh, Mrityunjay; January 27, 2008; 14 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.16.02; Copyright; Avail.: CASI: A03, Hardcopy

Advanced ceramic bonding and integration technologies play a critical role in the fabrication and application of silicon carbide based components for a number of aerospace and ground based applications. One such application is a lean direct injector for a turbine engine to achieve low NOx emissions. Ceramic to ceramic diffusion bonding and ceramic to metal brazing technologies are being developed for this injector application. For the diffusion bonding technology, titanium interlayers (coatings and foils) were used to aid in the joining of silicon carbide (SiC) substrates. The influence of such variables as surface finish, interlayer thickness, and processing time were investigated. Electron microprobe analysis was used to identify the reaction formed phases. In the diffusion bonds, an intermediate phase, Ti5Si3Cx, formed that is thermally incompatible in its thermal expansion and caused thermal stresses and cracking during the processing cool-down. Thinner interlayers of pure titanium and/or longer processing times resulted in an optimized microstructure. Tensile tests on the joined materials resulted in strengths of 13-28 MPa depending on the SiC substrate material. Nondestructive evaluation using ultrasonic immersion showed well formed bonds. For the joining technology of brazing Kovar fuel tubes to silicon carbide, preliminary development of the joining approach has begun. Various technical issues and requirements for the injector application are addressed.
Author
Ceramic Bonding; Aerospace Engineering; Silicon Carbides; Injectors; Diffusion Welding; Turbine Engines; Thermal Expansion; Thermal Stresses; Titanium

20080033971 Army Research Lab., Cleveland, OH, USA

Bonding and Integration Technologies for Silicon Carbide Based Injector Components

Halbig, Michael C.; Singh, Mrityunjay; January 27, 2008; 43 pp.; In English; 32nd International Conference and Exposition on Advanced Ceramics and Composites, 27 Jan. - 1 Feb. 2008, Daytona Beach, Fl, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.16.02; Copyright; Avail.: CASI: A03, Hardcopy

Advanced ceramic bonding and integration technologies play a critical role in the fabrication and application of silicon carbide based components for a number of aerospace and ground based applications. One such application is a lean direct injector for a turbine engine to achieve low NOx emissions. Ceramic to ceramic diffusion bonding and ceramic to metal brazing technologies are being developed for this injector application. For the diffusion bonding, titanium interlayers (PVD and foils) were used to aid in the joining of silicon carbide (SiC) substrates. The influence of such variables as surface finish, interlayer thickness (10, 20, and 50 microns), processing time and temperature, and cooling rates were investigated. Microprobe analysis was used to identify the phases in the bonded region. For bonds that were not fully reacted an intermediate phase, Ti5Si3Cx, formed that is thermally incompatible in its thermal expansion and caused thermal stresses and cracking during the processing cool-down. Thinner titanium interlayers and/or longer processing times resulted in stable and compatible phases that did not contribute to microcracking and resulted in an optimized microstructure. Tensile tests on the joined materials resulted in strengths of 13-28 MPa depending on the SiC substrate material. Non-destructive evaluation using ultrasonic immersion showed well formed bonds. For the joining technology of brazing Kovar fuel tubes to silicon carbide, preliminary development of the joining approach has begun. Various technical issues and requirements for the injector application are addressed.

Author

Aerospace Engineering; Ceramic Bonding; Turbine Engines; Injectors; Diffusion Welding; Metal Bonding; Metal Foils; Silicon Carbides; Thermal Stresses; Thermal Expansion

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*.

20080032815 Idaho National Engineering Lab., Idaho Falls, ID, USA

Evaluation of Alternate Materials for Coated Particle Fuels for the Gas-Cooled Fast Reactor. Laboratory Directed Research and Development Program FY 2006 Final Report

Demkowicz, P. A.; Wright, K.; Gan, J.; Petti, D. A.; Allen, T.; Sep. 2006; 146 pp.; In English

Report No.(s): DE2007-911682; INL/EXT-06-11749; No Copyright; Avail.: National Technical Information Service (NTIS)

Candidate ceramic materials were studied to determine their suitability as Gas-Cooled Fast Reactor particle fuel coatings. The ceramics examined in this work were: TiC, TiN, ZrC, ZrN, AlN, and SiC. The studies focused on (i) chemical reactivity of the ceramics with fission products palladium and rhodium, (ii) the thermomechanical stresses that develop in the fuel coatings from a variety of causes during burnup, and (iii) the radiation resiliency of the materials. The chemical reactivity of TiC, TiN, ZrC, and ZrN with Pd and Rh were all found to be much lower than that of SiC. A number of important chemical behaviors were observed at the ceramic-metal interfaces, including the formation of specific intermetallic phases and a variation in reaction rates for the different ceramics investigated. Based on the data collected in this work, the nitride ceramics (TiN and ZrN) exhibit chemical behavior that is characterized by lower reaction rates with Pd and Rh than the carbides TiC and ZrC. The thermomechanical stresses in spherical fuel particle ceramic coatings were modeled using finite element analysis, and included contributions from differential thermal expansion, fission gas pressure, fuel kernel swelling, and thermal creep. In general the tangential stresses in the coatings during full reactor operation are tensile, with ZrC showing the lowest values among TiC, ZrC, and SiC (TiN and ZrN were excluded from the comprehensive calculations due to a lack of available materials data). The work has highlighted the fact that thermal creep plays a critical role in the development of the stress state of the coatings by relaxing many of the stresses at high temperatures. To perform ion irradiations of sample materials, an irradiation beamline and high-temperature sample irradiation stage was constructed at the University of Wisconsins 1.7MV Tandem Accelerator Facility. This facility is now capable of irradiating of materials to high dose while controlling sample temperature up to 800 deg C.

NTIS

Ceramic Coatings; Coatings; Drops (Liquids); Fuel Sprays; Fuels; Gas Cooled Fast Reactors; Research and Development

20080032822 NASA Marshall Space Flight Center, Huntsville, AL, USA

Cherenkov and Scintillation Properties of Cubic Zirconium

Christl, M.J.; Adams, J.H.; Parnell, T.A.; Kuznetsov, E.N.; June 02, 2008; 1 pp.; In English; Symposium on Radiation Measurements and Applications, 2-5 Jun, 2008, California, USA; No Copyright; Avail.: Other Sources; Abstract Only

Cubic zirconium (CZ) is a high index of refraction (n =2.17) material that we have investigated for Cherenkov counter applications. Laboratory and proton accelerator tests of an 18cc sample of CZ show that the expected fast Cherenkov response is accompanied by a longer scintillation component that can be separated by pulse shaping. This presents the possibility of novel particle spectrometers which exploits both properties of CZ. Other high index materials being examined for Cherenkov applications will be discussed. Results from laboratory tests and an accelerator exposure will be presented and a potential application in solar energetic particle instruments will be discussed

Author

Zirconium; Scintillation; Cerenkov Counters; Refractivity; Energetic Particles

20080032887 National Inst. of Health, Bethesda, MD USA

Methods and Systems for Fabricating Electronic and/or Microfluidic Structures on Elastomeric Substrates

Carlson, R., Inventor; 1 Mar 05; 28 pp.; In English

Patent Info.: Filed Filed 1 Mar 05; US-Patent-Appl-SN-11-070 028

Report No.(s): PB2008-100032; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides methods and systems for fabricating electronic and/or microfluidic structures on elastomeric substrates. In one method, a protective structure is positioned onto a portion of a surface of the hydrophobic substrate. An unprotected portion of the surface is activated to become hydrophilic, wherein the protected portion of the surface of the substrate remains hydrophobic. The protective structure is removed from the surface of the substrate and material is deposited on the hydrophobic portion to form a structure on the substrate.

NTIS

Elastomers; Electronic Structure; Microfluidic Devices; Patent Applications

20080032892 Los Alamos National Lab., NM, USA; Department of Energy, Washington, DC USA

Preparation of High-Strength Nanometer Scale Twinned Coating and Foil

Zhang, X., Inventor; Misra, A., Inventor; Nastasi, M. A., Inventor; Hoagland, R. G., Inventor; 14 Jul 04; 13 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-36

Patent Info.: Filed Filed 14 Jul 04; US-Patent-Appl-SN-10-891 323

Report No.(s): PB2008-100031; No Copyright; Avail.: CASI: A03, Hardcopy

Very high strength single phase stainless steel coating has been prepared by magnetron sputtering onto a substrate. The coating has a unique microstructure of nanometer spaced twins that are parallel to each other and to the substrate surface. For cases where the coating and substrate do not bind strongly, the coating can be peeled off to provide foil.

NTIS

Coating; Patent Applications; Stainless Steels

20080032901 Honeywell International, Inc., Morristown, NJ, USA

Combined Effusion and Thick TBC Cooling Method

Woodcock, G. O., Inventor; Silcox, C. P., Inventor; Strangman, T. E., Inventor; Flamand, L. M., Inventor; Kawamura, H., Inventor; 23 Jul 04; 18 pp.; In English

Contract(s)/Grant(s): DAAE07-02-C-3-0002

Patent Info.: Filed Filed 23 Jul 04; US-Patent-Appl-SN-10-897 788

Report No.(s): PB2008-100607; No Copyright; Avail.: CASI: A03, Hardcopy

A method for combined effusion and thick TBC cooling comprises a providing a substrate, depositing a thick TBC onto the substrate and laser drilling an array of effusion holes through the TBC coated substrate. The thick TBC has a columnar crack structure, which gives compliance and spall resistance. The microstructure of the segmentation microcracked TBC reduces cracking and chipping of the TBC during effusion hole laser drilling.

NTIS

Cooling; Diffusion; Patent Applications; Protective Coatings

20080032938 Smith and Hopen, PA, Clearwater, FL, USA; Department of the Navy, Washington, DC, USA
Titania-Based Coating for Capillary Microextraction
Malik, A., Inventor; Kim, T., Inventor; 19 Jul 05; 23 pp.; In English
Patent Info.: Filed Filed 19 Jul 05; US-Patent-Appl-SN-11-161 005
Report No.(s): PB2008-100028; No Copyright; Avail.: CASI: A03, Hardcopy

A method is presented describing in situ preparation of the titania-based sol-gel PDMS coating and its immobilization on the inner surface of a fused silica microextraction capillary. Sol-gel titania-poly (dimethylsiloxane) (TiO.sub.2-PDMS) coating was developed for capillary microextraction (CME) to perform on-line preconcentration and HPLC analysis of trace impurities in aqueous samples. The sol-gel titania-based coatings demonstrated strong pH stability and enhanced extraction capability over other commercially availble GC coatings. Extraction characteristics of a sol-gel titania-PDMS capillary remained practically unchanged after continuous rinsing with a 0.1 M NaOH solution (pH=13) for 12 hours.
NTIS
Coating; Patent Applications; Sol-Gel Processes; Titania

20080032944 Kansas Dept. of Transportation, Topeka, KS USA
Effects of DSS Corrosion Inhibitor on Physical Characteristics of Concrete
Distlehorst, J. A.; Wojakowski, J. B.; Mar. 2007; 14 pp.; In English
Report No.(s): PB2008-100018; FHWA-KS-07-2; No Copyright; Avail.: National Technical Information Service (NTIS)

Corrosion of reinforcing steel in bridge decks and subsequent deterioration of the structure continues to challenge the materials engineering community. Hycrete DSS is a new product which has shown promising corrosion inhibiting behavior in testing by several northeastern states. The physical effects of adding DSS corrosion inhibitor to a standard Kansas concrete mix were investigated in the summer of 2003 by the concrete research staff of the Kansas Department of Transportation. Four 1.70 cubic foot batches of concrete were produced: a control mix, a mix with air-entraining admixture, a mix with Hycrete DSS, and a mixture with Hycrete DSS and a de-foaming agent. The conclusions were: (1) Hycrete DSS, used with a defoaming agent, reduces the permeability to one-tenth to one-third of plain air-entrained concrete as measured by the evapo-transpiration test; (2) The use of the de-foaming agent with the Hycrete DSS additive is highly recommended to control the amount of air in the mix. In this test, the de-foaming agent reduced the total air content by over 50%, into the normal air-content range for air-entrained concrete; (3) The addition of Hycrete DSS causes an approximately 10% strength reduction from expected valued for concrete with similar air contents; and (4) The addition of Hycrete DSS had no appreciable effect on the slump of the concrete or the proportion of entrained air content to total air content.
NTIS
Concretes; Corrosion Prevention; Steels

20080032946 Kansas State Univ., Manhattan, KS, USA
Evaluating Fiber Reinforced Polymer Repair Method for Cracked Prestressed Concrete Bridge Members Subjected to Repeated Loadings (Phase 2)
Larson, K. H.; Rasheed, H. A.; Peterman, R. J.; May 2007; 122 pp.; In English
Contract(s)/Grant(s): KSU-C1331
Report No.(s): PB2008-100017; K-TRAN-KSU-02-3; No Copyright; Avail.: National Technical Information Service (NTIS)

This research is intended to investigate the fatigue performance of pre-cracked prestressed concrete T-beams for a specific strand stress range and its relationship to the level of strengthening gained. Controlling the strand stress range is accomplished by iterative cycles of nonlinear analysis to determine the amount of external carbon Fiber Reinforced Polymer (FRP) reinforcement needed for that purpose. Five pre-tensioned prestressed concrete T-beams were cast at a prestressed concrete plant in Newton, Kansas. Beam 1 was tested under static loading up to failure as a control specimen. Beams 2 and 3 were strengthened with Carbon Fiber Reinforced Polymer (CFRP) to have a design stress range of 18 ksi under service load condition. Beams 4 and 5 were also strengthened to have a higher stress range of 36 ksi. Beams 2 and 4 were loaded monotonically to failure while Beams 3 and 5 were cycled over a million times before they were brought to failure. The design yielded one layer of flexural CFRP wrapped around the web sides up to 2.25 from the bottom for the 18 ksi stress range design. It also resulted in two layers of longitudinal CFRP for the 36 ksi stress range design, the inner layer wrapped around the web sides up to 0.5 and the outer layer went up 3 on the web sides. External CFRP stirrups were used to prevent the longitudinal CFRP from premature separation. Beams 2 and 4 successfully reached their target strengthening design levels and Beams 3 and 5 performed very well in fatigue.
NTIS
Carbon Fiber Reinforced Plastics; Carbon Fibers; Concretes; Prestressing; Structural Members

20080033074 Woodcock Washburn, LLP, Philadelphia, PA, USA

Flame Retardant Nanocomposite

Winey, K. I., Inventor; Du, F., Inventor; Haggenmueller, R., Inventor; Kashiwagi, T., Inventor; 29 Oct 04; 16 pp.; In English
Contract(s)/Grant(s): ONR-N00014-00-1-0720; ONR-R13572-416000001
Patent Info.: Filed Filed 29 Oct 04; US-Patent-Appl-SN-10-977 642
Report No.(s): PB2008-100946; No Copyright; Avail.: CASI: A03, Hardcopy

This invention relates to flame retardant nanocomposites and methods of reducing the flammability of polymeric compositions using nanotubes.

NTIS

Flame Retardants; Nanocomposites; Nanotubes; Nanostructure (Characteristics)

20080033317 Florida State Univ., Tallahassee, FL USA

Multiscale Modeling and Computation of Liquid Crystal Polymers, Polymer Blends, and Polymer Nanocomposites: Investigation of Rheology and Material Properties

Wang, Qi; Apr 15, 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49550-05-1-0025
Report No.(s): AD-A480651; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480651

High-performance polymeric materials such as liquid crystal polymers and polymer nano-particle composites have many military applications. The project aimed to study the mesoscopic structure formation during flow processing and characterization of material properties in solid states. Significant progress has been made to model the materials and to understand their rheological properties in melt or solution processing. Electrical and thermal conduction properties of the nanocomposites are characterized by the low volume fraction asymptotic approach. More anisotropic molecular configuration and their impact to the macroscopic material properties have been investigated. Applications of the models and numerical tools developed for complex fluids are used to important biological applications.

DTIC

Liquid Crystals; Polymer Blends; Rheology

20080033471 Naval Air Warfare Center, China Lake, CA USA

All-Organic Supercapacitors as Alternatives to Lithium Batteries

Prokopuk, Nicholas; May 26, 2004; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480864; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objectives of this work are to demonstrate at the laboratory scale a supercapacitor composed of conductive polymers as the electrodes that are separated by an environmentally benign electrolyte such as acetonitrile and tetraethyl ammonium triflate. The pertinent components of the capacitors must fit within the confines of a cylinder of 18 mm in diameter and 12.5 mm in height. Finally. the discharge properties of the capacitors must release a minimum of 0.2 J and maintain O.02 W for a minimum of 10 s. These metrics are required for the potential application of these power sources in medium caliber munitions. In addition, each component of the supercapacitors must not pose a risk to the environment.

DTIC

Alternatives; Capacitors; Electrochemical Capacitors; Lithium Batteries; Supplying

20080033486 Army Research Lab., Aberdeen Proving Ground, MD USA

Approaches for the Design of Ceramic Gun Barrels

Emerson, Ryan; Kaste, Robert; Carter, Robert; Burton, Larry; Swab, Jeff; Nov 1, 2006; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480918; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Army continues to be challenged to maintain the life of its cannons while introducing more robust propelling charges to provide increased performance. Audino (2004) reported declining cannon life in large caliber cannons with the introduction of each new projectile such that the current M256 cannon can fire less than 300 M829A3 rounds before being condemned. Over the past decade, substantial improvements in the robustness and consistency of quality of structural ceramics and the development of improved predictive methods for the failure of said materials resulted in the Army Research Laboratory

investigating the utility of this class of materials for use in modern high velocity cannons. This paper reports on the evaluation of the structural ceramics investigated and the design approaches implemented to utilize them in as a liner material for a gun barrel.
DTIC
Ceramics; Guns (Ordnance); Linings; Mathematical Models

20080033550 Fish and Richardson, P.C., Minneapolis, MN, USA
Catalyst Coated Heat Exchanger
Xue, Z. Y., Inventor; 10 Aug 05; 10 pp.; In English
Contract(s)/Grant(s): DE-FC02-99EE50580
Patent Info.: Filed Filed 10 Aug 05; US-Patent-Appl-SN-11-201 002
Report No.(s): PB2008-100665; No Copyright; Avail.: CASI: A02, Hardcopy
This invention relates to heat exchangers coated with a catalyst, as well as related methods and fuel reformers.
NTIS
Catalysts; Coating; Coatings; Heat Exchangers

20080033739 Applied Research Associates, Inc., Tyndall AFB, FL USA
Use of Precast Concrete Walls for Blast Protection of Steel Stud Construction Preprint
Grumbach, Stephen D; Naito, Clay; Dinan, Robert J; Nov 2007; 12 pp.; In English
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4915
Report No.(s): AD-A480290; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480290
This research study examines the response of a steel stud wall system and the use of an exterior precast concrete panel system for blast protection. The blast resistant system consists of a series of precast concrete panels installed in front of a conventional exterior stud wall and connected to the foundation at ground level and to the steel building frame beams at the top of the wall. The experimental investigation consists of two explosive detonations representing a 'relatively low' blast level and a 'very high' level of blast as defined by the Army Technical Manual 5-853-01. A bare stud wall and a precast concrete protected stud wall are both examined at the high and low level of threat. The research results show that the precast wall system provides an effective system protection for exterior walls. The research also shows that the metal stud wall system retains a significant degree of resilience and that the corresponding 'Levels of Protection' as defined by UFC 04-0101-1 may be too conservative at low blast levels.
DTIC
Concretes; Construction; Protection; Steels; Walls

20080033967 NASA Glenn Research Center, Cleveland, OH, USA
Multiscale Computer Simulation of Failure in Aerogels
Good, Brian S.; March 10, 2008; 1 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.15.03; Copyright; Avail.: CASI: A01, Hardcopy
Aerogels have been of interest to the aerospace community primarily for their thermal properties, notably their low thermal conductivities. While such gels are typically fragile, recent advances in the application of conformal polymer layers to these gels has made them potentially useful as lightweight structural materials as well. We have previously performed computer simulations of aerogel thermal conductivity and tensile and compressive failure, with results that are in qualitative, and sometimes quantitative, agreement with experiment. However, recent experiments in our laboratory suggest that gels having similar densities may exhibit substantially different properties. In this work, we extend our original diffusion limited cluster aggregation (DLCA) model for gel structure to incorporate additional variation in DLCA simulation parameters, with the aim of producing DLCA clusters of similar densities that nevertheless have different fractal dimension and secondary particle coordination. We perform particle statics simulations of gel strain on these clusters, and consider the effects of differing DLCA simulation conditions, and the resultant differences in fractal dimension and coordination, on gel strain properties.
Author
Computerized Simulation; Aerogels; Failure; Thermal Conductivity; Thermodynamic Properties

20080034547 Savannah River National Lab., Aiken, SC, USA; Pacific Northwest National Lab., Richland, WA, USA
Glass Formulation Development to Support Melter Testing to Demonstrate Enhanced High Level Waste Throughput
Marra, J. C.; Fox, K. M.; Peeler, D. K.; Edwards, T. B.; Youchak, A. L.; January 2007; 9 pp.; In English
Report No.(s): DE2007-914554; No Copyright; Avail.: Department of Energy Information Bridge

The U.S. Department of Energy (DOE) is currently processing high-level waste (HLW) through a Joule-heated melter (JHM) at the Savannah River Site (SRS) and plans to vitrify HLW and Low activity waste (LAW) at the Hanford Site. Over the past few years at the DWPF, work has concentrated on increasing waste throughput. These efforts are continuing with an emphasis on high alumina content feeds. High alumina feeds have presented specific challenges for the JHM technology regarding the ability to increase waste loading yet still maintain product quality and adequate throughput. Alternatively, vitrification technology innovations are also being investigated as a means to increase waste throughput. The Cold Crucible Induction Melter (CCIM) technology affords the opportunity for higher vitrification process temperatures as compared to the current reference JHM technology. Higher process temperatures may allow for higher waste loading and higher melt rate. Glass formulation testing to support melter demonstration testing was recently completed. This testing was specifically aimed at high alumina concentration wastes. Glass composition property models were utilized as a guide for formulation development. Both CCIM and JHM testing will be conducted so glass formulation testing was targeted at both technologies with a goal to significantly increase waste loading without compromising product quality.
NTIS
Glass; Grasslands; Radioactive Wastes; Rivers; Vitrification

20080034615 Dierker and Assoc., P.C., Troy, MI, USA
Multi-Functional Biocompatible Coatings for Intravascular Devices
Zhou, Z., Inventor; Meyerhoff, M. E., Inventor; Reynolds, M. M., Inventor; 23 Aug 04; 11 pp.; In English
Contract(s)/Grant(s): NIH-1R43HL072624-01
Patent Info.: Filed Filed 23 Aug 04; US-Patent-Appl-SN-10-924 102
Report No.(s): PB2008-100747; No Copyright; Avail.: CASI: A03, Hardcopy

A polymeric coating is adapted to substantially eliminate thrombus formation when in contact with blood. The polymeric coating includes a first polymeric layer and a second polymeric layer. Interposed between the first and second polymeric layers is a polymeric matrix layer doped with at least one of a nitric oxide donor and a nitric oxide generator. The nitric oxide donor and/or the nitric oxide generator are capable of releasing or generating NO. A bioactive agent is either immobilized to the surface of the second polymeric layer or is incorporated into the polymeric matrix layer.
NTIS
Blood; Intravascular System; Medical Equipment; Patent Applications; Plastic Coatings; Polymeric Films

20080034632 Humphreys Engineer Center, Alexandria, VA, USA
Self-Healing Coatings Using Microcapsules
Kumar, A., Inventor; Stephenson, L. D., Inventor; 24 Aug 04; 15 pp.; In English
Patent Info.: Filed Filed 24 Aug 04; US-Patent-Appl-SN-10-923 890
Report No.(s): PB2008-100748; No Copyright; Avail.: CASI: A03, Hardcopy

Self-healing coatings incorporate microcapsules of about 60-150 microns diameter that contain film formers and dust suppression compounds suitable for controlling spalling of lead dust, for example. In one embodiment, a primer paint is mixed with these microcapsules and applied by brushing or rolling. After the coating has cured, any physical compromise of the coating results in microcapsules bursting to release liquid that fills and seals the compromised volume. The microcapsule contents protect the underlying substrate from damage and repair some of the outer coating. In one application, embodiments of these self-healing coatings seal existing lead-based paint for suppression of lead dust. In another embodiment, microcapsules are provided separately to enhance commercially available products. For example, if a paint formulation is known a priori, specifically configured microcapsules, packaged separately from the paint and designed for use with the paint formulation, are added to the paint just prior to application.
NTIS
Healing; Paints; Patent Applications

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PROPELLANTS AND FUELS

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

20080032832 NASA Glenn Research Center, Cleveland, OH, USA
Cryogenic Fluid Transfer for Exploration
Chato, David J.; [2007]; 9 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032832

This paper discusses current plans and issues for exploration that involve the use of cryogenic transfer. The benefits of cryogenic transfer to exploration missions are examined. The current state of the art of transfer technology is reviewed. Mission concepts of operation for exploration are presented, and used to qualitatively discuss the performance benefits of transfer. The paper looks at the challenges faced to implement a cryogenic transfer system and suggest approaches to address them with advanced development research. Transfer rates required for exploration are shown to have already been achieved in ground test. Cost effective approaches to the required on-orbit demonstration are suggested.
Author
Cryogenic Fluids; Fluid Flow; Solar System; Storable Propellants

20080033144 Army War Coll., Carlisle Barracks, PA USA
Baloch Nationalism and the Geopolitics of Energy Resources: The Changing Context of Separatism in Pakistan
Wirsing, Robert G; Apr 2008; 64 pp.; In English
Report No.(s): AD-A480237; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480237

This monograph examines the Baloch separatist insurgency that has resurfaced in recent years in Pakistan's sprawling Balochistan province. The author maintains that the context of today's insurgency differs in certain important respects from that of its 1970s predecessor. Most fundamental of these differences are those stemming from energy resource developments in parts of South, Central, and Southwest Asia. In particular, the monograph looks at how Pakistan's mounting energy insecurity -- a product of rapid increase in demand coupled with rising scarcity and the region's intensified energy rivalry -- has magnified the economic and strategic importance of Balochistan, while at the same time complicating Pakistan's efforts to cope with the province's resurgent tribal separatism. This change in the energy context exerts a powerful threefold impact on the insurgents' prospects. In the first place, it lifts Balochistan and Baloch nationalism to a position much higher on the scale of central government priorities, thus seeming to warrant, as the government sees the problem, zero tolerance and ruthless crushing of the insurgency. Second, it arms the Baloch insurgents both with greater incentives than ever for reclaiming control of Balochistan and with the novel capacity to drive the economic and political costs to the government of continuing insurgent activity far higher than ever in the past. Third, to both sides' advantage, by promising to turn Balochistan into an important corridor for energy trafficking in the region, the changed context creates major opportunities for addressing Baloch nationalist demands in a positive and peaceful manner. While conceding that the counterinsurgency strategy pursued by the government thus far has a conspicuously dark side, the author insists that Balochistan's rapidly changing energy context could supply both the means and the incentives for bringing the insurgency to a swift, negotiated, and amicable end.
DTIC
Natural Gas; Pakistan; Policies; Security

20080033420 Library of Congress, Washington, DC USA
Iraq: Oil and Gas Legislation, Revenue Sharing, and U.S. Policy
Blanchard, Christopher M; Jun 26, 2007; 23 pp.; In English
Report No.(s): AD-A480733; CRS-RL34064; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Iraqi leaders continue to debate a package of hydrocarbon sector and revenue sharing legislation that will define the terms for the future management and development of the country's significant oil and natural gas resources. The package includes an oil and gas sector framework law and three supporting laws that would outline revenue sharing mechanisms, restructure Iraq 's Ministry of Oil, and create an Iraqi National Oil Company. Both the Bush Administration and Congress consider the passage of oil and gas sector framework and revenue sharing legislation as important benchmarks that will indicate the current Iraqi government 's commitment to promoting political reconciliation and long term economic development in Iraq. Section

1314 of the FY2007 Supplemental Appropriations Act [P.L.110-28] specifically identifies the enactment and implementation of legislation to ensure the equitable distribution of hydrocarbon resources of the people of Iraq without regard to the sect or ethnicity of recipients and to ensure that the energy resources of Iraq benefit Sunni Arabs, Shia Arabs, Kurds, and other Iraqi citizens in an equitable manner as benchmarks on which the President must report to Congress in July and September 2007. The draft framework legislation approved by Iraq s Council of Ministers (cabinet) in February 2007 does not include revenue sharing arrangements. The companion revenue sharing law defines terms for revenue distribution. The Council of Representatives (parliament) has not yet considered either bill. The central importance of oil and gas revenue for the Iraqi economy is widely recognized by Iraqis, and most groups accept the need to create new legal and policy guidelines for the development of the country s oil and natural gas.
DTIC
Economic Development; Law (Jurisprudence); Natural Gas; Oils; Policies; Revenue

20080033447 Library of Congress, Washington, DC USA
Iraq: Oil and Gas Legislation, Revenue Sharing, and U.S. Policy
Blanchard, Christopher M; Apr 2, 2008; 30 pp.; In English
Report No.(s): AD-A480797; CRS-RL34064; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Iraqi leaders continue to debate a package of hydrocarbon sector and revenue sharing legislation that would define the terms for the future management and development of the country's significant oil and natural gas resources. The package includes an oil and gas sector framework law and three supporting laws that would outline revenue sharing, restructure Iraq 's Ministry of Oil, and create an Iraqi National Oil Company. Both the Bush Administration and Congress consider the passage of oil and gas sector framework and revenue sharing legislation as important benchmarks that would indicate the current Iraqi government 's commitment to promoting political reconciliation and long term economic development in Iraq. Section 1314 of the FY2007 Supplemental Appropriations Act [P.L.110-28] specifically identified the enactment and implementation of legislation to ensure the equitable distribution of hydrocarbon resources of the people of Iraq without regard to the sect or ethnicity of recipients and to ensure that the energy resources of Iraq benefit Sunni Arabs, Shia Arabs, Kurds, and other Iraqi citizens in an equitable manner as benchmarks. The Administration reported to Congress on these benchmarks in July and September 2007. The draft framework law approved by Iraq 's Council of Ministers (cabinet) in July 2007 does not include revenue sharing arrangements. Iraq 's Council of Representatives (parliament) has not taken action to consider the legislation to date because of ongoing political disputes. The central importance of oil and gas revenue for the Iraqi economy is widely recognized by Iraqis, and most groups accept the need to create new legal and policy guidelines for the development of the country 's oil and natural gas.
DTIC
Economic Development; International Relations; Law (Jurisprudence); Natural Gas; Oils; Policies; Revenue

20080034608 Idaho National Engineering Lab., Idaho Falls, ID, USA
Impact Testing of Stainless Steel Material at Room and Elevated Temperatures
Morton, D. K.; Snow, S. D.; Rahl, T. E.; Blandford, R. K.; Jul. 2007; 11 pp.; In English
Report No.(s): DE2007-912898; INL/CON-07-12279; No Copyright; Avail.: National Technical Information Service (NTIS)

High-Level Functional & Operational Requirements for the AFCF -This document describes the principal functional and operational requirements for the proposed Advanced Fuel Cycle Facility (AFCF). The AFCF is intended to be the world's foremost facility for nuclear fuel cycle research, technology development, and demonstration. The facility will also support the near-term mission to develop and demonstrate technology in support of fuel cycle needs identified by industry, and the long-term mission to retain and retain U.S. leadership in fuel cycle operations. The AFCF is essential to demonstrate a more proliferation-resistant fuel cycle and make long-term improvements in fuel cycle effectiveness, performance and economy.
NTIS
High Temperature; Impact Tests; Nuclear Fuels; Spent Fuels; Stainless Steels

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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*.

20080033221 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Finite Element Simulation Methods for Dry Sliding Wear
Chmiel, Aaron; Mar 27, 2008; 123 pp.; In English
Report No.(s): AD-A480407; AFIT/GAE/ENY/08-M03; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480407

The Holloman High Speed Test Track is a rocket sled track for testing at hypersonic velocities. However, there are customers that desire to test at even greater velocities. In order to achieve higher velocities there are several phenomena that must be overcome. One important phenomenon is wear of the shoe that holds the sled on the rail. This research is a look at the feasibility of using finite element analysis to predict the wear of the shoe during a test run down the track. Two methods are investigated, one a macro-scale, incremental method utilizing traditional wear equations from Archard, the other a microscale, material property method that used a failure criteria to determine the amount of wear. These methods are implemented at low speeds to allow for comparison to results from the literature. While the incremental method was found to provide accurate results, there are many numerical problems associated with it. The material property method was found to be feasible, but more research is needed to validate and calibrate the process.
DTIC
Drying; Finite Element Method; Hypersonic Speed; Simulation; Sleds; Sliding; Wear

20080033409 Naval Research Lab., Bay Saint Louis, MS USA
Analysis of SWAN Model with In-situ and Remotely Sensed Data From SandyDuck '97
Rogers, W E; Hwang, Paul A; Wang, David W; Kaihatu, James M; Jul 2000; 15 pp.; In English
Report No.(s): AD-A480696; PP/7320-00-1016; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we present an analysis of a phase-averaged wind-wave model using a hindcast simulation of a moderate wave growth event that occurred during the SandyDuck '97 field experiment. We observe the activity of various source/sink terms in the model, with special attention to the deep-water dissipation term. We note shortcomings with this term and discuss possible improvements.
DTIC
In Situ Measurement; Ocean Models; Ocean Surface; Remote Sensing; Water Waves

20080033437 Queens Univ., Kingston, Ontario Canada
Development of a Dynamic Biomechanical Model for Load Carriage: Phase II Part A: Initial Development of a Novel Strap Tension Sensor
Reid, S A; Sanders, G A; Good, J A; Bryant, J T; Stevenson, J M; Aug 2005; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480772; DRDC-T-CR-2005-118; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work was undertaken in support of the DLR research thrust 'Development of a Dynamic Biomechanical Load Carriage Model'. This document details the design and development of a novel transducer (StrapSensor[TM]) that can be attached to a flexible membrane or strap to measure material tension. The transducer achieves an exceptionally small footprint (< 13 mm) and can be inserted into any strap on conventional Load Carriage (LC) systems to record strap tensions. No modification to the surface is required for attachment and it is readily repositioned. A variety of load ranges can be accommodated using the same transducer theory. The device demonstrated a highly linear response (R2 = 0.98 - 0.99) and low repeatable hysteresis (<6.5% error over multiple load-unload cycles). This is a potentially exploitable technical development and formal disclosure has been made to protect any intellectual property arising from this work. Initial patent searches have discovered an expired patent on a related similar device and further exploration is being made to determine if this new device is a 'substantive' improvement and subsequently remain patentable. Opportunities (other than by patenting) may exist for commercialization by protecting aspects of this device as a Registered Industrial Design.
DTIC
Biodynamics; Dynamic Models; Loads (Forces); Straps; Transducers

20080033461 Science Applications International Corp., McLean, VA USA

Classical and Ablative Richtmyer-Meshkov Instability and Other ICF-Relevant Plasma Flows Diagnosed With Monochromatic X-Ray Imaging

Aglitskiy, Y; Karasik, M; Velikovich, A L; Metzler, N; Zalesak, S; Schmitt, A J; Gardner, J H; Serlin, V; Weaver, J; Obenschain, S P; Aug 2007; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480832; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In inertial confinement fusion (ICF) and high-energy density physics (HEDP), the most important manifestations of the hydrodynamic instabilities and other mixing processes involve lateral motion of the accelerated plasmas. In order to understand the experimental observations and to advance the numerical simulation codes to the point of predictive capability, it is critically important to accurately diagnose the motion of the dense plasma mass. The most advanced diagnostic technique recently developed for this purpose is the monochromatic x-ray imaging that combines large field of view with high contrast, high spatial resolution and large throughput, ensuring high temporal resolution at large magnification. Its application made it possible for the experimentalists to observe for the first time important hydrodynamic effects that trigger compressible turbulent mixing in laser targets, such as ablative Richtmyer-Meshkov (RM) instability, feedout, interaction of a RM-unstable interface with rarefaction waves. It also helped to substantially improve the accuracy of diagnosing many other important plasma flows, ranging from laser-produced jets to electromagnetically driven wires in a Z-pinch, and to test various methods suggested for mitigation of the Rayleigh-Taylor instability. We will review the results obtained with the aid of this technique in ICF-HEDP studies at the Naval Research Laboratory and the prospects of its future applications.

DTIC

Ablation; Hydrodynamics; Laser Plasmas; Magnetohydrodynamic Flow; X Ray Imagery

20080033496 Department of Defence, Canberra, Australia

Defence Test and Evaluation Roadmap

Jan 2008; 39 pp.; In English

Report No.(s): AD-A480946; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Test and Evaluation (T&E) is one of the key enabling activities that underpin the ADF's capability development process to realise CDF's vision for a balanced, networked and deployable force. Defence's T&E approach will ensure that the capabilities that are fielded are tested and evaluated and are suitable for ADF operations. Defence's T&E approach contributes to the development of systems and capabilities, and articulates a strategy for managing T&E resources to meet the needs of the Defence Capability Plan (DCP). The T&E Roadmap achieves this by outlining the: factors that influence the T&E to enable delivery of capability; a framework for understanding the T&E requirements in the future joint operating environment; requirement for T&E to be conducted at all stages of a capability's life cycle; Defence's current T&E capabilities; and how Defence's future T&E requirements are to be realised. T&E can be employed to prove, demonstrate or assess the ability of proposed and existing capability systems, new or upgraded, to satisfy specified technical and operational requirements and objectives. When T&E is employed in this manner, with the objective of providing results to inform decisions at key milestones in a capability system's life cycle, it becomes an effective component of a capability risk management strategy. The results of T&E will be used to provide proof that risk is contained within acceptable boundaries when making key life cycle milestone decisions and that the intended system meets both safety standards and end-users requirements.

DTIC

Australia; Evaluation; System Effectiveness

20080033761 Vanderbilt Univ., Nashville, TN USA

UV Raman Scattering Measurements of a Mach 2 Reacting Flow Over a Piloted Cavity (Postprint)

Pitz, R W; Grady, N R; Shopoff, S W; Hu, Shengteng; Carter, C D; Feb 2008; 10 pp.; In English

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

Report No.(s): AD-A480547; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480547

UV Raman scattering measurements were made in a Mach 2 supersonic air flow over a cavity piloted with ethylene fuel (C2H4). The wall cavity simulated the pilot region of a scramjet combustor. In the UV Raman system, a 248 nm KrF excimer laser beam (400 mJ/pulse, 20 ns pulse length) was used to excite the Raman scattering in the combustion zone. Raman scattered light in the 254-278 nm spectral region allows measurement of the following molecular species: CO2 (257 nm), 02 (258 nm), N2 (263 nm), C2H4 (268 nm), H2O (273 nm) and H2 (277nm). To avoid damaging the fused-silica windows on the combustion test section: 1) the laser pulse was stretched from 20 ns to 150 ns using two optical delay cavities, 2) a long focal length lens (5 meters) focused the KrF beam to a relatively large diameter (1 mm diameter) and 3) the laser energy was

decreased to 100 mJ/pulse. Under these conditions, the high power pulsed laser beam passed through the side fused-silica windows without inflicting damage. Raman scattered light was collected from the top fused-silica and was focused into a 0.32 meter spectrometer.
DTIC
Cavities; Raman Spectra; Reacting Flow; Supersonic Combustion; Supersonic Speed; Ultraviolet Spectra

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*.

20080032743 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
GAI - An Architecture for the Generation of Adaptive Interfaces for Mobile Devices
Ito, Giani Carla; January 2008; 217 pp.; In Portuguese; Original contains color illustrations
Report No.(s): INPE-15146-TDI/1278; Copyright; Avail.: CASI: C01, CD-ROM: A10, Hardcopy

The development of systems for the mobile environment is considered complex due to the great number of aspects to be analyzed, such as constant changes of localization and the great diversity of devices. In this context the necessity of more flexibility for the modeling and implementation of systems appears. This thesis presents an architecture for the Generation of Adaptive Interfaces (GAI) and its objective is to allow an implementation directed to a multiplatform environment, which starts from a generic description of the interface. Moreover, the desire is that the specialists, such as the software programmers and the interface designers can implement interfaces for desktops and mobile devices, without the necessity of additional programming. Thus, this study aims at to consider a development environment with the purpose to integrate the recognition of multiple mobile devices in time of execution to a methodology of division of a page in blocks of diverse sizes. This methodology consists of partitioning a Web interface inside a set of sub-pages generating a menu of contents in a hierarchic form to facilitate the navigation in several types of devices. For the validation of GIA architecture, this thesis presents a case study with tests applied to cellular phones simulators and PDAs.
Author
Mobile Communication Systems; Adaptive Control; Systems Engineering; Digital Systems

20080032796 Idaho National Engineering Lab., Idaho Falls, ID, USA; Idaho Univ., Idaho Falls, ID, USA
CIMS: A Framework for Infrastructure Interdependency Modeling and Analysis. 2006 Winter Simulation Conference
Dudenhoeffer, D. P.; Permann, M. R.; Manic, M.; Dec. 2006; 9 pp.; In English
Report No.(s): DE2007-911896; INL/CON-06-11975; No Copyright; Avail.: National Technical Information Service (NTIS)

Todays society relies greatly upon an array of complex national and international infrastructure networks such as transportation, utilities, telecommunication, and even financial networks. While modeling and simulation tools have provided insight into the behavior of individual infrastructure networks, a far less understood area is that of the interrelationships among multiple infrastructure networks including the potential cascading effects that may result due to these interdependencies. This paper first describes infrastructure interdependencies as well as presenting a formalization of interdependency types. Next the paper describes a modeling and simulation framework called CIMSCO and the work that is being conducted at the Idaho National Laboratory (INL) to model and simulate infrastructure interdependencies and the complex behaviors that can result.
NTIS
Conferences; Simulation; Winter

20080032824 Farmkjo (Dennis F.), Albuquerque, NM, USA
Split Waveguide Antenna
Courtney, C. C., Inventor; Voss, D. E., Inventor; 24 May 05; 12 pp.; In English
Contract(s)/Grant(s): FA9541-04-C-0156
Patent Info.: Filed Filed 24 May 05; US-Patent-Appl-SN-11-136 675
Report No.(s): PB2008-100079; No Copyright; Avail.: CASI: A03, Hardcopy

An antenna concept for radiating intense, high power electromagnetic fields in the RF regime without electrical breakdown. The invention accomplishes this with high aperture and power efficiency, high gain, and in a geometry that is

compact and conformal to a planar or curved surface. The antenna concept is compatible with standard rectangular waveguide feeds, or other hybrid transmission line geometries.
NTIS
Electromagnetic Fields; Patent Applications; Waveguide Antennas

20080032834 NASA Glenn Research Center, Cleveland, OH, USA
Architecting Communication Network of Networks for Space System of Systems
Bhasin, Kul B.; Hayden, Jeffrey L.; June 02, 2008; 7 pp.; In English; 3rd International Conference on System of Systems Engineering (IEEE), 2-4 Jun. 2008, California, USA; Original contains black and white illustrations; Copyright; Avail.:
CASI: A02, Hardcopy

The National Aeronautics and Space Administration (NASA) and the Department of Defense (DoD) are planning Space System of Systems (SoS) to address the new challenges of space exploration, defense, communications, navigation, Earth observation, and science. In addition, these complex systems must provide interoperability, enhanced reliability, common interfaces, dynamic operations, and autonomy in system management. Both NASA and the DoD have chosen to meet the new demands with high data rate communication systems and space Internet technologies that bring Internet Protocols (IP), routers, servers, software, and interfaces to space networks to enable as much autonomous operation of those networks as possible. These technologies reduce the cost of operations and, with higher bandwidths, support the expected voice, video, and data needed to coordinate activities at each stage of an exploration mission. In this paper, we discuss, in a generic fashion, how the architectural approaches and processes are being developed and used for defining a hypothetical communication and navigation networks infrastructure to support lunar exploration. Examples are given of the products generated by the architecture development process.
Author
Aerospace Systems; Communication Networks; Space Communication; Architecture (Computers); Complex Systems

20080032940 Department of Energy, Washington, DC USA
Radio Frequency Electric Field Pasteurization System
Geveke, D. J., Inventor; Brunkhorst, C. D., Inventor; Bigley, A. B. W., Inventor; 28 Jun 05; 18 pp.; In English
Patent Info.: Filed Filed 28 Jun 05; US-Patent-Appl-SN-11-066 653
Report No.(s): PB2008-100026; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to a cost effective, non thermal pasteurization system that effectively treats liquid foods using radio frequency electric fields 'RFEFs'. One embodiment of the system operates by flowing liquid food products through a treatment chamber or a series of treatment chambers wherein the liquid food is exposed to high strength, uniform RFEFs for very short periods of time (i.e. less than 1 second). The treatment chamber is designed to apply a uniform and concentrated RFEF to the liquid food being treated. The system can be designed to incorporate recycling to increase the effectiveness. Suitable field strengths, treatment times and frequencies are provided.
NTIS
Electric Fields; Pasteurizing; Patent Applications; Radio Frequencies

20080033071 Navairwd Counsel Group, Point Mugu, CA, USA
Low Latency Switch Architecture for High-Performance Packet-Switched Networks
Rosen, W., Inventor; Sukhtankar, S., Inventor; Lachenmaier, R. N., Inventor; 12 Jan 05; 25 pp.; In English
Patent Info.: Filed Filed 12 Jan 05; US-Patent-Appl-SN-11-040 298
Report No.(s): PB2008-100827; No Copyright; Avail.: CASI: A03, Hardcopy

A low latency switch architecture for high performance packet-switched networks which is a combination of input buffers capable of avoiding head-of-line blocking and an internal switch interconnect capable of allowing different input ports to access a single output simultaneously.
NTIS
Patent Applications; Switches; Switching

20080033154 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

High Performing Teams: The Moderating Effects of Communication Channels

Zamora, Edgard I; Mar 2008; 79 pp.; In English

Report No.(s): AD-A480267; AFIT/GIR/ENV/08-M27; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480267

The purpose of this study is to support the Air Force's goal of improving team performance by bringing visibility to several overlapping areas of study where little comprehensive research has been conducted. Specifically, an officer's ability to successfully complete his or her mission has been complicated in recent years by the emergence of new communication technologies. For example, communication networks now make it possible for pilots to fly Unmanned Arial Vehicles (UAVs) who sit on one continent while the aircraft and mission planners are on another and, although they may not see each other, their physical separation does not negate the need for effective team performance. It is important organizations have a clear understanding of the impact that communication technologies have on team and individual behaviors. Knowing these effects may mean the difference between successfully completing a mission or not.

DTIC

Channels (Data Transmission); Communication Networks; Telecommunication

20080033160 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

An Examination into How Group Performance is influenced by Various Communication Channels

Norgaard, Jason C; Mar 2008; 49 pp.; In English

Report No.(s): AD-A480274; AFIT/GIR/ENV/08-M16; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480274

This purpose of this research was to look at the how group performance is influenced by various communication channels. Specifically, this research sought to determine what communication factors are affected when groups are forced to use different communications channels. The three communications channels tested were face-to-face communications, audio conferencing, and computer-mediated communications through an Internet chat program. Each channel was measured on accuracy, efficiency, and total number of ideas generated. The research found that the groups using computer-mediated communications had a difficult time completing the exercises in the allotted time. Additionally, the computer-mediated produced significantly fewer total words and total inputs during the experiment. This research produced no statistical difference between any of the groups in total number of ideas generated and no statistical difference in any of the three categories between the face-to-face and audio conference groups. 15. SUBJECT TERMS Face-to-Face communications, audio

DTIC

Channels (Data Transmission); Group Dynamics; Telecommunication

20080033541 Rosenberg Klein and Lee, Ellicott City, MD, USA

Systems and Methods for Coding in Broadband Wireless Communications Systems to Achieve Maximum Diversity in Space Time and Frequency

Su, W., Inventor; Liu, K. J. R., Inventor; Safar, Z., Inventor; 26 May 05; 40 pp.; In English

Patent Info.: Filed Filed 26 May 05; US-Patent-Appl-SN-11-137 589

Report No.(s): PB2008-100656; No Copyright; Avail.: CASI: A03, Hardcopy

Maximum diversity in multiple antenna distributed frequency broadband systems such as MIMO-OFDM is achievable through space-frequency (SF) and space-time-frequency (STF) coding. Full-rate full-diversity coding is achieved through a combination of maximal minimum product distance symbol set design and formation of codeword blocks. Full-diversity codes are also achieved which have reduced symbol transmission rates, such as through mapping of space-time (ST) codes to SF codes. The reduction in symbol rate may be offset by the fact that any ST code may be mapped to a full-diversity SF code.

NTIS

Broadband; Coding; Communication Networks; Frequencies; Patent Applications; Telecommunication; Wireless Communication

20080033549 Pietragallo, Bosic and Gordon, Pittsburg, PA, USA
Method for Imaging Computer Systems
Nelson, R. F., Inventor; Parker, R. J., Inventor; Williamson, J. T., Inventor; 7 Jun 04; 7 pp.; In English
Patent Info.: Filed Filed 7 Jun 04; US-Patent-Appl-SN-10-862 242
Report No.(s): PB2008-100668; No Copyright; Avail.: CASI: A02, Hardcopy

A method is provided for configuring a target computer system in accordance with a computer image. The method comprises the steps of determining a hardware configuration of the target system, reconfiguring a hardware abstraction layer of the target system, transferring information from the computer image to a storage device in the target computer, and using the transferred information to reconfigure the target computer.
NTIS
Computers; Imaging Techniques; Patent Applications

20080033828 Intellectual Property Law, Walthan, MA, USA
Antenna Assembly Including a Dual Flow Rotating Union
Pittman, J. E., Inventor; 24 Sep 04; 14 pp.; In English
Contract(s)/Grant(s): N00024-99-C-5380
Patent Info.: Filed Filed 24 Sep 04; US-Patent-Appl-SN-10-949 173
Report No.(s): PB2008-100630; No Copyright; Avail.: CASI: A03, Hardcopy

An antenna assembly including a first rotating pedestal including an antenna thereon, a second pedestal supporting the first pedestal, and a dual flow rotating union having a longitudinal axis. The dual flow rotating union includes a rotating housing portion coupled to the first rotating pedestal, a stationary housing portion coupled to the second stationary pedestal, and a conduit located in the housing portion. The conduit has opposing ports oriented parallel to the longitudinal axis, a rotating section and a stationary section. One said conduit port is located on the rotating section, and the other conduit port is located on the stationary section. The housing also has opposing ports oriented parallel to the longitudinal axis. One housing port is located on the stationary portion, and the other said housing port is located on the rotating portion.
NTIS
Patent Applications; Rotation

20080033838 Orrick Herrington and Sutcliffe, LLP, Irvine, CA, USA; California State Coll., Los Angeles, CA, USA
Systems and Methods for Resource Allocation to Multiple Antenna Arrays for Maintaining a Constant Bit Rate (CBR) Channel
Luo, W., Inventor; El Zarki, M., Inventor; Zan, L., Inventor; 24 Jan 05; 20 pp.; In English
Contract(s)/Grant(s): NSF ANI-0205720
Patent Info.: Filed Filed 24 Jan 05; US-Patent-Appl-SN-11-042 909
Report No.(s): PB2008-100640; No Copyright; Avail.: CASI: A03, Hardcopy

A wireless communication system configured for the efficient allocation of resources is provided. The wireless communication system can include a transmit system having a first set of one or more antennas each configured to transmit a data signal over a region to a receive system having a second set of two or more antennas each configured to receive the transmitted data signal. The transmit system can be configured to adjust a transmission parameter of a data signal based on a level of signal fading in the region to sustain a target bit rate, adjust a power and a bit rate at which a data signal is transmitted based on the level of signal fading in the region and select a subset of antennas within the first set of antennas to be used to transmit a data signal based on the level of signal fading in the region.
NTIS
Antenna Arrays; Resource Allocation; Signal Processing; Wireless Communication

20080033889 National Telecommunications and Information Administration, Washington, DC USA
Measurements to Characterize Land Mobile Channel Occupancy for Federal Bands 162-174 MHz and 406-420 MHz in the Washington, D.C., Area
Hoffman, J. R.; Matheson, R. J.; Dalke, R. A.; Jul. 2007; 118 pp.; In English
Report No.(s): PB2008-101277; NTIA-TR-07-448; No Copyright; Avail.: National Technical Information Service (NTIS)

In May 2003, President Bush established the Spectrum Policy Initiative to promote the development and implementation of a USA spectrum policy for the 21st century. In response to the Spectrum Policy Initiative, the Secretary of Commerce established a Federal Government Spectrum Task Force and initiated a series of public meetings to address policies affecting

spectrum use by the Federal, state, and local governments, and the private sector. The recommendations resulting from these activities were included in two reports released by the Secretary of Commerce in June 2004. Based on the recommendations contained in these reports, the President directed the Federal Agencies on November 30, 2004, to plan the implementation of the 24 recommendations contained in the reports. One of the recommendations directed the National Telecommunications and Information Administration (NTIA) to develop analytic approaches, software tools, and engineering techniques for evaluating and improving the efficiency and effectiveness of Federal spectrum use. To satisfy one of the goals of that recommendation, NTIAs Institute for Telecommunication Sciences (ITS) undertook a series of channel occupancy measurements in the Washington, D.C., area from October 26 to November 3, 2004 in the Land Mobile Radio (LMR) bands 162174 and 406420 MHz. The purpose of these measurements was twofold: first, to develop channel occupancy measurement techniques for LMR bands and secondly, to gather actual data on the usage of these bands in the Washington, D.C., area. The measurement techniques can be used at other metropolitan locations when the need arises to measure the LMR channel usage. The data gathered for this area and these bands will be used for further analyses of other aspects of the Presidential Spectrum Policy Initiative.
NTIS
District of Columbia; Policies; Spectra; Channels (Data Transmission)

20080034457 George Mason Univ., Fairfax, VA USA
Supporting Battle Management Command and Control: Designing Innovative Interfaces and Selecting Skilled Operators
Parasuraman, Raja; Jan 2008; 23 pp.; In English
Contract(s)/Grant(s): FA8650-05-C-6636; Proj-7184
Report No.(s): AD-A480645; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480645

As future combat force structures, doctrine, and tactics change with the introduction of new technologies, Battle Management Command and Control (BMC2) must be being designed to be capable of flexible response to unpredictable and unconventional adversarial postures. The operators of BMC2 systems must also be appropriately selected and trained for implementing such flexibility.
DTIC
Command and Control; Armed Forces (United States); Military Personnel; Military Operations

20080034557 EG and G Energy Measurements, Inc., Santa Barbara, CA, USA
High-bandwidth Transmission and Recording Sytems: Studies and Improvements
Nov. 2006; 32 pp.; In English
Report No.(s): DE2007-914427; DOE/NV-25946-100; No Copyright; Avail.: National Technical Information Service (NTIS)

Fiber optic data links for high bandwidth reaction history measurements have been improved by testing individual components and working closely with vendors. The work presented in this report represents collaborative work between Special Technologies Laboratory, Los Alamos National Laboratory, and Lawrence Livermore National Laboratory. We present data on testpulse synthesis for system evaluation, component improvements and electromagnetic pulse testing. In addition, we report on a variety of developmental recording techniques that potentially extend bandwidth beyond 12 GHz or improve dynamic range using existing 12 GHz digitizers.
NTIS
Data Links; Electromagnetic Pulses; Fiber Optics

20080034630 Idaho National Engineering Lab., Idaho Falls, ID, USA
Genetic Algorithms for Agent-Based Infrastructure Interdependency Modeling and Analysis. SpringSim 2007
Permann, M. R.; Mar. 2007; 10 pp.; In English
Report No.(s): DE2007-915522; INL/CON-07-12317; No Copyright; Avail.: Department of Energy Information Bridge

Today's society relies greatly upon an array of complex national and international infrastructure networks such as transportation, electric power, telecommunication, and financial networks. This paper describes initial research combining agent-based infrastructure modeling software and genetic algorithms (GAs) to help optimize infrastructure protection and restoration decisions. This research proposes to apply GAs to the problem of infrastructure modeling and analysis in order to determine the optimum assets to restore or protect from attack or other disaster. This research is just commencing and therefore

the focus of this paper is the integration of a GA optimization method with a simulation through the simulation's agents.
NTIS
Algorithms; Genetic Algorithms; Genetics

20080034631 Idaho National Engineering Lab., Idaho Falls, ID, USA
Toward Developing Genetic Algorithms to Aid in Critical Infrastructure Modeling. 2007 IEEE Conference on Technologies for Homeland Security
Permann, M. R.; May 2007; 7 pp.; In English
Report No.(s): DE2007-915524; INL/CON-07-12404; No Copyright; Avail.: Department of Energy Information Bridge

Today's society relies upon an array of complex national and international infrastructure networks such as transportation, telecommunication, financial and energy. Understanding these interdependencies is necessary in order to protect our critical infrastructure. The Critical Infrastructure Modeling System, CIMSCO, examines the interrelationships between infrastructure networks. CIMSCO development is sponsored by the National Security Division at the Idaho National Laboratory (INL) in its ongoing mission for providing critical infrastructure protection and preparedness. A genetic algorithm (GA) is an optimization technique based on Darwins theory of evolution. A GA can be coupled with CIMSCO to search for optimum ways to protect infrastructure assets. This includes identifying optimum assets to enforce or protect, testing the addition of or change to infrastructure before implementation, or finding the optimum response to an emergency for response planning. This paper describes the addition of a GA to infrastructure modeling for infrastructure planning. It first introduces the CIMSCO infrastructure modeling software used as the modeling engine to support the GA.
NTIS
Algorithms; Conferences; Genetic Algorithms; Genetics; Security

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20080032777 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Exploiting the Photoelectric effect for X-ray Polarimetry using Time Projection Chamber
Jahoda, Keith; Black, Kevin; Deines-Jones, Philip; Hill, Joanne; Swank, Jean; March 31, 2008; 1 pp.; In English; HEAD 2008, 31 Mar. - 3 Apr. 2008, USA; No Copyright; Avail.: Other Sources; Abstract Only

The promise of photoelectric X-ray polarimetry has now been realized in laboratory demonstrations and may soon be used for astrophysical observations. Photoelectric polarimetry in gas filled proportional counters achieves high sensitivity through a combination of broad band width and good modulation. The band can be tuned by careful choice of gas composition and pressure. The measurements rely on imaging the tracks of photoelectrons. The initial direction of each track carries information about the electric field of the X-ray photon, and an ensemble of such measurements thus measures the net polarization of the source. A novel readout geometry using time projection chambers (TPC) allows deep (i.e. high efficiency) detectors, albeit without the ability to image the sky. Polarimeters which exploit the TPC geometry can be optimized for use behind telescopes, to study faint persistent sources, or as wide field of view instruments, designed to study bright transient events such as gamma-ray bursts or solar flares. We present the conceptual design of both types of TPC polarimeter. Recent laboratory results demonstrate that these polarimeters can achieve substantial gains in the polarization sensitivity achievable in experiments of modest size.
Author
Astrophysics; Photoelectric Effect; Polarimetry; X Rays

20080032783 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Development and Operation of Arrays of TES x-ray Microcalorimeters Suitable for Constellation-X
Kilbourne, C. A.; Bandler, S. R.; Brown, A. D.; Chervenak, J. A.; Eckart, M. E.; Finkbeiner, F. M.; Iyomoto, N.; Kelley, R. L.; Porter, F. S.; Smith, S. J.; Irwin, K. D.; June 23, 2008; 1 pp.; In English; International Society for Optical Engineering (SPIE) Conference, 23-27 Jun. 2008, Marseilles, France; Copyright; Avail.: Other Sources; Abstract Only

Having already developed a transition-edge-sensor (TES) microcalorimeter design that enables uniform and reproducible high spectral resolution (routinely better than 3 eV resolution at 6 keV) and is compatible with high fill-factor arrays, we are

now working towards demonstrating this performance at high count rates and with the multiplexed read-out needed for instrumenting the Constellation-X X-ray Microcalorimeter Spectrometer (XMS) focal plane array. Design changes that increase the speed of the individual XMS pixels, such as lowering the heat capacity or increasing the thermal conductance of the link to the 50-mK heatsink, result in larger, faster signals, thus the coupling to the multiplexer and the overall bandwidth of the electronics must accommodate this increase in slew rate. In order to operate the array with high incident x-ray flux without unacceptable degradation of the spectral resolution, the magnitude of thermal and electrical crosstalk must be controlled. We will discuss recent progress in the thermal and electrical designs of our close-packed TES arrays, and we will present spectra acquired through the read-out chain from the multiplexer electronics, through the demultiplexer software, to real-time signal processing.
Author
Calorimeters; X Ray Spectrometers; Thermal Conductivity; Constellation-X; Focal Plane Devices; Real Time Operation; Specific Heat

20080032818 Los Alamos National Lab., NM USA
Reversible Electro-Optic Device Employing Aprotic Molten Salts and Method
Warner, B. P., Inventor; McCleskey, T. M., Inventor; Burrell, A. K., Inventor; Hall, S. B., Inventor; 8 Sep 05; 12 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36
Patent Info.: Filed Filed 8 Sep 05; US-Patent-Appl-SN-11-223 374
Report No.(s): PB2008-100082; No Copyright; Avail.: CASI: A03, Hardcopy

A reversible electro-optic device includes a medium of variable transmittance to light. The medium includes a soluble redox couple of a first soluble metal containing species and a second soluble metal containing species. The metal of the soluble redox couple is capable of being electrodeposited. The medium also includes one or more anodic compound(s) capable of being oxidized. An alternate medium includes a soluble metal-containing species and a soluble anodic compound, where the soluble metal-containing species includes metal capable of being electrodeposited, and the anodic compound is capable of being oxidized to a soluble oxidized anodic compound. Another electro-optic device includes a medium of variable reflection to light.
NTIS
Electro-Optics; Molten Salts; Optoelectronic Devices; Patent Applications

20080032823 Fieldmetries, Inc., Seminole, FL, FL, USA
Modular Voltage Sensor
Yakymyshyn, C. P., Inventor; Brubaker, M. A., Inventor; Yakymyshyn, P. J., Inventor; 17 Jul 05; 8 pp.; In English
Patent Info.: Filed Filed 17 Jul 05; US-Patent-Appl-SN-11-160 953
Report No.(s): PB2008-100080; No Copyright; Avail.: CASI: A02, Hardcopy

A voltage sensor is described that consists of a plurality of identical series-connected sections, where each section is comprised of an arrangement of impedance elements. The sensor is optimized to provide an output ratio that is substantially immune to changes in voltage, temperature variations or aging. The voltage sensor can be scaled to various voltage levels by varying the number of series-connected sections.
NTIS
Electric Potential; Patent Applications; Voltmeters

20080032826 Illinois Univ., Urbana-Champaign, IL, USA
Field Emission Assisted Microdischarge Devices
Park, S. J., Inventor; Eden, J. G., Inventor; Park, K. H., Inventor; 14 Jul 04; 14 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0391; AROSR-F49620-03-1-0391
Patent Info.: Filed Filed 14 Jul 04; US-Patent-Appl-SN-10-891 417
Report No.(s): PB2008-100078; No Copyright; Avail.: CASI: A03, Hardcopy

Field emission nanostructures assist operation of a microdischarge device. The field emission nanostructures are integrated into the microdischarge device(s) or are situated near an electrode of the microdischarge device(s). The field emission nanostructures reduce operating and ignition voltages compared to otherwise identical devices lacking the field

emission nanostructures, while also increasing the radiative output of the microdischarge device(s).
NTIS
Field Emission; Nanostructures (Devices); Patent Applications

20080032845 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Lunar Orbiter Laser Altimeter (LOLA) Laser Transmitter
Yu, Anthony W.; Novo-Gradac, Anne Marie; Shaw, George B.; Unger, Glenn; Lukemire, Alan; January 19, 2008; 4 pp.; In English; Photonics West 2008, 19-24 Jan. 2008, California, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

We present the final configuration of the space flight laser transmitter as delivered to the LOLA instrument. The laser consists of two oscillators with co-aligned outputs on a single bench, each capable of providing one billion plus shots.
Author
Laser Altimeters; Lunar Orbiter; Transmitters; Lunar Surface

20080032850 Crawford Maunu PLLC, Saint Paul, MN, USA
Thyristor-Type Memory Device
Nemati, F., Inventor; Plummer, J. D., Inventor; 18 Aug 05; 14 pp.; In English
Contract(s)/Grant(s): MDA972-95-1-0017
Patent Info.: Filed Filed 18 Aug 05; US-Patent-Appl-SN-11-206 627
Report No.(s): PB2008-100073; No Copyright; Avail.: CASI: A03, Hardcopy

A thyristor device can be used to implement a variety of semiconductor memory circuits, including high-density memory-cell arrays and single cell circuits. In one example embodiment, the thyristor device includes doped regions of opposite polarity, and a first word line that is used to provide read and write access to the memory cell. A second word line is located adjacent to and separated by an insulative material from one of the doped regions of the thyristor device for write operations to the memory cell, for example, by enhancing the switching of the thyristor device from a high conductance state to a low conductance state and/or from the low conductance state to the high conductance. This type of memory circuit can be implemented to significantly reduce standby power consumption and access time.
NTIS
Computer Storage Devices; Memory (Computers); Patent Applications; Semiconductor Devices; Switches; Thyristors

20080032853 Christian (Stephen R.), Idaho Falls, ID, USA
Microwave-Emitting Rotor, Separator Apparatus Including Same, Methods of Operation and Design Thereof
Meikrantz, D. H., Inventor; 16 Jul 04; 24 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID 13727
Patent Info.: Filed Filed 16 Jul 04; US-Patent-Appl-SN-10-892 883
Report No.(s): PB2008-100071; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for use in separating, at least in part, a mixture, including at least one chamber and at least one microwave generation device configured for communicating microwave energy into the at least one chamber is disclosed. The rotor assembly may comprise an electric generator for generating electricity for operating the microwave generation device. At least one microwave generation device may be positioned within a tubular interior shaft extending within the rotor assembly. At least a portion of the tubular interior shaft may be substantially transparent to microwave energy. Microwave energy may be emitted in an outward radial direction or toward an anticipated boundary surface defined between a mixture and a separated constituent thereof. A method including flowing a mixture through at least one chamber and communicating microwave energy into the at least one chamber while rotating same is disclosed. Methods of operating a centrifugal separator and design thereof are disclosed.
NTIS
Microwave Emission; Microwaves; Patent Applications; Rotors; Separators

20080032884 Bryant (Joy L), Lightgoot, VA, USA
Fiber Optic Position and Shape Sensing Device and Method Relating Thereto
Chidlers, B. A., Inventor; Gifford, D. K., Inventor; Duncan, R. G., Inventor; Raum, M. T., Inventor; Vercellino, M. E., Inventor; 13 Jul 05; 17 pp.; In English

Patent Info.: Filed Filed 13 Jul 05; US-Patent-Appl-SN-11-180 389
Report No.(s): PB2008-100047; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed toward a fiber optic position and shape sensing device and the method of use. The device comprises an optical fiber means. The optical fiber means comprises either at least two single core optical fibers or a multicore optical fiber having at least two fiber cores. In either case, the fiber cores are spaced apart such that mode coupling between the fiber cores is minimized. An array of fiber Bragg gratings are disposed within each fiber core. A broadband reference reflector is positioned in an operable relationship to each fiber Bragg grating wherein an optical path length is established for each reflector/grating relationship. A frequency domain reflectometer is positioned in an operable relationship to the optical fiber means. In use, the device is affixed to an object. Strain on the optical fiber is measured and the strain measurements correlated to local bend measurements. Local bend measurements are integrated to determine position or shape of the object. NTIS

Detection; Fiber Optics; Patent Applications; Position Sensing; Shapes

20080032886 Mintz Levin Cohn Ferris Glovsky and Popeo, Boston, MA, USA; National Inst. of Health, Bethesda, MD USA

Electro-Optical Stimulation/Measurement

Walt, D. R., Inventor; Szunerits, S., Inventor; 14 Feb 03; 20 pp.; In English
Patent Info.: Filed Filed 14 Feb 03; US-Patent-Appl-SN-10-503 995
Report No.(s): PB2008-100049; No Copyright; Avail.: CASI: A03, Hardcopy

An electro-optical system includes an array including a plurality of optical fibers and a plurality of electrodes, and an insulator. The optical fibers are configured to transmit light, the optical fibers being mechanically coupled at distal ends in a distal arrangement and mechanically coupled at proximal ends in a proximal arrangement. The plurality of electrodes are substantially coaxially disposed with at least portions of corresponding optical fibers, the electrodes being electrically conductive, with the electrodes and optical fibers being disposed in pairs, thereby being pair components, with one of the pair components of each pair being disposed about a radial periphery of the other pair component. The insulator is disposed between the plurality of electrodes and configured to inhibit transfer of electrical energy between the plurality of electrodes. NTIS

Electro-Optics; Patent Applications; Stimulation

20080032890 New Jersey Inst. of Tech., Newark, NJ, USA

Film Based Position and Pressure Sensor

Chang, T. N., Inventor; Cheng, B., Inventor; 26 Jul 05; 10 pp.; In English
Contract(s)/Grant(s): 2001-IJ-CX-0096
Patent Info.: Filed Filed 26 Jul 05; US-Patent-Appl-SN-11-189 338
Report No.(s): PB2008-100611; No Copyright; Avail.: CASI: A02, Hardcopy

Simultaneous pressure and position information is accurately measured in a sensor realized by utilizing first and second sensor elements that each exhibit a decreasing width over the length of the sensor element and that are arranged overlapping each other and in a substantially complementary orientation to one another with respect to the width so that the point of narrowest width of the first sensor element overlaps the point of the widest width of the second sensor element. Pressure applied to the sensor causes each sensor element to generate an electrical signal that is proportional to both the applied pressure and the surface area at the location of the applied pressure. As a result of the complementary orientation and overlapping for these sensor elements, the first and second sensor elements generate an asymmetric pair of signals that uniquely define the applied pressure by position and magnitude.
NTIS

Patent Applications; Pressure Sensors

20080032994 Chinese Inst. of Engineers, Taipei, Taiwan, Province of China

Journal of the Chinese Institute of Engineers, Volume 31, No. 3

Chen, Shi-Shuenn, Editor; Tsai, Hsien-Lung, Editor; Cern, Ming-Jyh, Editor; Lee, Liang-Sun, Editor; Young, Der-Lian, Editor; Lu, Chan-Nan, Editor; Lee, San-Lian; Shieh, Ce-Kuen; Chao, Ching-Kong; May 2008; ISSN 0253-3839; 188 pp.; In English; See also 20080032995 - 20080033011; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The following topics were discussed: Analysis of Multiservice Hierarchical Cellular CDMA Networks for Intelligent

Transportation Systems; Optimal Control Design of Fuel Processing System by Linear Quadratic Gaussian and Loop Transfer Recovery Method; Adaptive Diffusion Using Hesse Matrix for Detecting Nonstationary Signals; Design and Performance Modeling of Resource Allocation Strategies for GPRS; Effect of Enamel Anisotropy on Stress Singularities in Restorations of Premolar Class II Cavities; Hydrogen Production in a Thermal Plasma Hydrogen Reformer Using Ethanol Steam Reforming; A Micromechanical Cracking Imperfection Model of Edge Dislocations Generated by Residual Stresses; A General Algorithm for the Numerical Evaluation of Nearly Singular Boundary Integrals in the Equivalent Non-Singular BIES with Indirect Unknowns; Wireless Telemetry System for Single-Unit Recording in Rats Navigation; GPS On-the-Fly Medium-Length Positioning by an Estimation of the Measurement Variance; The Designs of a Scalable Optical Packet Switching Architecture; NeTSurv: An IP-Based Surveillance System with Robust Network Fault Tolerance and Link Load Balance Capabilities; Geometric Transformation Based Independent Component Analysis for Mixed Image Separation; An Information Flow Control Model for Software Processes that Manages Developer Associations; A Novel Grey-Based Feature Ranking Method for Feature Subset Selection; Improved Estimation of Hydrologic Data Using the Chi-Square Goodness-of-Fit Test; and On the Stability of Uncertain Homogeneous Bilinear Systems Subjected to Time-Delay and Constrained Inputs.

Derived from text

Code Division Multiple Access; Stress Analysis; Residual Stress; Packet Switching; Loop Transfer Recovery; Micromechanics; Information Flow; Fault Tolerance; Surveillance

20080032995 Cheng-Shiu Univ., Kaoshiung, Taiwan, Province of China

On the Stability of Uncertain Homogeneous Bilinear Systems Subjected to Time-Delay and Constrained Inputs

Lee, Chien-Hua; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 529-534; In English; See also 20080032994

Contract(s)/Grant(s): NSC 94-2213-E-230-007; Copyright; Avail.: Other Sources

This paper addresses the stability test problem for homogeneous bilinear uncertain time-delay systems with constrained inputs. By using differential inequality, some sufficient criteria are presented to guarantee the asymptotic stability of overall systems. Furthermore, the transient behaviors of the mentioned systems are also estimated.

Author

Stability Tests; Asymptotic Properties; Decay Rates; Estimating; Time Lag; Stability

20080032996 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

Design and Performance Modeling of Resource Allocation Strategies for GPRS

Tsai, Yi-Chou; Ferng, Huei-Wen; Huang, Jeng-Ji; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 385-401; In English; See also 20080032994

Contract(s)/Grant(s): NSC 95-2221-E-011-029; NSC 96-2221-E-011-020-MY3; Copyright; Avail.: Other Sources

Incorporating promising techniques, including buffering, priority, de-allocation, preemption, and threshold control on the buffer into the resource allocation design for the general packet radio service (GPRS) network, four resource allocation strategies are proposed in this paper, i.e., strategies RAS1, RAS2, RASth1, and RASth2. For the four strategies, analytic models are built to obtain performance measures expressed in general forms using the Markov chain approach. In addition, simulation experiments are arranged and used to validate the analytic results. Based on the numerical results, we show that i) a good match between analytic and simulation results strongly supports the theoretical analysis given in this paper; ii) these four strategies, designed in a comprehensive manner, can outperform many strategies previously proposed in the literature; iii) better voice call performance and superior quality of service (QoS) differentiation between new and handoff voice calls can be achieved by using these strategies.

Author

Resource Allocation; Performance Prediction; Mathematical Models; Markov Chains; Radio Transmission

20080032997 National Cheng Kung Univ., Tainan, Taiwan, Province of China

NeTSurv: An IP-Based Surveillance System with Robust Network Fault Tolerance and Link Load Balance Capabilities

Huang, Chung-Ming; Tsai, Ching-Hsien; Huang, Jia-Xuan; Chuang, Cheng-Yen; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 481-496; In English; See also 20080032994

Contract(s)/Grant(s): NSC 95-2221-E-006-094; Copyright; Avail.: Other Sources

Current video surveillance systems are becoming digitalized and IP-based. With the development of the Internet, wireless and broadband networks, it is possible for a surveillance system client to ubiquitously access the surveillance system, i.e., to

view the surveillance video and control the system remotely. One critical disadvantage of IP-based surveillance is the network reliability problem. That is, since the IP-based surveillance system is IP-based, all of the services provided by the IP-based surveillance system will not be accessible at all if network failure occurs. However, currently no related works address the network fault tolerance issue for IP-based surveillance systems. In this paper, possible network failure scenarios are investigated and determined. A network-fault-tolerant IP-based surveillance (NeTSurv) system is designed and implemented in the IPv6 network. In addition to the existing features of current video surveillance systems, a multihome-based approach is adopted to improve the network fault tolerance capability of the NeTSurv system. Two-level fault tolerance mechanisms are developed to solve the connectivity issue and the continuity issue of video playout for different link failure scenarios. With the devised mechanism, lost surveillance video data resulting from abrupt link failure can be recovered. Furthermore, a load balance mechanism is also devised for the NeTSurv system to distribute the load across multiple links. Using the load balance mechanism, congestion pf a single link can be prevented when multiple clients request surveillance video through the Internet at the same time.
Author
Video Data; Surveillance; Fault Tolerance; Failure; Broadband

20080032999 Da-Yeh Univ., Chang-Hua, Taiwan, Province of China
Optimal Control Design of Fuel Processing System by Linear Quadratic Gaussian and Loop Transfer Recovery Method
Tsai, Huan-Liang; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 369-378; In English; See also 20080032994
Contract(s)/Grant(s): NSC 95-2212-E-212-044; Copyright; Avail.: Other Sources

This paper presents an optimal control system which consists of both feedforward and state-feedback controllers designed using a well-developed linear quadratic Gaussian and loop transfer recovery (LQG/LTR) method for a fuel processing system (FPS). This FPS uses natural gas as fuel and reacts with atmospheric air through a catalytic partial oxidation (CPO) response. The control objective is focused on the regulatory performance of output vector in response to a desired stack current command in face of load variation. First, a Kalman filter is designed to provide an optimal estimation of state variables and to shape the target feedback loop function. And then an optimal two-degree-of-freedom controller is designed subject to a linear quadratic performance index in the LTR process. Finally, the numerical simulations of compensated FPS reveal that the proposed method achieves better performance and robustness properties than presently accepted methods, in both time-domain and frequency-domain responses.
Author
Loop Transfer Recovery; Feedforward Control; Optimal Control; Fuel Systems; Linear Quadratic Gaussian Control; Degrees of Freedom; Robustness (Mathematics)

20080033001 National Central Univ., Jhong-Li, Taiwan, Province of China
GPS On-the-Fly Medium-Length Positioning by an Estimation of the Measurement Variance
Wu, Joz; Hsieh, Chi-Hsiu; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 459-468; In English; See also 20080032994; Copyright; Avail.: Other Sources

This paper contributes to kinematic GPS phase ambiguity-fixed positioning by discussing the involvement of an adaptive estimator for dual-frequency pseudorange and carrier-phase variances. The resulting measurement covariance matrix has a positive impact on the estimated covariance matrix of the float ambiguity parameters. Whole-cycle ambiguities can be efficiently resolved, when transformed using a volume- preserving diagonalization technique, especially for short baseline lengths of up to 10 km. To compensate for the lower success rate for ambiguity-fixed positioning with long baselines (tens of kilometers), one can resort to a multi-epoch on-the-fly processing technique, although the positioning accuracy obtained via this method is not as good as that obtained using a short-baseline positioning solution. Despite double-difference operations, ranging biases could not be completely eliminated, eventually leading to the degradation of the positioning results. The time series of the differenced ionospheric delays were then examined. In many of the observation epochs, the delays took on non-zero values. In,kinematic GPS positioning for medium-length baselines, the estimation of residual range biases remains a challenging task, and a variance-component estimating method can play a vital role.
Author
Global Positioning System; Ambiguity; Estimating; Covariance; Kinematics; Rangefinding; Matrices (Mathematics)

20080033003 National Cheng Kung Univ., Tainan, Taiwan, Province of China

Improved Estimation of Hydrologic Data Using the Chi-Square Goodness-of-Fit Test

Huang, Yung-Ping; Lee, Cheng-Haw; Ting, Cheh-Shyh; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 515-521; In English; See also 20080032994; Copyright; Avail.: Other Sources

This study considers the complete Chi-Square goodness-of-fit test procedures and numerical analysis to improve the intermediate value method for an approximate solution of the cumulative distribution function. The goodness-of-fit test is applied for evaluating the appropriate distribution of frequency analysis for estimating annual maximum flows of hydrologic data, from four measurement stations (Lounung, Yuemei, Santimem, and Kaoping stations) located in the Kaoping River Basin. Analytical results indicate that the error percentage of the Chi-Square statistical values is improved by from 0.3 to 38.3%. Thus, the improved estimation of the Chi-Square goodness- of-fit test procedure increases the accuracy of some frequency distributions.

Author

Goodness of Fit; Distribution Functions; Statistical Tests; River Basins; Numerical Analysis; Approximation; Errors

20080033004 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

Geometric Transformation Based Independent Component Analysis for Mixed Image Separation

Chiu, Shih-Hsuan; Lu, Chuan-Pin; Wu, Dien-Chi; Wen, Che-Yen; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 497-502; In English; See also 20080032994

Contract(s)/Grant(s): NSC 94-2216-E-011-020; Copyright; Avail.: Other Sources

An independent component analysis (ICA) method for image separation by geometric transformation of a scatter diagram is proposed. Geometric transformation and normalization are used to project mixed image signals to independent component space. This method includes four procedures: data correction, whitening, geometric rotation, and slant compensation. Several synthetic mixed image and real applications are used to evaluate the performance of the proposed method. From experimental results, mixed images are separated accurately by the proposed method.

Author

Multivariate Statistical Analysis; Phase Diagrams; Algorithms; Neural Nets

20080033006 National Cheng Kung Univ., Tainan, Taiwan, Province of China

The Designs of a Scalable Optical Packet Switching Architecture

Chang, Wang-Rong; Wu, Ho-Ting; Ke, Kai-Wei; Lin, Hui-Tang; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 469-479; In English; See also 20080032994

Contract(s)/Grant(s): NSC 93-2213-E-027-037; Copyright; Avail.: Other Sources

This paper proposes a new switching architecture to be used in all optical packet switching networks. The proposed switch is derived from an original 2 x 2 two-stage multi-buffer switched delay line based optical switching node, known as an M-Quadro node. By incorporating bypass lines into the M-Quadro architecture and employing a novel switch control strategy, the optical packet switching node can effectively resolve packet contentions, thus reducing the packet deflection probability substantially. Furthermore, we show that such architecture is scalable for a generic multiple stages optical packet switch with a larger number of input/output ports.

Author

Optical Switching; Packet Switching; Delay Lines; Bypasses

20080033007 National Cheng Kung Univ., Tainan, Taiwan, Province of China

Wireless Telemetry System for Single-Unit Recording in Rats Navigation

Chen, Hsin-Yung; Wu, Jin-Shang; Li, Chia-Pin; Chen, Jia-Jin Jason; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 449-458; In English; See also 20080032994

Contract(s)/Grant(s): NHRI-EX-95-9524E1; Copyright; Avail.: Other Sources

The use of cable systems for neural activity recording limits the measure of behavioral tests in conscious free-moving animals. In particular, cable attachments make it difficult to solve the challenge of a wired measurement system in enclosed spaces such as tunnels or closure mazes. Such environments are of particular interest in investigations of hippocampal place cells, in which neural activity is correlated with spatial position in the environment. In this study, we developed a flexible miniaturized Bluetooth-based wireless data acquisition system and validated it in single-unit recordings of place cells in rats running an enclosed environment over a range of 5 m. The wireless module included an &channel analogue front end, digital controller, and Bluetooth transceiver mounted on a backpack. Our flexible bidirectional wireless design allowed all data

channels to be previewed at 1 kHz sample rate, and one channel, selected by remote control, to be sampled at 10 kHz. Through careful hardware design, appropriate shielding and avoiding ground loops, interferences from power line and Bluetooth hopping frequency were reduced sufficiently to yield signal quality comparable to that recorded by wired systems. Bluetooth technology thus offers a novel solution for telemetry systems to enable cable-free recordings of place cells.
Author
Telemetry; Navigation; Rats; Channels (Data Transmission); Remote Control; Transmitter Receivers; Cells (Biology)

20080033010 National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China
Analysis of Multiservice Hierarchical Cellular CDMA Networks for Intelligent Transportation Systems
Chung, Shun-Ping; Jhan, Jhih-Dao; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 355-367; In English; See also 20080032994; Copyright; Avail.: Other Sources

We consider two-tier cellular CDMA networks supporting soft handoff for ITS (Intelligent Transportation System), where mobile users can move in only one of two directions. Both narrowband voice service and broadband services are supported in the considered system. The broadband calls are assigned to the associated macrocell in order to reduce the number of handoffs and the voice calls are assigned to the associated microcell. The handoff calls are prioritized over new calls in the system. To avoid macrocell resource under-utilization, voice calls in microcells can be allowed to overflow to macorcells. To avoid excessive overflow from the microcells, broadband calls are prioritized over voice calls. Another way to avoid excessive overflow in macrocells is to allow overflowed voice calls to be taken back to microcells. For comparison purposes, we study three models: Model A (no overflow), Model B (overflow without takeback), and Model C (overflow and takeback). Two multi-dimensional Markov chains are used to describe microcells and macrocells, respectively, and the analytical results for the performance measures of interest are derived, e.g., new call blocking probability, handoff failure probability, forced termination probability, and utilization. Last but not least, simulation programs are written in C to collect simulation results for verifying the analytical results.
Author
Code Division Multiple Access; Broadband; Integrated Circuits; Narrowband; Probability Theory; Markov Chains

20080033011 University of Electronics Science and Technology of China, Chengdu, China
Adaptive Diffusion Using Hesse Matrix for Detecting Nonstationary Signals
Tan, Xiao-Gang; Li, Li-Ping; Wei, Ping; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 379-384; In English; See also 20080032994
Contract(s)/Grant(s): NCET-05-0803; Copyright; Avail.: Other Sources

Adaptive diffusion, using a gradient-square tensor, was proposed to improve the readability of time frequency representations (TFRs) of the Cohen class and the affine class in 2005. It works with a signal-dependent kernel and can adapt to a wide range of nonstationary signals. Here we substitute the Hesse matrix for the gradient-square tensor after making an analysis of local diffusion behavior in an adaptive diffusion process, in close conjunction with the local signature of the auto terms and the interference terms. The eigenvectors of the Hesse matrix not only can give the local average gradient direction and thus the local diffusion direction, but also can provide an explicit mathematical explanation for local diffusion behavior. The Hesse method is capable of providing TFRs of better readability than the gradient square tensor. The validity of the new method is verified by computational simulations.
Author
Diffusion; Kernel Functions; Eigenvectors; Frequencies; Gradients; Detection

20080033039 NASA Marshall Space Flight Center, Huntsville, AL, USA
Modifications to the Fission Surface Power Primary Test Circuit (FSP-PTC)
Garber, Anne E.; June 08, 2008; 9 pp.; In English; 2008 International Congress on Advances in Nuclear Power Plants (ICAPP), 8-12 Jun. 2008, Anaheim, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033039

An actively pumped alkali metal flow circuit, designed and fabricated at the NASA Marshall Space Flight Center, underwent a range of tests at MSFC in early 2007. During this period, system transient responses and the performance of the liquid metal pump were evaluated. In May of 2007, the circuit was drained and cleaned to prepare for multiple modifications: the addition of larger upper and lower reservoirs, the installation of an annular linear induction pump (ALIP), and the inclusion of a closeable orifice in the test section. Modifications are now complete and testing has resumed. Performance of the ALIp,

provided by Idaho National Laboratory (INL), is the subject of the first round ofexperimentation. This paper provides a summary of the tests conducted on the original circuit, details the physical changes that have since been made to it, and describes the current test program.
Author
Fission; Alkali Metals; Fabrication; Circuits; Electrical Engineering

20080033055 Baker and Botts, New York, NY, USA
Method of Electric Field Assisted Deposition of Films of Nanoparticles
Herman, I. P., Inventor; Islam, M. A., Inventor; 27 Oct 04; 24 pp.; In English
Contract(s)/Grant(s): NSF-DMR-9809687
Patent Info.: Filed Filed 27 Oct 04; US-Patent-Appl-SN-10 974 406
Report No.(s): PB2008-100680; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed to a method for depositing unpatterned or selectively patterned nanoparticle films of controlled thickness on the respective film deposition surface of each of a pair of electrodes. In the present method, a pair of electrodes, each having a conducting film deposition surface, are immersed in a non-conducting nonpolar solvent in which nanoparticles, each having ligands attached thereto, are suspended. A voltage is applied to the pair of electrodes thereby causing films of the nanoparticles to deposit on the respective film deposition surface of each of the pair of electrodes. The nanoparticle films formed by the present method may be unpatterned or they may be patterned by patterning the conducting film deposition surface of at least one electrode of the pair of electrodes. The nanoparticle films formed according to the method of the present invention are useful as layers in electronic devices.
NTIS
Deposition; Electric Fields; Nanoparticles; Patent Applications

20080033058 Choate, Hall and Stewart, Boston, MA, USA
Scanning Probe Microscopy with Inherent Disturbance Suppression
Sparks, A. W., Inventor; Manalis, S. R., Inventor; 15 Jun 05; 14 pp.; In English
Contract(s)/Grant(s): NSF-CCR-0122419; AFOSR-F49620-02-1-0322
Patent Info.: Filed Filed 15 Jun 05; US-Patent-Appl-SN-11-153 300
Report No.(s): PB2008-100821; No Copyright; Avail.: CASI: A03, Hardcopy

A method for inherently suppressing out-of-plane disturbances in scanning probe microscopy that facilitates higher resolution imaging, particularly in noisy environments.
NTIS
Microscopy; Patent Applications; Scanners

20080033102 Spinelli (Thomas), East Northport, NY, USA
Methods and Apparatus for Power Generation Governmental Rights
Rastegar, J. S., Inventor; Haarhoff, D., Inventor; 27 Apr 05; 27 pp.; In English
Contract(s)/Grant(s): DAAE-30-03-C1077
Patent Info.: Filed Filed 27 Apr 05; US-Patent-Appl-SN-11-116 093
Report No.(s): PB2008-100825; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for generating an electrical power upon an acceleration of the apparatus is provided. The apparatus includes: a piezoelectric member having at least a portion thereof formed of a piezoelectric material for generating an output power upon an impact; and a spring element configured to have at least one of a portion thereof and a portion attached thereto impact the piezoelectric material upon the acceleration.
NTIS
Patent Applications; Electrical Properties; Electric Generators

20080033103 Los Alamos National Lab., NM USA; California Univ., Berkeley, CA, USA
Conductive Layer for Biaxially Oriented Semiconductor Film Growth
Findikoglu, A. T., Inventor; Matias, V., Inventor; 6 Oct 05; 9 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed Filed 6 Oct 05; US-Patent-Appl-SN-11-245 721
Report No.(s): PB2008-100824; No Copyright; Avail.: CASI: A02, Hardcopy

A conductive layer for biaxially oriented semiconductor film growth and a thin film semiconductor structure such as, for example, a photodetector, a photovoltaic cell, or a light emitting diode (LED) that includes a crystallographically oriented semiconducting film disposed on the conductive layer. The thin film semiconductor structure includes: a substrate; a first electrode deposited on the substrate; and a semiconducting layer epitaxially deposited on the first electrode. The first electrode includes a template layer deposited on the substrate and a buffer layer epitaxially deposited on the template layer. The template layer includes a first metal nitride that is electrically conductive and has a rock salt crystal structure, and the buffer layer includes a second metal nitride that is electrically conductive. The semiconducting layer is epitaxially deposited on the buffer layer. A method of making such a thin film semiconductor structure is also described.

NTIS

Patent Applications; Semiconductors (Materials); Thin Films; Crystal Structure; Semiconducting Films

20080033116 NASA Glenn Research Center, Cleveland, OH, USA

High Temperature Electronics for Intelligent Harsh Environment Sensors

Evans, Laura J.; May 08, 2008; 22 pp.; In English; 54th International Instrumentation Symposium, 5-8 May 2008, Florida, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033116

The development of intelligent instrumentation systems is of high interest in both public and private sectors. In order to obtain this ideal in extreme environments (i.e., high temperature, extreme vibration, harsh chemical media, and high radiation), both sensors and electronics must be developed concurrently in order that the entire system will survive for extended periods of time. The semiconductor silicon carbide (SiC) has been studied for electronic and sensing applications in extreme environment that is beyond the capability of conventional semiconductors such as silicon. The advantages of SiC over conventional materials include its near inert chemistry, superior thermomechanical properties in harsh environments, and electronic properties that include high breakdown voltage and wide bandgap. An overview of SiC sensors and electronics work ongoing at NASA Glenn Research Center (NASA GRC) will be presented. The main focus will be two technologies currently being investigated: 1) harsh environment SiC pressure transducers and 2) high temperature SiC electronics. Work highlighted will include the design, fabrication, and application of SiC sensors and electronics, with recent advancements in state-of-the-art discussed as well. These combined technologies are studied for the goal of developing advanced capabilities for measurement and control of aeropropulsion systems, as well as enhancing tools for exploration systems.

Author

Electronics; High Temperature Environments; Smart Materials; Silicon Carbides; Pressure Sensors

20080033284 Harvard Univ., Cambridge, MA USA

Instrumentation for Creation and Diagnostics of an Intense Cold Atom Beam: CW Atom Laser and Nanotube Single Atom Detector

Hau, Lene V; Feb 14, 2007; 9 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0333
Report No.(s): AD-A480578; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480578

The creation of a continuous wave atom laser would greatly enhance the possibility of ultracold atom based, jam-proof, precision inertial navigation systems. This proposal is for instrumentation necessary to support the Pi's current AFOSR grant. The proposal outlines the usage of equipment purchased through this DURIP grant to create the first continuous wave atom laser and for a novel single atom detector based on a carbon nanotube.

DTIC

Atomic Beams; Continuous Wave Lasers; Detectors; Diagnosis; Lasers; Nanotubes

20080033285 Delaware Univ., Newark, DE USA

Multicolor Nanostructured High Efficiency Photovoltaic Devices

Honsberg, Christiana; Bremner, S P; Liu, G M; Ban, K Y; Jun 30, 2007; 8 pp.; In English
Contract(s)/Grant(s): FA9550-06-1-0447
Report No.(s): AD-A480579; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480579

The goal of the project 'Multicolor Nanostructured High Efficiency Photovoltaic Devices,' is to experimentally

demonstrate the fundamental physical mechanisms required for high performance photovoltaics, focusing on the conditions which maximize simultaneous radiative coupling between multiple energy levels. A material which has multiple quasi-Fermi levels is predicted to display a range of unique properties, including highly nonlinear absorption coefficients which depend on light intensity, absorption and emission properties which can be tuned by shining different wavelengths of light on the material, and the ability to alter the mobility of one type of carrier while leaving the other unaffected. While these properties allow a range on new devices, the focus of the material choices and theory is on ultra-high efficiency photovoltaics. Other potential new devices include efficient broad-band emitters, and lasers and photodetectors which are multicolor and switchable between the operating wavelengths.
DTIC
Photometers; Photovoltaic Effect

20080033334 Naval Research Lab., Washington, DC USA
Advanced Pulsed Power Concept and Component Development for KrF Laser IFE
Weidenheimer, D; Smith, I; Warren, F T; Morton, D; Schlitt, L; Giorgi, D; Driscoll, J; Sethian, J; Jul 2002; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480679; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480679

The Electra advanced pulsed power development program has the goal of developing and demonstrating pulsed power technology that is applicable for KrF (krypton fluoride) Laser IFE (inertial fusion energy). The application presents efficiency, lifetime and cost challenges that mandate the use of advanced pulse compression topologies. In turn, these advanced topologies require the development of critical components and the establishment of engineering criteria for use in designing them. The component most critical to realizing any of the advanced topologies under study is the primary energy transfer switch. Therefore, the program has been developing an advanced optically-triggered and pumped solid state switch that is expected to meet the efficiency, lifetime and cost requirements of an IFE driver. Liquid dielectric breakdown studies are also underway, with the intent to develop design criteria relevant to the large electrically stressed areas associated with a viable KrF IFE power plant. KrF IFE pulse compression and component concepts will be discussed as well as the most recent results from the solid-state switch development and liquid dielectric test efforts.
DTIC
Energy Transfer; Lasers; Nuclear Fusion; Pulse Compression

20080033402 Naval Research Lab., Washington, DC USA
Suppression of the Transit-Time Instability in Large-Area Electron Beam Diodes
Myers, Matthew C; Friedman, Moshe; Swanekamp, Stephen B; Chan, Lop-Yung; Ludeking, Larry; Sethian, John D; Jun 2002; 5 pp.; In English
Report No.(s): AD-A480617; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Experiment, theory, and simulation have shown that large-area, electron-beam diodes are susceptible to transit-time instability. The instability modulates the electron beam spatially and temporally, producing a wide spread in electron energy and momentum distributions. The result is gross inefficiency in beam generation and propagation. Simulations indicate that a periodic, slotted cathode structure that is loaded with resistive elements may be used to eliminate the instability. Such a cathode has been fielded on one of the two opposing 60 cm x 200 cm diodes on the NIKE Krypton-fluoride (KrF) laser at the Naval Research Laboratory. These diodes typically deliver 600 kV, 500 kA, 250 ns electron beams to the laser cell in an external magnetic field of 0.2 T. The authors conclude that the slotted cathode suppressed the transit-time instability such that the radiofrequency power was reduced by a factor of 9 and that electron transmission efficiency into the laser gas was improved by more than 50%.
DTIC
Cathodes; Diodes; Electron Beams; Electron Transfer; Laser Fusion; Stability; Transit Time

20080033403 Naval Research Lab., Washington, DC USA
Development of a Durable, Large Area Cathode for Repetitive, Uniform Electron Beam Generation
Myers, Matthew C; Hegeler, F; Friedman, Moshe; Sethian, John D; Jan 2002; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480618; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Electra is a large-aperture, krypton-fluoride laser under development for inertial fusion energy research. The laser will

require dual 500 kV, 36 A/sq cm, uniform electron beams operating at 5 Hz. Experimental studies have been performed to develop an approx. 3000 sq cm cathode capable of generating a 110 kA, 100 ns flat top beam pulse with minimal current density variation (<10%), fast rise time (<40 ns), negligible gap closure (<1 cm/microsecond), and long lifetime (ultimately 10(exp 8) shots). Time resolved electrical and optical data from the study of various dielectric fiber, carbon, and metal/dielectric cathodes will be discussed.
DTIC
Carbon; Carbon Fibers; Cathodes; Dielectric Properties; Dielectrics; Durability; Electron Beams; Gas Lasers; Laser Fusion; Laser Plasmas

20080033416 Raytheon Co., Canton, MA, USA
Broadband Dual Polarized Slotline Feed Circuit
DeLuca, M. R., Inventor; Cummings, R. V., Inventor; Trott, K. D., Inventor; Biondi, J. P., Inventor; Cavener, R. J., Inventor; 10 Nov 04; 21 pp.; In English
Contract(s)/Grant(s): N00014-99-C-0314
Patent Info.: Filed Filed 10 Nov 04; US-Patent-Appl-SN-10-989 231
Report No.(s): PB2008-101500; No Copyright; Avail.: CASI: A03, Hardcopy

A dual polarized slotline feed circuit includes a first slotline circuit and a second slotline circuit with the first and second slotline circuits disposed such that first slotline circuit is orthogonal to the second slotline and such that the first and second slotline circuits each have a first portion with a common centerline and wherein a second portion of one of the first and second slotline circuits is bent such that it is disposed at an angle with respect to the common centerline portion of the first and second slotline circuits.
NTIS
Broadband; Circuits; Patent Applications; Polarization

20080033430 Naval Air Warfare Center, China Lake, CA USA
High-Voltage Polymers for High-Power Supercapacitors. Version 1
Prokopuk, Nicholas; May 30, 2006; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480759; No Copyright; Avail.: Defense Technical Information Center (DTIC)

New polymer supercapacitors were constructed from novel hybrid poly(triarylamines) with organic electrolytes. The new polymers contain benzyl or nitro functionalized aromatic side groups. In addition to the anilino segments, the polymer backbone contains either furanyl or thiophenyl linkages. These electronic and structural varieties provide polymers with a range or oxidation potentials. The nitro-furane derivative exhibits the highest oxidation potential and supercapacitors constructed with anodes or this polymer and organic electrolytes provide 20% more power and energy than the polythiophene derivatives studied previously. These results indicate that the supercapacitor performance can be significantly altered by varying pendent substituents and the polymer backbone.
DTIC
Capacitors; Electrochemical Capacitors; High Voltages; Polymers

20080033492 Army Research Lab., Adelphi, MD USA
Water Level Antenna Design at 20 GHz
Anthony, Theodore K; Apr 2008; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480937; ARL-TR-4425; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This prototype design demonstrates that a compact, efficient, and affordable wafer level antenna is realizable and can be processed along with microelectromechanical system (MEMS) technology on the same material. A coplanar fed proximity coupled patch antenna was ultimately designed to operate at a frequency around 20 GHz (K-Band) for proof-of-concept. Simulation data is compared with the experimental data for validation of model designs.
DTIC
Antenna Design; Antennas; Coupled Modes; Superhigh Frequencies; Wafers; Water

20080033526 Du Pont de Nemours (E. I.) and Co., Wilmington, DE, USA
Methods for Forming an Undercut Region and Electronic Devices Incorporating the Same
Truong, N., Inventor; MacPherson, C. D., Inventor; 10 Aug 04; 13 pp.; In English
Contract(s)/Grant(s): DARPA-4332

Patent Info.: Filed Filed 10 Aug 04; US-Patent-Appl-SN-10-915 578
Report No.(s): PB2008-101497; No Copyright; Avail.: CASI: A03, Hardcopy

An electronic device having a substrate structure having an undercut region is provided and further included is a method for forming an undercut region of a substrate structure. The method includes forming a patterned protective layer over a first electrode. The method also includes forming the substrate structure over the patterned protective layer. An opening within the substrate structure overlies an exposed portion of the substrate structure. The method further includes removing the exposed portion of the patterned protective layer, thereby exposing a portion of the first electrode and forming an undercut region of the substrate structure. The method still further includes depositing a liquid over the first electrode after removing the exposed portion of the patterned protective layer, and solidifying the liquid to form a solid layer.

NTIS

Electronic Equipment; Patent Applications

20080033531 Schellenberg, Franklin, Palo Alto, CA, USA; Stanford Univ., Trustee, CA, USA

Replication and Transfer of Microstructures and Nanostructures

Schaper, C. D., Inventor; 27 Oct 04; 28 pp.; In English
Contract(s)/Grant(s): N66001-01-1-8962
Patent Info.: Filed Filed 27 Oct 04; US-Patent-Appl-SN-10-974 302
Report No.(s): PB2008-101476; No Copyright; Avail.: CASI: A03, Hardcopy

A method for the duplication of microscopic patterns from a master to a substrate is disclosed, in which a replica of a topographic structure on a master is formed and transferred when needed onto a receiving substrate using one of a variety of printing or imprint techniques, and then dissolved. Additional processing steps can also be carried out using the replica before transfer, including the formation of nanostructures, microdevices, or portions thereof. These structures are then also transferred onto the substrate when the replica is transferred, and remain on the substrate when the replica is dissolved. This is a technique that can be applied as a complementary process or a replacement for various lithographic processing steps in the fabrication of integrated circuits and other microdevices.

NTIS

Microelectronics; Microstructure; Nanostructures (Devices); Patent Applications; Replicas

20080033534 Rosenberg (Frank), Moraga, CA, USA

Microsystem Process Networks (PAT-APPL-11-241 585)

Wegeng, R. S., Inventor; TeGrotenhuis, W. E., Inventor; Whyatt, G. A., Inventor; 30 Sep 05; 44 pp.; In English
Contract(s)/Grant(s): DE-AC06-76RLO1830
Patent Info.: Filed Filed 30 Sep 05; US-Patent-Appl-SN-11-241 585
Report No.(s): PB2008-101464; No Copyright; Avail.: CASI: A03, Hardcopy

Various aspects and applications or microsystem process networks are described. The design of many types of microsystems can be improved by ortho-cascading mass, heat, or other unit process operations. Microsystems having energetically efficient microchannel heat exchangers are also described. Detailed descriptions of numerous design features in microcomponent systems are also provided.

NTIS

Microelectronics; Patent Applications; Networks

20080033536 Rosenberg (Frank), Moraga, CA, USA

Microsystem Process Networks (PAT-APPL-11-241 575)

Wegeng, R. S., Inventor; TeGrotenhuis, W. E., Inventor; Whyatt, G. A., Inventor; 30 Sep 05; 44 pp.; In English
Contract(s)/Grant(s): DE-AC06-76RL01830
Patent Info.: Filed Filed 30 Sep 05; US-Patent-Appl-SN-11-241 575
Report No.(s): PB2008-101463; No Copyright; Avail.: CASI: A03, Hardcopy

Various aspects and applications of microsystem process networks are described. The design of many types of Microsystems can be improved by ortho-cascading mass, heat, or other unit process operations. Microsystems having energetically efficient microchannel heat exchangers are also described. Detailed descriptions of numerous design features in microcomponent systems are also provided.

NTIS

Microelectronics; Patent Applications; Networks

20080033542 McKinley Law Office, Richland, WA, USA
Boron Carbide Films with Improved Thermoelectric and Electric Properties
Olsen, L. C., Inventor; Martin, P. M., Inventor; 13 Aug 04; 9 pp.; In English
Contract(s)/Grant(s): DE-AC0676RLO1830
Patent Info.: Filed Filed 13 Aug 04; US-Patent-Appl-SN-10-917 813
Report No.(s): PB2008-100678; No Copyright; Avail.: CASI: A02, Hardcopy

A p-type semiconductor material with enhanced thermoelectric and electric properties comprising alternating thin films of boron carbide having a dopant selected from the group of Ge and Si. Alternating layers of boron carbide are of the general form B(sub x)C(sub y) with B(sub 4)C and B(sub9)C being preferred. Layers are formed by sputter depositing. The dopant is provided in the layers by co-sputtering the dopant with the boron carbide. Alternatively, the dopant may be provided by diffusing the dopant into the deposited boron carbide layers. Layers are formed on a substrate that is heated to a temperature of between about 400 degrees C. and about 600 degrees C. The alternating layers of boron carbide are heat treated at a temperature of about 900 degrees C.-1000 degrees C. for a period of about 1 hour to form a polycrystalline structure.
NTIS
Boron Carbides; Electrical Properties; Patent Applications; P-Type Semiconductors; Semiconductors (Materials); Thermoelectricity

20080033543 UT-Battelle, LLC, Oak Ridge, TN, USA
Non-Optical Explosive Sensor Based on Two-Track Piezoresistive Microcantilever
Pinnaduwage, L. A., Inventor; Yi, D., Inventor; Thundat, T. G., Inventor; Hawk, J. E., Inventor; 7 Feb 05; 6 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 7 Feb 05; US-Patent-Appl-SN-11-052 556
Report No.(s): PB2008-100677; No Copyright; Avail.: CASI: A02, Hardcopy

A two-track piezoresistive cantilever detects explosives in ambient air by measuring resistance changes in the cantilever when one piezoresistive track is pulse heated to cause deflagration of explosive adhered to the surface of the cantilever. The resistance measurement is through the second piezoresistive track, which is located at the most resistance-sensitive area. The resistance change of this track is caused by the temperature change of the cantilever as well as the bending of the cantilever due to bi-material thermal expansion. The detecting method using this novel cantilever avoids the use of any optical components such as a laser and position sensing detector (PSD), which are necessary in traditional detecting systems using cantilevers. Therefore, it can extremely reduce the complexity of the detecting system and make a portable chemical detection system possible that is small, less expensive, and able to be mass produced and is particularly useful for the detection of explosives.
NTIS
Optical Measuring Instruments; Patent Applications; Position Sensing; Explosives

20080033546 Nathan (Robert R.) Associates, Inc., Washington, DC, USA
Semiconductor Flip-Chip Package and Method for the Fabrication Thereof
Capote, M. A., Inventor; Zhou, Z., Inventor; Zhu, X., Inventor; Zhou, L., Inventor; 28 May 04; 23 pp.; In English
Contract(s)/Grant(s): DARPA-N00164-96-C-0089
Patent Info.: Filed Filed 28 May 04; US-Patent-Appl-SN-10-855 708
Report No.(s): PB2008-100672; No Copyright; Avail.: CASI: A03, Hardcopy

A simplified process for flip-chip attachment of a chip to a substrate is provided by pre-coating the chip with an encapsulant underfill material having separate discrete solder columns therein to eliminate the conventional capillary flow underfill process. Such a structure permits incorporation of remeltable layers for rework, test, or repair. It also allows incorporation of electrical redistribution layers. In one aspect, the chip and pre-coated encapsulant are placed at an angle to the substrate and brought into contact with the pre-coated substrate, then the chip and precoated encapsulant are pivoted about the first point of contact, expelling any gas therebetween until the solder bumps on the chip are fully in contact with the substrate. There is also provided a flip-chip configuration having a complaint solder/flexible encapsulant understructure that deforms generally laterally with the substrate as the substrate undergoes expansion or contraction. With this configuration, the complaint solder/flexible encapsulant understructure absorbs the strain caused by the difference in the thermal coefficients of expansion between the chip and the substrate without bending the chip and substrate.
NTIS
Chips; Fabrication; Patent Applications; Semiconductors (Materials)

20080033547 Whitham, Curtis and Christofferson, P.C., Reston, VA, USA

Decision Selection and Associated Learning for Computing All Solutions in Automatic Test Pattern Generation (ATPG) and Satisfiability

Hsiao, M. S., Inventor; Chandrasekar, K., Inventor; 2 Aug 05; 16 pp.; In English

Contract(s)/Grant(s): NSF-CCR-0196470; NSF-CCR-0305881

Patent Info.: Filed Filed 2 Aug 05; US-Patent-Appl-SN-11-194 543

Report No.(s): PB2008-100669; No Copyright; Avail.: CASI: A03, Hardcopy

An all solutions automatic test pattern generation (ATPG) engine method uses a decision selection heuristic that makes use of the 'connectivity of gates' in the circuit in order to obtain a compact solution-set. The 'symmetry in search-states' is analyzed using a 'Success-Driven Learning' technique which is extended to prune conflict sub-spaces. A metric is used to determine the use of learnt information a priori, which information is stored and used efficiently during 'success driven learning'.

NTIS

Heuristic Methods; Decision Making

20080033555 Army Research Lab., Adelphi, MD USA

Pendeo-Epitaxy Process Optimization of GaN for Novel Devices Applications

Derenge, Michael A; Zheleva, Tsvetanka S; Jones, Kenneth A; Shah, Pankaj B; Ewing, Daniel; Molstad, J; Lee, Unchul; Ervin, Matthew H; Stepp, David N; Apr 2008; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480707; ARL-TR-4426; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A relatively new class of materials known as wide bandgap materials and the corresponding devices fabricated from them have extremely useful characteristics for high temperature, high-frequency, high-power applications in numerous army systems and components. However the technology for these new materials is not mature enough and these materials contain various types of structural defects in high concentrations. It is well known that structural defects degrade the performance of the electronic devices and greatly diminish their reliability. Therefore various approaches for materials and devices optimization have been utilized in order to improve the operational characteristics of the wide bandgap electronic devices. One approach for defect reduction and improved electronic performance of wide-bandgap devices fabricated from material such as gallium nitride (GaN) is via pendeo-epitaxy. Pendeo-epitaxy as a technology is known to enable drastic reduction of the densities of structural defects in GaN over three to four orders of magnitude. We have used metal organic chemical vapor deposition (MOCVD) technique to grow pendeo-epitaxial (PE)-GaN, performed analysis of the morphology, structure, and electrical properties via numerous characterization techniques available at ARL, and correlated the materials and electrical characteristics with the growth and processing conditions. Further, we designed and fabricated test device structures in order to investigate the improved electronic performance of the Shottky contacts and high electron mobility transistors (HEMTs) and correlate the improved devices performance with the improved structural quality of the GaN material.

DTIC

Dielectric Properties; Epitaxy; Gallium Nitrides

20080033558 Army Research Lab., Adelphi, MD USA

Ranging With Electromagnetic Singularities

Mait, Joseph N; Ly, Canh; Testorf, Markus; Apr 2008; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480689; ARL-TN-307; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Most improvements in radar have concentrated solely on the temporal characteristics of the electromagnetic pulse. The spatial dimension is typically exploited only through arrays of antennas. The limits to using spatial characteristics of a transmitted beam to perform ranging were investigated, specifically, Laguerre-Gaussian beams as potential carriers for encoding range in spatial characteristics. The results indicate that whereas the beams are indeed capable of encoding range, aberrations and imaging fidelity limit the utility of the approach to small ranges. The system is better suited for microscopy than it is for battlefield ranging.

DTIC

Electromagnetic Pulses; Rangefinding; Singularity (Mathematics)

20080033657 Michigan Univ., Ann Arbor, MI USA

Reducing Antenna Visual Signature Using Meta-Materials

Sarabandi, Kamal; Palafox, George; Nov 1, 2006; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480935; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The current as well as planned family of Army vehicles requires multiple antennas to meet the growing communications

requirements and therefore exhibit a significantly large visual signature. Antenna size is dictated by frequency and the lower the frequency, the larger the antenna. At VHF and UHF frequencies, the primary military tactical communication bands, antennas have a significant visual signature. The visual signature exhibited by these antennas increases the vulnerability of the platforms. Low profile and conformal antenna technologies have a great potential to reduce or even eliminate antenna visual signatures thereby having a significant effect on vehicle survivability. In this paper, we propose a technique for significantly reducing the antenna visual signature. This technique involves printing the antenna on a high Reactive Impedance Surface (RIS) permittivity substrate or Meta-Material. We have chosen the UHF Enhanced Position Location Radio System (EPRLS) AS- 3449 antenna, a 1-meter whip structure as a baseline for this research. The proposed technique uses known patch antenna geometries as the antenna radiation elements with a substantially reduced signature while retaining the radiation characteristics of the EPLRS antenna. We present a computer model of the antenna with computer simulation results along with the antenna prototype with the experimental results.
DTIC
Antenna Components; Signatures; Telecommunication; Visual Signals

20080033811 Department of the Army, Washington, DC, USA
Panoramic See-Through Optical Device
Bryant, K. R., Inventor; Hall, J. M., Inventor; 23 Jul 04; 10 pp.; In English
Patent Info.: Filed Filed 23 Jul 04; US-Patent-Appl-SN-10-896 958
Report No.(s): PB2008-100636; No Copyright; Avail.: CASI: A02, Hardcopy

A panoramic see-through optical device in accordance with the present invention includes at least two prisms having a reflective face extending diagonally through the prism. Each prism has one convex surface with a tangent plane thereto, and the two prisms are arranged so that the tangent planes are orthogonal to each other. The device further includes a plurality of display panels corresponding to a respective prism. The display panels are placed about parallel to each tangent plane so that the convex surface of the prism faces the panel. An optical train, which minimally includes a filter and a surface diffractive lens, is located between the display panel and the prism, primarily to correct for chromatic aberration, or color spread. Data from each display panel can be reflected by reflective face internal to the prism and seen by the operator. At the same time, the operator can see directly through the partially reflective face of the prism. The result is a field of view with data from the display panel that is superimposed over the field of view.
NTIS
Optical Equipment; Patent Applications

20080033812 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA; California Univ., Berkeley, CA, USA
Internal Electrostatic Transduction Structure for Bulk-Mode Micromechanical Resonators
Bhave, S. A., Inventor; Howe, R. T., Inventor; 3 Jun 05; 14 pp.; In English
Contract(s)/Grant(s): N66001-01-1-8967
Patent Info.: Filed Filed 3 Jun 05; US-Patent-Appl-SN-11-146 303
Report No.(s): PB2008-100627; No Copyright; Avail.: CASI: A03, Hardcopy

An electrostatic transducer for micromechanical resonators, in which the electrode gaps are filled with a dielectric material having a much higher permittivity than air. This internal electrostatic transducer has several advantages over both air-gap electrostatic and piezoelectric transduction; including lower motional impedance, compatibility with advanced scaled CMOS device technology, and extended dynamic range. In one aspect, in order to minimize energy losses, the dielectric material has an acoustic velocity which is matched to that of the resonator material. Internal electrostatic transduction can be adapted to excite and detect either vertical modes (perpendicular to the substrate) or lateral modes (in the plane of the substrate). Its increased transduction efficiency is of particular importance for reducing the motional resistance of the latter.
NTIS
Electrostatics; Genetics; Micromechanics; Patent Applications; Resonators; Transducers; Transferring

20080033814 Taylor Russell and Russell, PC, Austin, TX, USA
System and Method for Detection of Fiber Optic Cable Using Static and Induced Charge
Helffrich, J. A., Inventor; Light, G. M., Inventor; Thwing, C. J., Inventor; 16 Jun 05; 11 pp.; In English
Contract(s)/Grant(s): MDA904-01-C-2133

Patent Info.: Filed Filed 16 Jun 05; US-Patent-Appl-SN-11-160 275
Report No.(s): PB2008-100647; No Copyright; Avail.: CASI: A03, Hardcopy

The system and method provides means for detecting fiber optic cable embedded within a structure such as a wall of a building. It relies upon detecting an electrical field generated by movement of static and induced electrical charged fiber optic cable contained within the building wall. The invention is particularly useful when only one side of a wall structure is accessible and there is no access to the fiber optic cable. The process comprises the steps of locating wall studs, making a small hole in the wall material between the wall studs at approximately mid height, inserting a field emitter in the small hole for generating an electrical charge on a fiber cable, inserting an air nozzle in the small hole to create fiber cable movement, and detecting an electric field generated by the movement of an electrically charged fiber cable.
NTIS
Electric Charge; Fiber Optics; Power Lines; Walls

20080033825 McKee Voorhees and Sease, PLC, Des Moines, IA, USA; Pennsylvania State Univ., University Park, PA, USA
High Selectivity Electromagnetic Bandgap Device and Antenna System
Werner, D. H., Inventor; Werner, P. L., Inventor; Wilhelm, M. J., Inventor; 30 Jul 04; 12 pp.; In English
Contract(s)/Grant(s): NBCHC010061
Patent Info.: Filed Filed 30 Jul 04; US-Patent-Appl-SN-10-909 213
Report No.(s): PB2008-100631; No Copyright; Avail.: CASI: A03, Hardcopy

An antenna system includes an antenna element and an electromagnetic bandgap element proximate the antenna element wherein the electromagnetic bandgap element is optimized for narrow bandwidth operation thereby providing radiofrequency selectivity to the antenna system. Preferably the electromagnetic bandgap element is tunable such as through use of a bias-alterable dielectric substrate or other tuning mechanism. The design approach also provides a means of creating an ultra-thin low-profile narrowband tunable channel selective antenna system suitable for low frequency applications.
NTIS
Antenna Design; Electromagnetic Pulses; Energy Gaps (Solid State); Patent Applications

20080033826 Park Vaughan and Fleming LLP, Davis, CA, USA
Method and Apparatus for Using Capacitively Coupled Communication within Stacks of Laminated Chips
Drost, R. J., Inventor; Ho, R., Inventor; Zingher, A. R., Inventor; 14 Oct 04; 8 pp.; In English
Contract(s)/Grant(s): NBCH020055
Patent Info.: Filed Filed 14 Oct 04; US-Patent-Appl-SN-10-966 510
Report No.(s): PB2008-100624; No Copyright; Avail.: CASI: A02, Hardcopy

One embodiment of the present invention provides a technique for assembling semiconductor chips. First, multiple semiconductor chips are permanently laminated together into a plurality of laminated chip assemblies, wherein the semiconductor chips within the laminated chip assembly communicate with each other through electrically conductive connections. Next, laminated chip assemblies are stacked together to form a stack of semiconductor chips without permanently bonding the laminated chip assemblies together, wherein the laminated chip assemblies communicate with each other using capacitive coupling.
NTIS
Chips; Chips (Electronics); Laminates; Patent Applications; Stacks

20080033830 Hirschboeck (Whyte), Dudek, SC, USA
Large Area Electron Emission System for Application in Mask-Based Lithography, Maskless Lithography II and Microscopy
Pilla, S. V. S., Inventor; 22 Jul 05; 32 pp.; In English
Contract(s)/Grant(s): 0085922
Patent Info.: Filed Filed 22 Jul 05; US-Patent-Appl-SN-11-188 043
Report No.(s): PB2008-100622; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to a various systems for generating and directing electron flow, and related methods, manufacturing techniques and related componentry, such as can be used in lithography, microscopy and other applications. In one embodiment, the present invention involves a system that includes an electron source having a plurality of independently-actuatable emission surfaces each of which is capable of emitting electrons, and an optical column adjacent to

the electron source through which the emitted electrons pass. The optical column includes a plurality of actuatable electrodes that are capable of influencing paths taken by the emitted electrons.
NTIS
Electron Emission; Lithography; Masks; Microscopy; Patent Applications

20080033836 Sun Microsystems, Inc., Mountain View, CA, USA
Optimal Communication Path Routing in a System Employing Interconnected Integrated Circuit Technology
Vigouroux, X. F., Inventor; Tourancheau, B., Inventor; Koch-Hofer, C., Inventor; 2 Sep 05; 12 pp.; In English
Contract(s)/Grant(s): NBCH020055
Patent Info.: Filed Filed 2 Sep 05; US-Patent-Appl-SN-11-219 153
Report No.(s): PB2008-100639; No Copyright; Avail.: CASI: A03, Hardcopy

An electronic system is described in which integrated circuits employing cornered I/O are arranged in a framework including an optional path manager and at least one updateable routing table. Packet routing options are described with solutions being provided to minimize transmission latency and pathway alternatives.
NTIS
Communication Networks; Integrated Circuits; Interprocessor Communication

20080033897 Schwegman, Lundberg, Woessner and Kluth, Minneapolis, Macau
Chemoreceptive Semiconductor Structure
Kan, E., Inventor; Minch, A., Inventor; 11 Oct 05; 10 pp.; In English
Contract(s)/Grant(s): NER-ECS-0210743; NCER-R830902
Patent Info.: Filed Filed 11 Oct 05; US-Patent-Appl-SN-11-247 035
Report No.(s): PB2008-100976; No Copyright; Avail.: CASI: A02, Hardcopy

A field effect transistor has a floating gate with an extended portion. A selectively chemoreceptive finger or layer is electrostatically coupled to the extended portion of the floating gate, and induces a voltage on the gate in response to selected chemicals or other conditions affecting the finger. The voltage on the gate modulates current flowing between a source and a drain of the transistor, effectively sensing the presence of the selected chemicals or conditions. In one embodiment, multiple chemoreceptive fingers are electrostatically coupled to the extended portion of the floating gate. In a further embodiment, an array of such field effect transistors provide a sensor for multiple conditions.
NTIS
Chemoreceptors; Field Effect Transistors; Fingers; Patent Applications; Semiconductors (Materials)

20080033898 O'Keefe, Egan and Peterman, LLP, Austin, TX, USA
Systems and Methods for Implementing Delay Line Circuitry
Avants, B. S., Inventor; Yanez, A., Inventor; 20 Aug 04; 17 pp.; In English
Contract(s)/Grant(s): F33657-00-G-4029-02044
Patent Info.: Filed Filed 20 Aug 04; US-Patent-Appl-SN-10-922 803
Report No.(s): PB2008-100975; No Copyright; Avail.: CASI: A03, Hardcopy

Memory devices used to control delay line circuitry, and that may be implemented in one embodiment to provide a self-tuning delay line device using empirical calibration technique/s to achieve a desired signal delay. The memory control device may be implemented to store electrical characteristics of the delay line circuitry during testing to enable self-calibration of the delay line circuitry.
NTIS
Circuits; Computer Storage Devices; Control Equipment; Delay Lines; Patent Applications

20080033899 Foster (Lynn G.), L.C., Salt Lake City, UT, USA
Microscopic Batteries for MEMS (PAT APPL-10-982 606)
LaFollette, R. M., Inventor; Salmon, L. G., Inventor; Harb, J. N., Inventor; 5 Nov 04; 25 pp.; In English
Contract(s)/Grant(s): F20601-96-C-0078

Patent Info.: Filed Filed 5 Nov 04; US-Patent-Appl-SN-10-982 606
Report No.(s): PB2008-100974; No Copyright; Avail.: CASI: A03, Hardcopy

Microscopic batteries, integratable or integrated with and integrated circuit, including a MEMS microcircuit, and methods of microfabrication of such microscopic batteries are disclosed.

NTIS

Electric Batteries; Microelectromechanical Systems; Patent Applications

20080033928 Lawrence Livermore National Lab., Livermore, CA USA

High Performance Hybrid Magnetic Structure for Biotechnology Applications

Humphries, D. E., Inventor; Pollard, M. J., Inventor; Elkin, C. J., Inventor; 11 Oct 05; 40 pp.; In English
Contract(s)/Grant(s): DE-AC03-76SF00098; DE-AC02-05CH11231
Patent Info.: Filed Filed 11 Oct 05; US-Patent-Appl-SN-11-248 934
Report No.(s): PB2008-100972; No Copyright; Avail.: CASI: A03, Hardcopy

The present disclosure provides a high performance hybrid magnetic structure made from a combination of permanent magnets and ferromagnetic pole materials which are assembled in a predetermined array. The hybrid magnetic structure provides means for separation and other biotechnology applications involving holding, manipulation, or separation of magnetic or magnetizable molecular structures and targets. Also disclosed are: a method of assembling the hybrid magnetic plates, a high throughput protocol featuring the hybrid magnetic structure, and other embodiments of the ferromagnetic pole shape, attachment and adapter interfaces for adapting the use of the hybrid magnetic structure for use with liquid handling and other robots for use in high throughput processes.

NTIS

Biotechnology; Hybrid Structures; Magnetic Field Configurations; Molecular Structure; Patent Applications

20080034443 California Univ., Berkeley, CA USA

Environmentally Benign Stab Detonators

Gash, Alexander; Jul 11, 2006; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W74RDV30663230; Proj-L99251
Report No.(s): AD-A480781; UCRL-TR-222711; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work details the stab ignition, small-scale sensitivity, and energy release characteristics of bimetallic Al/Ni(V) and Al/Monel energetic nanolaminate free-standing films. The influence of the engineered nanostructural features of the multilayers/correlated with both stab initiation and small-scale energetic materials testing results. Structural parameters of the thin films found to be important include the bi-layer period, total thickness of the film, and presence of coating Al layers. Live lead-free M55 stab detonators were prepared using energetic nanolaminate as the stab mix, cyanuric triazide as the transfer charge, and an Army formulation for the output charge. These lead-free detonators were demonstrated to have the acceptable stab sensitivity (21-35 mJ) as is required in current M55 detonators. There was evidence that the replacement of the current NOL-130 stab mix by compact powders of energetic multilayers does not affect the performance of the stab detonator.

DTIC

Detonators; Thin Films; Structural Design; Bimetals; Explosives

20080034448 Arnold Engineering Development Center, Arnold AFS, TN USA

Deconflicting Electronic Warfare in Joint Operations

Huber, Arthur F; Carlberg, Gary; Gilliard, Prince; Marquet, L D; Jan 2007; 8 pp.; In English
Report No.(s): AD-A480913; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As in combat involving weapons whose lethal effects can result in friendly casualties, electronic warfare (EW) is no less immune to the deleterious effects of fratricide. While the problem of fratricide involving projectile weapons continues to plague modern armies due to advances in velocity and lethality, it is becoming a growing issue for those who conduct EW. More and more systems both weapons and purely commercial devices are vying for their place in an increasingly crowded frequency spectrum. There is growing pressure to transfer previously reserved military frequency bands to the public domain and low tolerance for interference of any kind outside of assigned operating bands. Exacerbating this situation is the rush to field emitters of various kinds without proper vetting through the spectrum certification process. Something must be done soon to manage and deconflict the electromagnetic(EM) spectrum better if EW is to remain a weapon that warfighters can wield with acceptable confidence to yield desired effects. The problem of EW fratricide is one that exists even in operations involving the most modern equipment and well-trained, professional crews. Although this example comes from Operation

Desert Storm, the problem has recently become highlighted through the experiences of warfighters in Operations Enduring Freedom and Iraqi Freedom. According to Lieutenant General Walter Buchanan, former chief of Ninth Air Force and U.S. Central Command Air Forces, 'This is the first time that you and I have seen electronic fratricide reach the point that it has. . . . When you take a look at data links and the number of jammers in place and all the radios we have out there, [deconflicting] becomes a very difficult problem.'
DTIC
Electronic Warfare; Jamming; Radio Frequency Interference

20080034454 Sharma and Associates, Inc., Hinsdale, IL, USA
Conceptual Development of Impact Overload Detection Devices for Tank Car Service
Prabhakaran, A.; Brabb, D. C.; Sharma, V.; Aug. 2007; 40 pp.; In English
Report No.(s): PB2008-101288; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project was to develop concepts for mechanical and electronic systems that can detect yard or in-train impacts that exceed design load or other reasonable limits on tank cars. The project team developed some mechanical and electronic systems for detecting overload impacts. For the mechanical system, detection of draft gear travel and closeout offered the best chances for success. For electronic systems, this project identified the following methods for overload impact detection: Measuring a combination of draft gear travel and draft gear velocity; Measuring impact force using piezo-electric film; Using acceleration measurements for overload detection. Although the team developed a fairly accurate way to estimate overload impacts through acceleration measurements, the commercially available unit tested did not function well enough to do the same. It is possible that additional development will help the unit perform better. Therefore, it is recommended that this option not be used for electronic overload detection until additional developments are made. It might be possible for the manufacturer of the tested unit to make adjustments in its functionality that might in turn enable the unit to perform better at threshold detection and transmission.
NTIS
Detection; Mechanical Properties; Electrical Properties

20080034508 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Diamond/Carbon Fiber Composite as Anode in Lithium Ion Batteries
Almeida, Erica Cristina; [2007]; 179 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-14644-TDI/1204; Copyright; Avail.: CASI: C01, CD-ROM: A09, Hardcopy

An innovative composite diamond/carbon fiber is presented for application as negative electrode (anode) in lithium ion batteries. In this sense, it was important the understanding and discussion of three subjects divided into: obtaining and characterization of the carbon fiber, used as substrate; growth and characterization of doped diamond film on the fiber, forming the composite; and, finally, the results of the application of this material as anode in lithium ion batteries. The structure of the carbon fibers obtained from polyacrylonitrile precursor is strongly dependent on the heat treatment temperature (HTT). HTT increasing affects the diamond film quality as well as the sample electrical resistivity and the intercalation sites. Morphological differences on the diamond films are also evident as a function of HTT. The grain size, observed from Scanning Electron Microscopy (SEM), increases with the evolution of the substrates graphitization treated at 1000, 1500 and 2000 C. An more organized structure favored the appearance of the pyramidal (111) diamond plane where diamond particles possibly nucleated at the graphite edge. In all the studied substrate the SEM images show that the carbon fibers were completely re-covered by the diamond film, forming a three-dimensional diamond structure up to a depth of 1.5 mm, for films grown in both sample sides. The electrochemical behavior of lithium intercalation showed that the composite electrode with fibers treated at 1000 C and re-covered with highly conducting diamond increases the capacity of lithium storage, when the intercalation process was made with low current, reaching 370 mA.h.g(exp -1) of the reversible charge capacity. The main advantage of these composite electrodes is that they are free of a polymer binder, frequently used in the electrodes for lithium ion batteries. Thus, the batteries anode preparation becomes easy and simplified, rather than to decrease the electric resistance in such device.
Author
Diamonds; Carbon Fibers; Composite Materials; Anodes; Lithium Batteries; Nanostructures (Devices)

20080034586 Lawrence Livermore National Lab., Livermore, CA USA
Contraband Detection with Nuclear Resonance Fluorescence: Feasibility and Impact
Pruet, J.; Lange, D.; Jan. 04, 2007; 18 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Report No.(s): DE2007-902370; UCRL-TR-227067; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Detection; Feasibility; Resonance Fluorescence

20080034597 Sandia National Labs., Albuquerque, NM USA
Advanced Modeling and Simulation to Design and Manufacture High Performance and Reliable Advanced Microelectronics and Microsystems
Ewsuk, K. G.; Hinklin, T.; Neilsen, M.; Tandon, R.; Arguello, J. G.; Jul. 2007; 97 pp.; In English
Report No.(s): DE2007-913216; SAND2007-4298; No Copyright; Avail.: National Technical Information Service (NTIS)
An interdisciplinary team of scientists and engineers having broad expertise in materials processing and properties, materials characterization, and computational mechanics was assembled to develop science-based modeling/simulation technology to design and reproducibly manufacture high performance and reliable, complex microelectronics and microsystems. The teams efforts focused on defining and developing a science-based infrastructure to enable predictive compaction, sintering, stress, and thermomechanical modeling in real systems, including: (1) developing techniques to and determining materials properties and constitutive behavior required for modeling; (2) developing new, improved/updated models and modeling capabilities, (3) ensuring that models are representative of the physical phenomena being simulated; and (4) assessing existing modeling capabilities to identify advances necessary to facilitate the practical application of Sandia's predictive modeling technology.
NTIS
Integrated Circuits; Microelectronics; Performance Prediction; Simulation

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*.

20080032792 Idaho National Engineering Lab., Idaho Falls, ID, USA
Investigations of the Application of CFD to Flow Expected in the Lower Plenum of the Prismatic VHTR
Johnson, R. W.; Guillen, D. P.; Gallway, T.; Sep. 2006; 76 pp.; In English
Report No.(s): DE2007-911906; INL/EXT-06-11756; No Copyright; Avail.: National Technical Information Service (NTIS)
The Generation IV (Gen IV) very high temperature reactor (VHTR) will either be a prismatic (block) or pebble bed design. However, a prismatic VHTR reference design, based on the General Atomics Gas Turbine-Modular Helium Reactor (GT-MHR) (General Atomics, 1996) has been developed for preliminary analysis purposes (MacDonald, et al., 2003). Numerical simulation studies reported herein are based on this reference design. In the lower plenum of the prismatic reference design, the flow will be introduced by dozens of turbulent jets from the core above. The jet flow will encounter rows of columns that support the core. The flow from the core will have to turn ninety degrees and flow toward the exit duct as it passed through the forest of support columns. Due to the radial variation of the power density in the core, the jets will be at various temperatures at the inlet to the lower plenum. This presents some concerns, including that local hot spots may occur in the lower plenum. This may have a deleterious effect on the materials present as well as cause a variation in temperature to be present as the flow enters the power conversion system machinery, which could cause problems with the operation of the machinery. In the past, systems analysis codes have been used to model flow in nuclear reactor systems. It is recognized, however, that such codes are not capable of modeling the local physics of the flow to be able to analyze for local mixing and temperature variations. This has led to the determination that computational fluid dynamic (CFD) codes be used, which are generally regarded as having the capability of accurately simulating local flow physics. Accurate flow modeling involves determining appropriate modeling strategies needed to obtain accurate analyses. These include determining the fineness of the grid needed, the required iterative convergence tolerance, which numerical discretization method to use, and which turbulence model and wall treatment should be employed. It also involves validating the computer code and turbulence model against a series of separate and combined flow phenomena and selecting the data used for the validation. This report describes progress made to identify proper modeling strategies for simulating the lower plenum flow for the task entitled CFD software validation

of jets in crossflow, which was designed to investigate the issues pertaining to the validation process. The flow phenomenon previously chosen to investigate is flow in a staggered tube bank because it is shown by preliminary simulations to be the location of the highest turbulence intensity in the lower plenum Numerical simulations were previously obtained assuming that the flow is steady. Various turbulence models were employed along with strategies to reduce numerical error to allow appropriate comparisons of the results. It was determined that the sophisticated Reynolds stress model (RSM) provided the best results. It was later determined that the flow is an unsteady flow wherein circulating eddies grow behind the tube and peel off alternately from the top and the bottom of the tube. Additional calculations show that the mean velocity is well predicted when the flow is modeled as an unsteady flow. The results for U are clearly superior for the unsteady computations; the unsteady computations for the turbulence stress are similar to those for the steady calculations, showing the same trends.
NTIS
Computational Fluid Dynamics; Nuclear Reactors; High Temperature

20080032962 Johns Hopkins Univ., MD, USA
An Experimental Investigation of Shear Layer Mixing in Supersonic Flows
Sullins, Gary Alan; December 1988; 136 pp.; In English; Original contains black and white illustrations
Report No.(s): CN-164-463; Copyright; Avail.: Other Sources

In the design of a combustor, information is necessary for the mixing of the fuel and air in order to determine the optimum combustor length. In scramjet combustors the mixing often takes place in a shear layer that is formed between the fuel and air. This research was an experimental study of shear layers in supersonic flows aimed at determining what mechanisms affect the shear layer so that the mixing could be better predicted. A second goal was to provide sufficient instream information for use in checking existing Computational Fluid Dynamic (CFD) codes. The shear layer between a supersonic two-dimensional air stream (M = 2 or M = 3) was mixed with a near sonic two-dimensional air stream (M = 1.2). Instream measurements of pitot pressure and cone static pressure were used to determine mean velocity profiles at various axial locations. These velocity profiles were used to determine the shear layer spreading rate and are compared with various predictions. Wall measurements of static pressure, temperature and skin friction were also taken and are presented. The instream measurements were also used for comparison with an existing CFD code. The upstream velocity, pressure and temperature profiles were used as a starting profile and the code was used to calculate downstream profiles for comparison with the experimental results. Reasonable agreement between the measured and calculated results was obtained.
Author
Supersonic Flow; Shear Layers; Computational Fluid Dynamics; Air Flow; Supersonic Combustion Ramjet Engines

20080033005 Da-Yeh Univ., Taiwan, Province of China
Hydrogen Production in a Thermal Plasma Hydrogen Reformer Using Ethanol Steam Reforming
Tsai, Huan-Liang; Wang, Chi-Sheng; Lee, Chien-Hsiung; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 417-425; In English; See also 20080032994; Copyright; Avail.: Other Sources

This paper presents both analytical thermodynamic analysis and experimental results of ethanol steam reforming in a thermal plasma reformer at various working conditions. Since our thermal plasma reformer can work well at atmospheric pressure, a thermodynamic equilibrium prediction is first performed at temperatures in the range from 500 to 1000 C and at mole flow ratios of ethanol to water from 1:l to 1:6. And then the experiment for ethanol steam reforming of a fabricated thermal plasma reformer is performed and the reformate stream is immediately analyzed using GC/MS, GC/FID/TCD, and pre-concentrator. Comparing predicted data with experimental data, an optimal working condition is determined at the temperature of 750 C and at mole flow ratio of ethanol to water of 1:3. In the future, an optimal temperature control system will be designed to maintain the thermal plasma reformer at the temperature of 750 C under the inlet mole flow ratio of ethanol to water of 1:3.
Author
Hydrogen Production; Thermodynamic Equilibrium; Plasma Temperature; Hydrogen Plasma; Ethyl Alcohol; Temperature Control; Optimal Control

20080033036 NASA Marshall Space Flight Center, Huntsville, AL, USA
Interface Shape Control using Localized Heating during Bridgman Growth
Volz, M. P.; Mazuruk, K.; Aggarwal, M. D.; June 08, 2008; 1 pp.; In English; American Association for Crystal Growth and Epitaxy (AACGE) West 21 Conference, 8-11 Jun. 2008, South Lake Tahoe, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Numerical calculations were performed to assess the effect of localized radial heating on the melt-crystal interface shape

during vertical Bridgman growth. System parameters examined include the ampoule, melt and crystal thermal conductivities, the magnitude and width of localized heating, and the latent heat of crystallization. Concave interface shapes, typical of semiconductor systems, could be flattened or made convex with localized heating. Although localized heating caused shallower thermal gradients ahead of the interface, the magnitude of the localized heating required for convexity was less than that which resulted in a thermal inversion ahead ofthe interface. A convex interface shape was most readily achieved with ampoules of lower thermal conductivity. The conditions under which convection in the melt must be considered were determined.

Author

Shape Control; Bridgman Method; Melts (Crystal Growth); Temperature Effects; Latent Heat; Semiconductors (Materials)

20080033098 NASA Marshall Space Flight Center, Huntsville, AL, USA

Transient Three-Dimensional Startup Side Load Analysis of a Regeneratively Cooled Nozzle

Wang, Ten-See; June 23, 2008; 22 pp.; In English; 38th AIAA Fluid Dynamics Conference and Exhibit, 23-26 Jun. 2008, Seattle, WA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033098

The objective of this effort is to develop a computational methodology to capture the startup side load physics and to anchor the computed aerodynamic side loads with the available data from a regeneratively cooled, high-aspect-ratio nozzle, hot-fired at sea level. The computational methodology is based on an unstructured-grid, pressure-based, reacting flow computational fluid dynamics and heat transfer formulation, a transient 5 s inlet history based on an engine system simulation, and a wall temperature distribution to reflect the effect of regenerative cooling. To understand the effect of regenerative wall cooling, two transient computations were performed using the boundary conditions of adiabatic and cooled walls, respectively. The results show that three types of shock evolution are responsible for side loads: generation of combustion wave; transitions among free-shock separation, restricted-shock separation, and simultaneous free-shock and restricted shock separations; along with the pulsation of shocks across the lip, although the combustion wave is commonly eliminated with the sparklers during actual test. The test measured two side load events: a secondary and lower side load, followed by a primary and peak side load. Results from both wall boundary conditions captured the free-shock separation to restricted-shock separation transition with computed side loads matching the measured secondary side load. For the primary side load, the cooled wall transient produced restricted-shock pulsation across the nozzle lip with peak side load matching that of the test, while the adiabatic wall transient captured shock transitions and free-shock pulsation across the lip with computed peak side load 50% lower than that of the measurement. The computed dominant pulsation frequency of the cooled wall nozzle agrees with that of a separate test, while that of the adiabatic wall nozzle is more than 50% lower than that of the measurement. The computed teepee-like formation and the tangential motion of the shocks during lip pulsation also qualitatively agree with those of test observations. Moreover, a third transient computation was performed with a proportionately shortened 1 s sequence, and lower side loads were obtained with the higher ramp rate.

Author

Computational Fluid Dynamics; Aerodynamic Loads; Regenerative Cooling; Transient Loads; Unstructured Grids (Mathematics); Nozzles; High Aspect Ratio

20080033399 Naval Undersea Warfare Center, Newport, RI USA

Explosive Water Jet With Precursor Bubble

Gieseke, Thomas J, Inventor; Apr 28, 2008; 21 pp.; In English

Report No.(s): AD-D020362; No Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/100.2/ADD020362

A water jet assembly and method of use comprising a tank with cutting fluid, fuel and oxidizer lines, and a tank discharge lines. In operation, the tank is filled with oxidizer; the oxidizer line is closed and cutting fluid is supplied compressing the oxidizer. When the fluid reaches a level, the fluid line is closed and fuel is injected. A spark generator ignites the fuel/oxidizer mixture thereby raising the tank pressure. As the pressure rises, a low pressure valve simultaneously closes at a prescribed level. The vent line and a discharge to a nozzle are opened thereby, forming a gas bubble. When the bubble reaches a desired size and pressure drops below a level, the vent closes, allowing combustion expansion to force fluid through the nozzle to form a cutting jet. The bubble allows the jet to retain coherence between the nozzle and a cutting surface.

DTIC

Bubbles; Explosives; Hydraulic Jets; Patent Applications

20080033450 Naval Research Lab., Washington, DC USA

Instability of isolated planar shock waves

Bates, Jason W; Jun 7, 2007; 18 pp.; In English

Report No.(s): AD-A480805; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Previously, expressions governing the temporal evolution of linear perturbations to an isolated, planar, two-dimensional shock front in an inviscid fluid medium with an arbitrary equation of state were derived using a methodology based on Riemann invariants and Laplace transforms [J.W. Bates, Phys. Rev. E 69, 056313 '2004"]. An overlooked yet immediate consequence of this theory is that the stability limits of shocks can be readily determined from a inspection of the poles of the transformed ripple amplitude. Here, it is shown that two classes of instabilities exist for isolated planar shock waves: one in which perturbations grow exponentially in time, and the other in which disturbances are stationary. These results agree with those derived by D'yakov and Kontorovich 'by more arduous and somewhat ambiguous means', and serve as an important addendum to our earlier analysis.

DTIC

Inviscid Flow; Isolation; Planar Structures; Ripples; Shock Waves; Wave Dispersion

20080033456 Naval Surface Warfare Center, Indian Head, MD USA

Design and Analysis of Orthotrophic Ring-Stiffened Cylindrical Shells Subjected to External Hydrostatic Pressure

Renzi, John R; Mar 28, 2008; 91 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480819; NSWC-IHTR-2944; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Three theories are presented for the analysis of ring-stiffened or monocoque cylindrical shells under hydrostatic pressure. The theories compute the stress state and the axisymmetric collapse, interbay buckling, and general instability pressures from external hydrostatic pressure loading. The theories were derived for the case of specially orthotropic material with theoretically uniform properties through the thickness; the theories apply equally to shells made of isotropic materials. A computer program, DAPS4 (Design and Analysis of Plastic Shells, Version 4), was written that incorporates these theories that can be used as an initial sizing tool or analysis of a shell's hydrostatic pressure capability. The program includes a 'pseudo-plastic' method to account for the reduction of computed collapse pressures when the stress state is above the proportional limit of the material's stress-strain curve. The purpose of this report is to document the theories and the code. Correlation with numerous pressure tests is shown. A user manual with example problems is included.

DTIC

Cylindrical Shells; Design Analysis; Hydrostatic Pressure

20080033458 Air Force Research Lab., Edwards AFB, CA USA

Numerical Study of Two-Phase Flow Field in a Simplified Swirl Cup Combustor (Preprint)

Park, Tae W; Aggarwal, Suresh K; Katta, Viswanath R; Roquemore, William M; Sep 24, 2007; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-23080532

Report No.(s): AD-A480828; AFRL-PR-ED-JA-2007-419; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A numerical study was performed to investigate the two-phase flow field in a geometrically simplified swirl cup in a gas turbine combustor. The actual combustor has a hybrid-atomization feature with pressure atomization from the nozzle and airblast reatomization for the liquid film at the tip of venturi wall. The amount of liquid film formed in venturi tube could play an important role in characterizing the flow field of this combustor. Therefore, the major objective is to investigate the effects of swirl mode, gas temperature, and droplet injection characteristics on the amount of liquid film formed on the venturi wall. The present study first investigates the effects of the swirl mode and temperature of the primary and secondary air on the gas-phase flow field and then the effect of droplet injection characteristics in terms of velocity and location on the droplet transport and vaporization behavior. The detailed plots of droplet trajectory are used to identify the size ranges of the droplets which can form a liquid film by their impaction on the venturi tube wall. In general, the results indicate that the droplet injection characteristics have the dominant effect on the cut-off droplet diameter for droplet impaction on the venturi wall.

DTIC

Combustion Chambers; Flow Distribution; Gas Turbines; Two Phase Flow; Vaporizing

20080033678 NASA Langley Research Center, Hampton, VA, USA

Aeroservoelastic Testing of a Sidewall Mounted Free Flying Wind-Tunnel Model

Scott, Robert C.; Vetter, Travis K.; Penning, Kevin B.; Coulson, David A.; Heeg, Jennifer; August 18, 2008; 24 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581

Report No.(s): AIAA Paper 2008-7186; Copyright; Avail.: CASI: A03, Hardcopy

A team comprised of the Air Force Research Laboratory (AFRL), Northrop Grumman, Lockheed Martin, and the NASA Langley Research Center conducted three j wind-tunnel tests in the Transonic Dynamics Tunnel to demonstrate active control technologies relevant to large, exible vehicles. In the rst of these three tests, a semispan, aeroelastically scaled, wind-tunnel model of a ying wing SensorCraft vehi- cle was mounted to a force balance to demonstrate gust load alleviation. In the second and third tests, the same wing was mated to a new, multi-degree-of-freedom, sidewall mount. This mount allowed the half-span model to translate vertically and pitch at the wing root, allowing better simulation of the full span vehicle's rigid-body modes. Gust Load Alleviation (GLA) and Body Freedom Flutter (BFF) suppression were successfully demonstrated. The rigid body degrees-of-freedom required that the model be own in the wind tunnel using an active control system. This risky mode of testing necessitated that a model arrestment system be integrated into the new mount. The safe and successful completion of these free-flying tests required the development and integration of custom hardware and software. This paper describes the many systems, software, and procedures that were developed as part of this effort.
Author

Aeroservoelasticity; Software Engineering; Transonic Wind Tunnels; Wind Tunnel Models; Wind Tunnel Tests

20080033696 NASA Langley Research Center, Hampton, VA, USA

Allowable Trajectory Variations for Space Shuttle Orbiter Entry-Aeroheating CFD

Wood, William A.; Alter, Stephen J.; Palmer, Grant E.; Saunders, David A.; August 18, 2008; 15 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 377816.06.02.03.08

Report No.(s): AIAA Paper 2008-6559; Copyright; Avail.: CASI: A03, Hardcopy

Reynolds-number criteria are developed for acceptable variations in Space Shuttle Orbiter entry trajectories for use in computational aeroheating analyses. The criteria determine if an existing computational fluid dynamics solution for a particular trajectory can be extrapolated to a different trajectory. The criteria development considers twelve types of computational aeroheating data, such as boundary layer thickness. For each type of datum, the allowable uncertainty contribution due to trajectory variation has been set by the Entry Aeroheating Subsystem team. Then Reynolds-number relations between trajectory variation and output uncertainty are determined. From these relations the criteria are established for the maximum allowable trajectory variations. The most restrictive criterion allows a 25% variation in Reynolds number at constant Mach number between trajectories.
Author

Aerodynamic Heating; Atmospheric Entry; Computational Fluid Dynamics; Space Shuttle Orbiters; Trajectories

20080033751 Department of Defense, USA

Cavitation-Induced Vibrations in a Two-Bladed Rocket Engine Inducer

Burton, Kevin; Hibbs, Robert; Nadolski, Mark; Subbaraman, Maria; Feb 2008; 11 pp.; In English

Contract(s)/Grant(s): FA9300-04-C-0008; Proj-5026

Report No.(s): AD-A480749; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Experimental investigation of cavitation induced vibrations in a 2-bladed water model inducer was performed for inlet flowrates ranging from 70% to 120% of the design flowrate and over a range of inlet cavitation numbers representative of a typical rocket engine operation. Dynamic (high frequency) pressure transducers were used to record fluctuating pressures along inducer housing (stationary reference frame) up to 2500 Hz, i.e. about 30 times the shaft speed. Data were obtained in two axial planes: one 0.08 diameters upstream and one 0.37 diameters downstream relative to the inducer blade leading edge tip plane. Flow visualization data at conditions typical of tip vortex instabilities at high cavitation number and sheet cavitation are presented and correlated to dynamic signature. Dynamic spectrum of the 2-bladed inducer is compared to data representative of the environment in a 4-bladed rocket engine inducer. The differences in the dynamic characteristics between

the 2-bladed and 4-bladed inducers and the potential implications to inducer design decisions for lowering the impact of cavitation induced vibrations in turbomachinery are discussed.
DTIC
Cavitation Flow; Rocket Engines; Vibration

20080033831 Rosenberg (Frank), Moraga, CA, USA
Methods for Fluid Separations, and Devices Capable of Separating Fluids
TeGrotenhuis, W. E., Inventor; Stenkamp, V. S., Inventor; 23 Apr 03; 20 pp.; In English
Contract(s)/Grant(s): DE-AC0676RLO1830
Patent Info.: Filed Filed 23 Apr 03; US-Patent-Appl-SN-10-422 367
Report No.(s): PB2008-100661; No Copyright; Avail.: CASI: A03, Hardcopy

Wick-Containing apparatus capable of separating fluids and methods of separating fluids using wicks are disclosed.
NTIS
Patent Applications; Fluids; Separators

20080033931 Argonne National Lab., Idaho Falls, ID, USA
Entropy Generation in the Viscous Layer ofa Turbulent Channel Flow. 5th International Symposium on Turbulence, Heat and Mass Transfer (THMT-5)
McEligot, D. M.; Walsh, E. J.; Laurien, E.; Sep. 2006; 13 pp.; In English
Report No.(s): DE2007-911191; INL/CON-06-01272; No Copyright; Avail.: National Technical Information Service (NTIS)

The local (pointwise) entropy generation rate per unit volume S is a key to improving many energy processes and applications. Entropy generation due to friction occurs from viscous dissipation of mean-flow kinetic energy (called 'direct dissipation') and dissipation of turbulent kinetic energy into thermal energy ('indirect' or turbulent dissipation). The objective of the present study is to compare two approaches for the prediction of S for the viscous layer in near asymptotic (high Reynolds number) turbulent flows. By employing available direct numerical simulations (DNS) it was found that about two-thirds of the entropy generation occurs in this layer. A popular approximate approach does not agree with the result from the more exact evaluation of S but its integral falls within about four per cent at the edge of the viscous layer.
NTIS
Channel Flow; Conferences; Entropy; Heat Transfer; Mass Transfer; Turbulence; Turbulent Flow

20080034453 Kentucky Univ., Lexington, KY USA
Evaluation of Geophysical Methods and Geophysical Contractors on Four Projects in Kentucky
Allen, D. L.; Mar. 2007; 240 pp.; In English
Contract(s)/Grant(s): KYSPR-02-244
Report No.(s): PB2008-101289; KTC-07-10/SPR244-02/1F; No Copyright; Avail.: National Technical Information Service (NTIS)

This report details four geophysical testing projects that were conducted in Kentucky for the Kentucky Transportation Cabinet. The four projects were as follows: KY101 Edmonson and Warren Counties, US 31-W, Elizabethtown Bypass, Hardin County, KY 61, LaRue County and US 27, Pulaski County. Two contractors conducted the investigations for this study: P.E. LaMoreaux and Associates (PELA) and The Center for Cave and Karst Studies, Western Kentucky University (CCKS). The geophysical methods and the contractor that were used on each project was as follows: KY 101 - (PELA) Electrical Resistivity and Microgravity US 31-W - (CCKS) Microgravity, KY 61 - (CCKS) Electrical Resistivity and Microgravity, and US 27 - (CCKS) Electrical Resistivity and Microgravity. These two methods performed well and this report recommends that these geophysical methods be used in Kentucky on a regular basis. One contractor (PELA) did not perform well. Although his report was well written and his analysis clearly illustrated, he was over a year behind schedule finishing his report and he was over budget by $15,000. This report recommends that this contractor not be permitted to do further geophysical work in Kentucky. The second contractor (CCKS) performed very well. His report was also well written and his analysis was clear. He finished each of his projects on time and within budget. This report recommends that this contractor be permitted to do more geophysical work in Kentucky.
NTIS
Contractors; Geophysics

20080034517 NASA Langley Research Center, Hampton, VA, USA

Thermal Model Development for Ares I-X

Amundsen, Ruth M.; DelCorso, Joe; August 18, 2008; 9 pp.; In English; 19th Annual Thermal and Fluids Analysis Workshop (TFAWS 2008), 18-22 Aug. 2008, San Jose, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 136905.10.10.20.20; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034517

Thermal analysis for the Ares I-X vehicle has involved extensive thermal model integration, since thermal models of vehicle elements came from several different NASA and industry organizations. Many valuable lessons were learned in terms of model integration and validation. Modeling practices such as submodel, analysis group and symbol naming were standardized to facilitate the later model integration. Upfront coordination of coordinate systems, timelines, units, symbols and case scenarios was very helpful in minimizing integration rework. A process for model integration was developed that included pre-integration runs and basic checks of both models, and a step-by-step process to efficiently integrate one model into another. Extensive use of model logic was used to create scenarios and timelines for avionics and air flow activation. Efficient methods of model restart between case scenarios were developed. Standardization of software version and even compiler version between organizations was found to be essential. An automated method for applying aeroheating to the full integrated vehicle model, including submodels developed by other organizations, was developed.

Author

Ares 1 Launch Vehicle; Thermal Analysis; Temperature Distribution; Aerodynamic Heating; Avionics; Air Flow

20080034583 Pennsylvania State Univ., University Park, PA, USA

Critical Chemical-Mechanical Couplings that Define Permeability Modifications in Pressure-Sensitive Rock Fractures. (Final Report, September 15, 2000-November 14, 2004)

Elsworth, D.; Grader, A.; Brantley, S.; Apr. 2007; 10 pp.; In English

Contract(s)/Grant(s): DE-FG02-00ER15111

Report No.(s): DE2007-902525; No Copyright; Avail.: Department of Energy Information Bridge

This work examined and quantified processes controlling changes in the transport characteristics of natural fractures, subjected to coupled thermal-mechanical-chemical (TMC) effects. Specifically, it examined the effects of mineral dissolution and precipitation mediated by mechanical effects, using laboratory through-flow experiments concurrently imaged by X-ray CT. These were conducted on natural and artificial fractures in cores using water as the permeant. Fluid and mineral mass balances are recorded and are correlated with in-sample saturation, porosity and fracture aperture maps, acquired in real-time by X-ray CT-imaging at a maximum spatial resolution of 15-50 microns per pixel. Post-test, the samples were resin-impregnated, thin-sectioned, and examined by microscopy to define the characteristics of dissolution and precipitation. The test-concurrent X-ray imaging, mass balances, and measurements of permeability, together with the post-test microscopy, were used to define dissolution/precipitation processes, and to constrain process-based models. These models define and quantify key processes of pressure solution, free-face dissolution, and shear-dilation, and the influence of temperature, stress level, and chemistry on the rate of dissolution, its distribution in space and time, and its influence on the mechanical and transport properties of the fracture.

NTIS

Couplings; Dissolving; Fractures (Materials); Minerals; Permeability; Rocks; Sensitivity

20080034696 NASA Dryden Flight Research Center, Edwards, CA, USA

Thermal and Fluids Engineering at Dryden Flight Research Center in 2008

Kostyk, christopher; August 18, 2008; 6 pp.; In English; Thermal and Fluids Analysis Workshop 2008 (TFAWS 2008), 18-22 Aug. 2008, San Jose, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034696

This viewgraph presentation reviews thermal structures and fluids engineering at NASA Dryden Research Center. The contents include: 1) SOFIA; 2) In-Flight Infrared Thermography Boundary Layer Transition Measurement; 3) Thermal Testing; and 4) Aerodynamic Heating Analysis.

CASI

Aerodynamic Heating; Fluid Flow; Thermography; High Temperature Tests

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*.

20080032778 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Wide-Field Imaging Interferometry Testbed: Enabling Techniques for High Angular Resolution Astronomy
Rinehart, S. A.; Armstrong, T.; Frey, Bradley J.; Jung, J.; Kirk, J.; Leisawitz, David T.; Leviton, Douglas B.; Lyon, R.; Maher, Stephen; Martino, Anthony J.; Pauls, T.; August 26, 2007; 10 pp.; In English; International Society for Optical Engineering Conference, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

The Wide-Field Imaging Interferometry Testbed (WIIT) was designed to develop techniques for wide-field of view imaging interferometry, using 'double-Fourier' methods. These techniques will be important for a wide range of future spacebased interferometry missions. We have provided simple demonstrations of the methodology already, and continuing development of the testbed will lead to higher data rates, improved data quality, and refined algorithms for image reconstruction. At present, the testbed effort includes five lines of development; automation of the testbed, operation in an improved environment, acquisition of large high-quality datasets, development of image reconstruction algorithms, and analytical modeling of the testbed. We discuss the progress made towards the first four of these goals; the analytical modeling is discussed in a separate paper within this conference.
Author
Angular Resolution; Imaging Techniques; Astronomical Interferometry; Image Reconstruction

20080032910 NASA Goddard Space Flight Center, Greenbelt, MD, USA
JWST ISIM Harness Thermal Evaluation
Kobel, Mark; Glazer, Stuart; Tuttle, Jim; Martins, Mario; Ruppel, Sean; March 11, 2008; 19 pp.; In English; Thermal Control Workshop - Aerospace Corp., 11-13 Mar. 2008, Los Angeles, Ca, USA; Copyright; Avail.: CASI: A03, Hardcopy

The James Webb Space Telescope (JWST) will be a large infrared telescope with a 6.5-meter primary mirror. Launch is planned for 2013. JWST wl1 be the premier observatory of the next decade serving thousands of astronomers worldwide. The Integrated Science Instrument Module (ISIM) is the unit that will house thc four main JWST instruments. The ISIM enclosure passively cooled to 37 Kelvin and has a tightly managed thermal budget. A significant portion of the ISIM heat load is due to parasitic heat gains from the instrument harnesses. These harnesses provide a thermal path from the Instrument Electronics Control (IEC) to the ISIM. Because of the impact of this load to the ISIM thermal design, understanding the harness parasitic heat gains is critical. To this effect, a thermal test program has been conducted in order to characterize these parasitic loads and verify harness thermal models. Recent parasitic heat loads tests resulted in the addition of a dedicated multiple stage harness radiator. In order for the radiator to efficiently reject heat from the harness, effective thermal contact conductance values for multiple harnesses had to be determined. This presentation will describe the details and the results of this test program.
Author
James Webb Space Telescope; Thermal Conductivity; Loads (Forces); High Temperature Tests; Infrared Telescopes; Harnesses

20080033140 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Shallow Water UXO Technology Demonstration Site Scoring Record No. 5 (NAEVA/XTECH, EM61 MKII)
Rowe, Gary; Apr 2008; 51 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-8-CO-160-UXO-016
Report No.(s): AD-A480218; ATC-9329; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480218

This report documents the efforts of NAEVA/XTECH to detect and discriminate inert unexploded ordnance (UXO) using an EM61 MKII. Testing was conducted at ATC, Standardized Shallow Water UXO Technology Demonstration Site. A description of the tested system and an estimate of survey costs along with the analysis of the system performance are provided.
DTIC
Ammunition; Evaluation; Ordnance; Scoring; Shallow Water; System Effectiveness

20080033197 Massachusetts Inst. of Tech., Lexington, MA USA

Elementary Surveillance (ELS) and Enhanced Surveillance (EHS) Validation via Mode S Secondary Radar Surveillance

Grappel, Robert D; Harris, Garrett S; Kozar, Mark J; Wiken, Randall T; Apr 23, 2008; 135 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0002; Proj-1564

Report No.(s): AD-A480346; PR-ATC-337; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480346

This report presents a set of algorithms that may be employed to monitor the conformation and performance of Mode S avionics in aircraft equipped for the Elementary Surveillance (ELS) and Enhanced Surveillance (ERS) data link applications. The intended audience for this report is an engineering staff assigned the task of implementing a monitoring system used to determine ELS and EHS compliance. It is assumed that surveillance data and Mode S ELS and EHS register data have been acquired using a ground Mode S sensor capable of extracting particular Mode S transponder registers via the ground-initiated Comm B (GICB) protocol. The approach described in this report assumes that the aircraft avionics have already passed all the required unit-level bench and installation tests.

DTIC

Search Radar; Secondary Radar; Surveillance

20080033296 Army Tank-Automotive Research and Development Command, Warren, MI USA

A Comparison of the Performance of 3-5 and 8-12 Micron Infrared Cameras

Meitzler, Thomas; Gerhart, Grant; Sohn, Euijung; Collins, Paul; Apr 7, 2004; 9 pp.; In English

Report No.(s): AD-A480613; TARDEC-18753; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480613

An image based comparison of modeled infrared cameras in the medium-wave (MW) and longwave (LW) bands is done using the TARDEC Thermal Image Model (TTIM) and LOWTRAN7. A state-of-the-art staring focal plane array (FPA), a common module scanning FLIR, and a scanning dual-band sensor are modeled. The simulations using TTIM demonstrate the imaging performance of the cameras as well as the degradation caused by the atmosphere in the two bands. Atmospheric degradation to the image is simulated in rain and fog in northern hemisphere environments.

DTIC

Cameras; Infrared Detectors; Infrared Radiation

20080033300 Science, Engineering and Technology, Arlington, VA USA

Random Radar

Reed, John; Nov 16, 2007; 17 pp.; In English

Contract(s)/Grant(s): FA9550-06-C-0118

Report No.(s): AD-A480620; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480620

This STTR explores the details of designing a SAR type system that maps building interiors at close ranges with an entirely covert system. The program has defined a top level SAR operations parameter set, identified technical challenges specific to the Random Radar mission, and has delineated a design that meets those challenges. Wave propagation through buildings and their interiors has been characterized thoroughly. Near field SAR image formation equations, differing substantially from classical SAR image formation techniques, have been defined. Electromagnetic simulations that generate what the SAR receiver input signals would be for certain building scenarios were generated - from which SAR images were formed. The program also conducted a thorough radar systems architecture trade study and found one radar topology that fulfilled all radar system performance requirements where many radar system topologies fail.

DTIC

Buildings; Military Operations; Synthetic Aperture Radar

20080033320 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Magnetic Clutter Reduction Efficiency in Humanitarian Demining

Ubink, E M; Lotens, W A; Aldershoff, R F; Feb 2008; 88 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480659; TNO-DV-2008-A126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480659

The aim of the project was to quantify the efficiency increase obtained by using hand-held permanent magnets(- tools)

to remove metallic clutter from the top layer of the ground in the ′close-in' detection phase of humanitarian demining operations. Therefore, three successive trials were executed in live demining operations in Cambodia and Angola. Four magnet(-tools) were chosen for the trials: a ring magnets and a block magnet and two rakes with magnets, one with rigid and one with flexible tines. The local deminers acted as operators of the magnet(-tools). The cleared area per day per deminer was compared for deminers working with and without magnet(-tools). The ring magnet is the most popular tool among the deminers due to its strength and is believed to increase the efficiency of humanitarian demining and make demining easier. However, the data did not show an efficiency increase. The deminers in the reference group cleared a larger area than the deminers using the magnet(-tool) but also found less metallic clutter. This effect may either be caused by inhomogeneous metal distributions in the demining lanes. It is also possible the deminers in the reference group did not find and clear all metallic clutter from their demining lanes.
DTIC
Clutter; Magnetic Properties; Mining

20080033455 Naval Research Lab., Washington, DC USA
Explosives Detecting Immunosensors
Shriver-Lake, Lisa; Kusterbeck, Anne; Sep 2000; 75 pp.; In English
Report No.(s): AD-A480817; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To meet environmental remediation goals, there is a need for rapid, quantitative detection of hazardous pollutants such as explosives. Biosensors provide a rapid, specific, sensitive, portable, and inexpensive means to fulfill those needs. The Naval Research Laboratory has developed two methods for measuring TNT and RDX. These methods employ either the Analyte 2000 or the FAST 2000 optical instruments, both engineered by Research International (Woodinville, WA) in collaboration with NRL (Figures 1 and 2). These biosensors, based on fluorescence immunoassay techniques, are interfaced to portable computers for instrument control and data analysis. Both biosensors are portable, and easily set-up within 30 minutes on a small table. The Analyte 2000 is a fiber optic biosensor capable of simultaneously monitoring four optical probes. It is based on a competitive fluoroimmunoassay, in which a fluorescent molecule, similar to the analyte, competes with the analyte for binding sites on antibodies immobilized on the surface of an optical probe. In this format, the fluorescence signal is inversely proportional to the amount of analyte in the sample. Results are determined in 12-17 minutes depending on the analyte. Multiple analyses are p erformed on the same fiber probe to reducing probe to probe variation issues for quantitation. The Fast 2000 is a continuous flow immunosensor based on a displacement immunoassay, with the key components being antibodies specific for the analyte immobilized on a membrane support, fluorescent signal molecules similar to the analyte saturated on the immobilized antibodies, and a fluorescent detector. Upon injection of an explosive contaminated sample, fluorescent signal molecules are released into the flow stream and detected by a detector. The FAST 2000 quantitates samples with minimal sample preparation and reagent addition.
DTIC
Bioinstrumentation; Biological Effects; Detection; Explosives; Optical Equipment; Soils

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*.

20080032735 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Direct-detection Free-space Laser Transceiver Test-bed
Krainak, Michael A.; Chen, Jeffrey R.; Dabney, Philip W.; Ferrara, Jeffrey F.; Fong, Wai H.; Martino, Anthony J.; McGarry Jan. F.; Merkowitz, Stephen M.; Principe, Caleb M.; Sun, Siaoli; Zagwodzki, Thomas W.; January 19, 2008; 12 pp.; In English; Photonics West 2008, 19-25 Jan. 2008, San Jose, CA, USA; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032735

NASA Goddard Space Flight Center is developing a direct-detection free-space laser communications transceiver test bed. The laser transmitter is a master-oscillator power amplifier (MOPA) configuration using a 1060 nm wavelength laser-diode with a two-stage multi-watt Ytterbium fiber amplifier. Dual Mach-Zehnder electro-optic modulators provide an extinction ratio greater than 40 dB. The MOPA design delivered 10-W average power with low-duty-cycle PPM waveforms and achieved 1.7 kW peak power. We use pulse-position modulation format with a pseudo-noise code header to assist clock recovery and frame

boundary identification. We are examining the use of low-density-parity-check (LDPC) codes for forward error correction. Our receiver uses an InGaAsP 1 mm diameter photocathode hybrid photomultiplier tube (HPMT) cooled with a thermo-electric cooler. The HPMT has 25% single-photon detection efficiency at 1064 nm wavelength with a dark count rate of 60,000/s at -22 degrees Celsius and a single-photon impulse response of 0.9 ns. We report on progress toward demonstrating a combined laser communications and ranging field experiment.
Author
Test Stands; Transmitter Receivers; Optical Communication; Systems Engineering; Power Amplifiers

20080033222 Naval Research Lab., Washington, DC USA
Efficient Electron Beam Deposition for Repetitively Pulsed Krypton Fluoride Lasers
Hegeler, F; Meyers, M C; Friedman, M; Sethian, J D; Swanekamp, S B; Rose, D V; Welch, D R; Jun 2002; 5 pp.; In English
Report No.(s): AD-A480410; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480410
We have demonstrated that we can significantly increase the electron beam transmission efficiency through a pressure foil structure (hibachi) by segmenting the beam into strips to miss the hibachi support ribs. In order to increase the electron beam transmission, the cathode strips are adjusted to compensate for beam rotation and pinching. The beam propagation through the hibachi has been both measured and simulated with 1-D and 3-D codes.
DTIC
Deposition; Electron Beams; Krypton Fluoride Lasers; Pulsed Lasers

20080033224 Naval Research Lab., Washington, DC USA
Electron Energy Deposition in an E-Beam Pumped KrF Amplifier: Impact of the Gas Composition
Giuliani, J L; Petrov, G M; Dasgupta, A; Dec 23, 2002; 28 pp.; In English
Report No.(s): AD-A480412; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480412
No abstract available
Electron Beams; Electron Energy; Energy Transfer; Gas Composition; Light Amplifiers

20080033226 Berkeley Scholars, Inc., Springfield, VA USA
Electron Energy Deposition in an E-Beam Pumped KrF Amplifier: Impact of Beam Power and Energy
Petrov, G M; Giuliani, J L; Dasgupta, A; Dec 23, 2002; 57 pp.; In English
Report No.(s): AD-A480414; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480414
No abstract available
Electron Beams; Electron Energy; Energy Transfer; Light Amplifiers

20080033231 Naval Research Lab., Washington, DC USA
Fusion Electra: A Krypton Fluoride Laser for Fusion Energy
Sethian, J; Friedman, M; Giuliani, J; Lehmberg, R; Myers, M; Obenschain, S; Hegeler, F; Swanekamp, S; Sep 2001; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480420; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480420
Electra is a Krypton Fluoride (KrF) laser to develop the science and technology for Inertial Fusion Energy. The objective is to develop the technologies that can meet the IFE requirements for beam quality, durability, and efficiency. Electra will use double-sided electron-beam pumping, run at 5 Hz, and have a laser output of 400-700 Joules. We will focus on technologies that can be scalable to the 50-150 kJ energy needed for a full-size fusion power plant beam line and are projected to meet the economic requirements for fusion power. Electra is a multifaceted, multi-disciplinary program that will perform the research needed to develop the individual laser components and then combine the components into an integrated system. These components are: the pulsed power system; the electron beam emitter; the pressure foil structure; the recirculator to cool and quiet the laser gas; and long life optical windows. We have built a first generation pulsed power system which runs continuously in 100,000 shot runs at 5 Hz at full energy. This five-hour run is more than adequate to start developing the laser components. To date we have evaluated a large number of cathode materials, have developed a first generation hibachi design, performed experiments and modeling of electron beam transport and stability, developed models for the electron beam

deposition and KrF kinetics, started component development for an advanced pulsed power system, and are developing long life optical coatings.
DTIC
Krypton Fluoride Lasers; Laser Fusion; Lasers; Nuclear Fusion

20080033319 Temple Univ., Philadelphia, PA USA
Photonic Reagents: The Production of Cyclic Ozone, With a Focus on Developing Equation Free Methods for Optimization Schemes
Levis, Robert J; Romanov, Dmitri A; Rabitz, Hersch A; Kevrekidis, Yannis G; Coifman, Ronald; Mar 31, 2008; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-05-1-0039
Report No.(s): AD-A480657; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480657

An apparatus capable of producing and detecting neutral ozone species created from high pressure oxygen using strong field photonic reagents have been designed constructed and utilized. The apparatus uses femtosecond BoxCARS to probe small volumes with multiple laser beams. Using this technique strong evidence was obtained that photonic reagents convert O2 to conventional ozone. Progress has also been made on the understanding and control of filament formation in ambient conditions. For guiding the search for appropriate photonic reagents the use of dimensionality reduction schemes was demonstrated on several model systems; the software code was developed that is used for reducing the complexity of the search space near dimension of 64. A general intrinsic parameter extraction method was developed for nonlinear cases; it may enable control independent of the measurement settings. Quantum control landscapes for photonic reagent optimization were shown to be trap free and inherently robust thereby permitting optimization searches to reach the ultimate yield and to effectively manage experimental noise even near the top.
DTIC
Laser Beams; Ozone; Photonics

20080033451 Naval Research Lab., Washington, DC USA
Direct-Drive Laser Target Designs for Sub-MegaJoule Energies
Colombant, D G; Schmitt, A J; Obenachain, S P; Zalesak, S T; Velikovich, A L; Bates, J W; Fyfe, D E; Gardner, J H; Manheimer, W; Jan 2007; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480807; No Copyright; Avail.: Defense Technical Information Center (DTIC)

New direct-drive laser target designs with KrF laser light take advantage of the shorter wavelength to lower the laser energy required for substantial gain (>30x) to sub-MJ level. These low laser-energy pellets are useful in systems that could form an intermediate step towards fusion energy, such as the proposed Fusion Test Facility [S. P. Obenschain,et al, Phys. Plasmas 13, 056320 (2006)]. The short wavelength laser should allow higher intensity (and higher pressure) without increasing the risk of laser-plasma instabilities. The higher pressure in turn allows higher velocities to be achieved while keeping the low aspect ratios required for hydrodynamic stability. The canonical laser energy has been chosen to be 500 kJ. A target design is presented with various laser pulse shapes and both 1D and 2D simulation results are shown. The sensitivity of these targets to both low-mode and high-mode perturbations is examined. The analysis and simulations in this paper indicate that significant gain (G=57) can be achieved for these targets even in the presence of hydrodynamic instabilities.
DTIC
Drives; Laser Targets; Lasers; Mechanical Drives; Pulsed Lasers

20080033556 Naval Research Lab., Washington, DC USA
Electron Beam Pumped Krypton-Fluoride (KrF) Lasers for Fusion Energy: A Tutorial
Sethian, John; Nov 15, 2002; 50 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480705; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This briefing discusses the basic technology of Krypton Fluoride (KrF) lasers, their use for inertial fusion energy and their part in an integrated program to develop laser fusion energy.
DTIC
Electron Beams; High Power Lasers; Krypton; Krypton Fluoride Lasers; Laser Fusion; Pulsed Lasers; Research Management

20080033567 Texas Univ., San Antonio, TX USA

Computation and Modeling for Laser Propagation in Ocular Tissues

Sardar, Dhiraj K; Yow, Raylon M; Takkalapally, Deepthi; Thomas, Robert J; Nov 2007; 28 pp.; In English

Contract(s)/Grant(s): FA8650-06-1-6746; Proj-7757

Report No.(s): AD-A480796; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A computational model for the propagation of laser radiation within cylindrical geometry is developed in C++. This model employs a finite difference technique to model the Pad approximant of the light propagation (Helmholtz) operator to solve the scalar Helmholtz equation obtained using the slowly-varying envelope formalism. This technique is capable of handling wide-angle propagation and refractive index variation while still maintaining numerical speed and simplicity. In addition, this model uses a non-linear map from the infinite physical space to a finite computational space to avoid spurious reflections from the computational window edge and improve computational efficiency. Also, the model depends solely on the spatial refractive index and hence can be coupled in a time-slicing scheme to an optical thermal model that can include linear and non-linear optical effects as well as capture thermal lensing. As an application of the model developed here, predicted irradiance at the retina of laser light incident on the human eye could be used to establish new maximum permissible exposure (MPE) limits.
DTIC

Computation; Exposure; Laser Beams; Lasers

20080033740 Air Force Research Lab., Tyndall AFB, FL USA

Air Force Research Laboratory on Autonomous and Non-Destructive Pavement Surface Assessment Postprint

Kopeikin, Andrew; Jul 2007; 19 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A480292; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480292

Current techniques used to evaluate airfields, include falling weight deflectomers, dynamic cone penetrometers and core sampling; these methods are slow, laborious, and destructive to the pavement being sampled. The LUNS system uses a non-contact system which uses a high intensity laser to pulse pavement samples. These samples respond by reflecting off a compression wave. The compression wave can be analyzed to determine the depth of the concrete and various other concrete properties. This system, while still at the bench level, could eventually be used to evaluate the overall quality of runways non-destructively, while expediting the process from its current level.
DTIC

Autonomy; Landing Sites; Lasers; Military Technology; Pavements; Research and Development

20080033746 Air Force Research Lab., Kirkland AFB, NM USA; Los Gatos Research, Mountain View, CA, USA

Measuring the Yield of Singlet Oxygen in a Chemical Oxygen Iodine Laser (Postprint)

Hewett, Kevin B; McCord, John E; Gupta, Manish; Owano, Thomas; Aug 1, 2006; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-MDA6

Report No.(s): AD-A480219; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480219

A critical parameter for understanding the performance of Chemical Oxygen Iodine Lasers is the yield of singlet oxygen produced by the generator. Off-Axis Integrated Cavity Output Spectroscopy (Off-Axis ICOS) has been utilized to measure the absolute density of both ground-state and singlet oxygen in the cavity of a COIL laser.
DTIC

Chemical Lasers; Chemical Oxygen-Iodine Lasers; Oxygen

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*.

20080032759 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Analysis of Superficial Covering Behavior in Screw Threads of Fixture Elements when Submitted to Torque
dosSantosYassuda, Irineu; January 2008; 104 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15180-TDI/1296; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

The objective in this study is evaluation of mechanical behavior of different types of superficial treatments in screw threads used in commercial vehicles. This analysis was based on the comparison of the resultant over surfaces of these elements the application after different efforts of torques and speed. These efforts had been applied in same conditions to ones normal productive processes conditions, but with controlled temperature, torque and speeds. This kind of test was possible after the advent of equipments with torque and speeds controlled for digital systems. The results had been analyzed by means of microscopy optics to determine the conditions limits of the process and these conditions had been repeated in validated samples had been analyzed by scanning electronic microscopy (SEM) and Energy Dispersive Spectrometry (EDS). There exists an extensive number of different elements of setting and coatings had been selected M6 and M10 elements class 8.8 with coatings more used than are dacromet, dichromate, black zinc and phosphate. The developed analysis can be used as a methodology for the determination of critical parameters of development of processes of unions for this kind of elements, establish the optimum assembly speed to the conservation of the superficial treatments of the screws reduction of times of assembly, greater productivity, guaranteeing the useful life and the preservation of the equipment. The results had shown the failure mode of the layers and the interrelations speed and layer consuming. It was also consisted that the failure of the surface is related to the speed of the process and the substratum failure is correlated to the applied torque.
Author
Screws; Threads; Torque; Surface Properties; Coatings; Mechanical Properties; Failure Modes

20080032916 Michigan Univ., Ann Arbor, MI USA
Engineering Assessment of Current and Future Vehicle Technologies. FMVSS No. 105 - Hydraulic and Electric Brake Systems, FMVSS No. 135 Passenger Car Brake Systems
Winkler, C.; Gordon, T.; Bareket, Z.; Mar. 2005; 41 pp.; In English
Contract(s)/Grant(s): DTNH22-02-D-02104
Report No.(s): PB2007-113826; UMTRI-2005-11; No Copyright; Avail.: CASI: A03, Hardcopy

This report provides a technical assessment of Federal Motor Vehicle Safety Standards (FMVSS) 105, Hydraulic and electric brake systems, and FMVSS 135, Passenger car brake systems. The review of these standards is part of a NHTSAs Regulatory Review Plan to systematically examine all of the FMVSS. The primary thrust of the document is to address two questions: Do the current standards impede emerging technologies in passenger car and light/medium truck braking systems. Do the current standards require modification to adequately regulate emerging technologies. Emerging technologies are reviewed. Estimates of the extent and timing of their influence are made. It is concluded that the standards will not impede emerging technologies in the foreseeable future but could do so in the long term. The view is expressed that the approach of the current standards to ensuring adequate performance under partial-failure conditions may become ineffective as more, and more complex, automatic functions are added to automotive brake systems. A new approach may be required. Seventy-eight references are included in an annotated bibliography.
NTIS
Hydraulic Equipment; Motor Vehicles; Passengers; Safety

20080033049 West Virginia Univ., Morgantown, WV USA
Creation of the 16-hour Engine Test Schedule from the Heavy Heavy-Duty Diesel Engine Test Schedule
Clark, N. N.; Zhen, F.; Bedick, C.; Gautam, M.; Wayne, W. S.; Jul. 01, 2007; 14 pp.; In English
Contract(s)/Grant(s): ACES-1A
Report No.(s): PB2008-100010; CRC-ACES-1A; No Copyright; Avail.: CASI: A03, Hardcopy

The program objective was to create a 16-hour test schedule based on the ACES-1 modes for use in diesel engine health effect studies. Two requirements were that the engine schedule had a 16-hour length and a 50/50 time split for urban and rural

operation. Urban operation was considered to include transient, creep, and FTP modes. Rural operation was considered to include cruise and high-speed cruise modes.
NTIS
Diesel Engines; Engine Tests; Exhaust Emission; Schedules

20080033050 West Virginia Univ., Morgantown, WV USA
Creation of the 'Heavy Heavy-Duty Diesel Engine Test Schedule' for Representative Measurement of Heavy-Duty Engine Emissions
Clark, N. N.; Gautam, M.; Wayne, W. S.; Thompson, G.; Lyons, D. W.; Jul. 16, 2007; 75 pp.; In English
Contract(s)/Grant(s): ACES-1
Report No.(s): PB2008-100009; CRC-ACES-1; No Copyright; Avail.: National Technical Information Service (NTIS)
The objective of the ACES-1 project was to develop an engine test schedule representative of modern truck usage, and to demonstrate their application in an engine test cell. The motivation for developing a new test schedule was to include a broad range of engine activity in the heavy-duty diesel engine emissions study.
NTIS
Combustion Products; Diesel Engines; Engine Tests; Exhaust Emission; Exhaust Gases; Schedules

20080033054 Environmental Protection Agency, Washington, DC, USA
Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2007
Sep. 2007; 104 pp.; In English
Report No.(s): PB2008-101041; EPA-420-R-07-008; No Copyright; Avail.: CASI: A06, Hardcopy
This report summarizes key trends in fuel economy and technology usage related to model year (MY) 1975 through 2007 light-duty vehicles sold in the USA. Light-dutyvehicles are those vehicles that EPA classifies as cars or light-duty trucks (sport utility vehicles, vans, and pickup trucks with less than 8500 pounds gross vehicle weight ratings). Since 1975, overall new light-duty vehicle fuel economy has moved through four phases: (1) a rapid increase from 1975 through the early 1980s, (2) a slower increase until reaching its peak in 1987, (3) a gradual decline until 2004, and (4) an increase in 2005 and 2006, with 2007 levels projected to be similar to 2006. The projected average MY2007 light-duty vehicle fuel economy, based in large part on pre-model year sales projections from automakers, is 20.2 miles per gallon (mpg). The MY2006 value is also 20.2 mpg. There is greater confidence in the MY2006 value as the database for2006 includes formal sales data for about 70% of the MY2006 fleet. The 20.2 mpg value for model years 2006 and 2007 represents a 0.9 mpg, or 5%, increase over the 19.3 mpg value for 2004, which was the lowest fuel economy value since 1980. The fuel economy values in this report are either adjusted (ADJ) EPA real-worldestimates provided to consumers, or unadjusted EPA laboratory (LAB) values. Most of the data is presented in adjusted values. Either adjusted or laboratory fuel economy may be reported as city, highway, or, most commonly, as composite (combined city/highway, or COMP). In 2006, EPA revised the methodology by which EPA estimates adjusted fuel economy to better reflect changes in driving habits and other factors that affect fuel economy such as higher highway speeds, more aggressive driving, and greater use of air conditioning. This is the first report inthis series to reflect this new real-world fuel economy methodology, and every adjusted fuel economy value in this report for 1986 and later model years is lower than previously reported. To reflect the fact that these changes did not occur overnight, these new downward adjustments are phased in, gradually, beginning in 1986, and for 2005 and later model years the new adjusted composite (combined city/highway) values are, on average, about 6% lower than under the methodology used by EPA in previous reports in this series.
NTIS
Automobile Fuels; Motor Vehicles

20080033427 Army Research Lab., Adelphi, MD USA
A Foil Thrust Bearing Test Rig for Evaluation of High Temperature Performance and Durability
Dykas, Brian D; Tellier, Daniel W; Apr 2008; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480747; ARL-MR-0692; No Copyright; Avail.: Defense Technical Information Center (DTIC)
A new test rig is designed to evaluate the start-stop cyclic durability of high-temperature solid lubricant coatings applied to foil thrust bearing systems. This test rig also allows the characterization of low speed thrust bearing performance, augmenting existing high speed test capabilities. The Low-Speed Thrust Bearing Rig is designed to test foil thrust bearings at speeds up to 21,000 rpm and temperatures up to 540 deg C (1000 deg F), with variable thrust loads. Thrust bearings can be subjected to tens of thousand of start-stop cycles to simulate decades of service in a turbomachinery application. Initial

testing has validated the rig capabilities by subjecting a bearing and thrust runner to more than two thousand start/stop cycles at a temperature of 430 deg C (800 deg F).
DTIC
Durability; Foil Bearings; High Temperature; Thrust Bearings

20080033551 Honeywell International, Inc., Morristown, NJ, USA
Effusion Momentum Control
Anderson, M. G., Inventor; Kawamura, H., Inventor; Flamand, L. M., Inventor; 16 Aug 04; 15 pp.; In English
Contract(s)/Grant(s): ARMY-DAAE07-02-3-0002
Patent Info.: Filed Filed 16 Aug 04; US-Patent-Appl-SN-10-919 663
Report No.(s): PB2008-100664; No Copyright; Avail.: CASI: A03, Hardcopy

A combustor liner for shielding an engine from heat generated in a combustion zone includes a sheet with a cool surface for intercepting a cooling air stream and a hot surface enclosing the combustion zone, the combustor liner further including an array of effusion holes extending from the cool surface to the hot surface to allow a portion of the cooling air stream to pass through the effusion holes into the combustion zone, where a portion of the array includes a plurality of upstream-pointed effusion holes oriented such that each upstream-pointed effusion hole has an orientation obtuse to a direction of main flow in the combustion zone so as to control the momentum of cooling air passing into the combustion zone.
NTIS
Combustion; Combustion Chambers; Linings; Momentum; Patent Applications

20080034599 West Virginia Univ., Morgantown, WV USA
Selective NOx Recirculation for Stationary Lean-Burn Natural Gas Engines. Reporting Period for October 1, 2002 to December. 31, 2006
Clark, N. N.; Apr. 30, 2007; 151 pp.; In English
Contract(s)/Grant(s): DE-FC26-02NT41608
Report No.(s): DE2007-913089; No Copyright; Avail.: National Technical Information Service (NTIS)

Nitric oxide (NO) and nitrogen dioxide (NO2) generated by internal combustion (IC) engines are implicated in adverse environmental and health effects. Even though leanburn natural gas engines have traditionally emitted lower oxides of nitrogen (NOx) emissions compared to their diesel counterparts, natural gas engines are being further challenged to reduce NOx emissions to 0.1 g/bhp-hr. The Selective NOx Recirculation (SNR) approach for NOx reduction involves cooling the engine exhaust gas and then adsorbing the NOx from the exhaust stream, followed by the periodic desorption of NOx. By sending the desorbed NOx back into the intake and through the engine, a percentage of the NOx can be decomposed during the combustion process. SNR technology has the support of the Department of Energy (DOE), under the Advanced Reciprocating Engine Systems (ARES) program to reduce NOx emissions to under 0.1 g/bhp-hr from stationary natural gas engines by 2010. The NO decomposition phenomenon was studied using two Cummins L10G natural gas fueled spark-ignited (SI) engines in three experimental campaigns. It was observed that the air/fuel ratio (e), injected NO quantity, added exhaust gas recirculation (EGR) percentage, and engine operating points affected NOx decomposition rates within the engine.
NTIS
Air Pollution; Circulation; Exhaust Emission; Exhaust Gases; Internal Combustion Engines; Natural Gas; Nitric Oxide; Nitrogen Dioxide; Nitrogen Oxides; Pollution Control

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QUALITY ASSURANCE AND RELIABILITY

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

20080033029 Lockheed Martin Space Systems Co., New Orleans, LA, USA
NDE Imaging of Time Differential Terahertz Waves
Trinh, Long B.; [2008]; 9 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS8-00016; Copyright; Avail.: Other Sources

Natural voids are present in the vicinity of a conathane interface that bonds two different foam materials. These voids are out of focus with the terahertz imaging system and multiple optical reflections also make it difficult to determine their depths. However, waves passing through the top foam article at normal incidence are partially reflected at the denser conathane layer prior to total reflection at the tank s wall. Reflections embedded in the oscillating noise segment prior to the main signals can

be extracted with dual applications of filtering and time derivative. Void's depth is computed from direct path's time of flight. Author

Nondestructive Tests; Electromagnetic Radiation; Imaging Techniques

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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*.

20080032830 NASA Glenn Research Center, Cleveland, OH, USA

Simplified Shear Solution for Determination of the Shear Stress Distribution in a Composite Panel from the Applied Shear Resultant

Bednarcyk, Brett A.; Aboudi, Jacob; Yarrington, Phillip W.; Collier, Craig S.; April 07, 2008; 24 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The simplified shear solution method is presented for approximating the through-thickness shear stress distribution within a composite laminate or panel based on laminated beam theory. The method does not consider the solution of a particular boundary value problem; rather it requires only knowledge of the global shear loading, geometry, and material properties of the laminate or panel. It is thus analogous to lamination theory in that ply level stresses can be efficiently determined from global load resultants (as determined, for instance, by finite element analysis) at a given location in a structure and used to evaluate the margin of safety on a ply by ply basis. The simplified shear solution stress distribution is zero at free surfaces, continuous at ply boundaries, and integrates to the applied shear load. Comparisons to existing theories are made for a variety of laminates, and design examples are provided illustrating the use of the method for determining through-thickness shear stress margins in several types of composite panels and in the context of a finite element structural analysis.
Derived from text

Composite Structures; Panels; Shear Stress; Structural Analysis

20080033002 East China Univ. of Science and Technology, Shanghai, China

A Micromechanical Cracking Imperfection Model of Edge Dislocations Generated by Residual Stresses

Li, L. X.; Tang, X. S.; Wang, Z. D.; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 427-435; In English; See also 20080032994; Copyright; Avail.: Other Sources

The nucleation of crystals is a highly non-homogeneous process. It depends on the number of nucleation sites, the rate of cooling, initial imperfections in the molten liquid and other variables. These inhomogeneities not only vary from location to location but they give rise to non-uniform residual stresses throughout the solid. The existence of initial microcracks and dislocations in a polycrystal is the rule rather than the exception. Knowledge of the micro-dislocational initial defects can be important since they can affect the ensuing service stress and strain states, particularly when the size of the system is in microns. The objective of this work is to develop a micro-atomic multiscale damage model for estimating the initial damage during processing of the material. In what follows, an effective analytical solution will be found for the specific case of a microcrack generating edge dislocations under in-plane shear loading. Crossscale characteristics will be determined although discontinuities cannot be avoided if equilibrium mechanics theories are tp be used for the range of microscopic and atomic scales. The unique idea of a 'scale multiplier' is used to connect the microcrack and edge dislocations. The transition from microscopic to atomic can be smoothed out by introducing additional meso zones that would further divide the scale ranges into smaller segments. The process involves labor. Since it will not entail new physical insights, elaboration will not be made until the effort can be justified by the need. It is more important to illustrate the method for treating multiscale damage. Numerical results are obtained and displayed graphically for quantitiks of interest. The sliding displacement attains its maximum value at the end of the segment where a uniform residual stress is assumed to prevail. Edge dislocations are therefore generated. And they reach a maximum at a distance of about one third of the length of the segment from the point at which residual stresses are locked into the system. The location of this peak shifts with the magnitude of the residual stress. The decay and cross scaling effects of the strain energy density functions are also exhibited. They are relevant for discussing potential failure. In addition, these findings are expected to alter if the residual stresses are non-uniform. Such situations will depend on the specific application. The exact shapes of the microcrack and edge dislocation are depicted figuratively; they are not the important issues. Their singular characteristics, represented by the l/r.0.5a nd 1/r, however, are essential to show the difference in strength of local intensification with I. being the distance from the singular points. The relevant quantities are

the energy level and characteristic length associated with the micro-defect or crack and the atomic-defect or dislocation. Hence, there is no loss in generality from using the line crack-edge dislocation model for considering the effect of residual stresses. Since the corresponding problem for generating screw dislocation has already been considered in previous work, the addition of edge dislocations can be used to generate a more general solution of line dislocations in a plane under the combined effects of in-plane and out-of-plane shear action. Even though this work considers only the case of uniform residual stress trapped ahead of a microcrack, other situations of non-uniform residual stresses can be obtained by superposition.
Author
Residual Stress; Edge Dislocations; Micromechanics; Microcracks; Nucleation; Polycrystals; Discontinuity; Stress-Strain Relationships; Defects

20080033082 National Renewable Energy Lab., Golden, CO USA
Resonance Test System
Musial, W., Inventor; White, D., Inventor; 3 Jul 02; 13 pp.; In English
Contract(s)/Grant(s): DE-AC36-99GO10337
Patent Info.: Filed Filed 3 Jul 02; US-Patent-Appl-SN-10-520 011
Report No.(s): PB2008-100959; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for applying at least one load to a specimen according to one embodiment of the invention may comprise a mass. An actuator mounted to the specimen and operatively associated with the mass moves the mass along a linear displacement path that is perpendicular to a longitudinal axis of the specimen. A control system operatively associated with the actuator operates the actuator to reciprocate the mass along the linear displacement path at a reciprocating frequency, the reciprocating frequency being about equal to a resonance frequency of the specimen in a test configuration.
NTIS
Loads (Forces); Patent Applications; Resonance Testing; Turbine Blades; Wind Turbines

20080033084 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA
Adaptive Vibration Control Using Synchronous Demodulation with Machine Tool Controller Motor Commutation
Hopkins, D. J., Inventor; 15 Aug 05; 9 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG48
Patent Info.: Filed Filed 15 Aug 05; US-Patent-Appl-SN-11-205 551
Report No.(s): PB2008-100953; No Copyright; Avail.: CASI: A02, Hardcopy

A control system and method for actively reducing vibration in a spindle housing caused by unbalance forces on a rotating spindle, by measuring the force-induced spindle-housing motion, determining control signals based on synchronous demodulation, and provide compensation for the measured displacement to cancel or otherwise reduce or attenuate the vibration. In particular, the synchronous demodulation technique is performed to recover a measured spindle housing displacement signal related only to the rotation of a machine tool spindle, and consequently rejects measured displacement not related to spindle motion or synchronous to a cycle of revolution. Furthermore, the controller actuates at least one voice-coil (VC) motor, to cancel the original force-induced motion, and adapts the magnitude of voice coil signal until this measured displacement signal is brought to a null. In order to adjust the signal to a null, it must have the correct phase relative to the spindle angle. The feedback phase signal is used to adjust a common (to both outputs) commutation offset register (offset relative to spindle encoder angle) to force the feedback phase signal output to a null. Once both of these feedback signals are null, the system is compensating properly for the spindle-induced motion.
NTIS
Adaptive Control; Commutation; Controllers; Demodulation; Machine Tools; Patent Applications; Tooling; Vibration; Vibration Damping

20080033101 Kirsch (Alan D.), Idaho Falls, ID, USA
Insertion Tube Methods and Appartus
Casper, W. L., Inventor; Casper, C., Inventor; Clark, D. T., Inventor; Grover, B. K., Inventor; Mathewson, R. O., Inventor; 9 Aug 05; 15 pp.; In English
Contract(s)/Grant(s): DE-AC07-99ID13727; DE-AC07-05ID14517
Patent Info.: Filed Filed 9 Aug 05; US-Patent-Appl-SN-11-200 752
Report No.(s): PB2008-100822; No Copyright; Avail.: CASI: A03, Hardcopy

A drill string comprises a first drill string member having a male end; and a second drill string member having a female

end configured to be joined to the male end of the first drill string member, the male end having a threaded portion including generally square threads, the male end having a non-threaded extension portion coaxial with the threaded portion, and the male end further having a bearing surface, the female end having a female threaded portion having corresponding female threads, the female end having a non-threaded extension portion coaxial with the female threaded portion, and the female end having a bearing surface. Installation methods, including methods of installing instrumented probes are also provided.
NTIS
Females; Males; Strings

20080034566 Lawrence Livermore National Lab., Livermore, CA USA
Monitoring Thickness Deviations in Planar Multi-Layered Elastic Structures Using Impedance Signatures
Fisher, K. A.; Mar. 29, 2007; 15 pp.; In English
Report No.(s): DE2007-914620; UCRL-TR-229538; No Copyright; Avail.: Department of Energy Information Bridge

In this letter, a low frequency ultrasonic resonance technique that operates in the (20 80 kHz) regime is presented that demonstrates detection of thickness changes on the order of +/- 10mm. This measurement capability is a result of the direct correlation between the electrical impedance of an electro-acoustic transducer and the mechanical loading it experiences when placed in contact with a layered elastic structure. The relative frequency shifts of the resonances peaks can be estimated through a simple one dimensional transmission model. Separate experimental measurements confirm this technique to be sensitive to subtle changes in the underlying layered elastic structure.
NTIS
Impedance; Signatures; Thickness

20080034606 Idaho National Engineering Lab., Idaho Falls, ID, USA
Seismic Evaluation of Atypical Special Plate Shear Walls
Russell, R. J.; Spears, R. E.; Kobbe, R. G.; Jul. 2007; 8 pp.; In English
Report No.(s): DE2007-912901; INL/CON-07-12558; No Copyright; Avail.: Department of Energy Information Bridge

The structure of a building undergoing a seismic reevaluation at the Idaho National Laboratory includes a number of steel plate walls and a roof liner which will act as shear diaphragms during an earthquake. Since the facility was designed and built long before such criteria were formulated, it is not surprising that these walls are not configured to meet all of the recently formulated requirements for such structures. To take advantage of this unusual structural feature, nonlinear analysis was used to ensure accurate modeling of the plate walls in a linear elastic seismic analysis of the full superstructure. The modeling was also used to establish the capacity of the plate.
NTIS
Buildings; Metal Plates; Steels; Walls; Structural Analysis

20080034628 Idaho National Engineering Lab., Idaho Falls, ID, USA
Accidental Drop of a Carbon Steel/Lead Shipping Cask (HFEF 14) at Low Temperatures. Structural Mechanics in Reactor Technology
Hawkins, B. D.; Nitzel, M. E.; Aug. 2007; 8 pp.; In English
Report No.(s): DE2007-915531; INL/CON-07-12593; No Copyright; Avail.: National Technical Information Service (NTIS)

A shielded cask is used to transport radioactive materials between facilities at the Idaho National Laboratory. The cask was fabricated with an outer and inner shell of A36 carbon steel with lead poured in the annular space between the shells to provide radiation shielding. Carbon steel is known to be susceptible to low-temperature brittle fracture under impact loading. This paper will present the analysis results representing postulated transportation accidents during on-site transfers of the cask at subzero temperatures. The accident scenarios were based on a series of cask drops onto a rigid surface from a height of 1.83m (6 feet.) Finite element models of the cask and its contents were solved and post processed using the ABAQUS software. Each model was examined for failure to contain radioactive materials and/or significant loss of radiation shielding. Results of these analyses show that the body of the cask exhibits considerable ruggedness and will remain largely intact after the impact. There will be deformation of the main cask body with localized brittle failure of the cask outer shell and door structure. The cask payload outer waste can remains in the cask but will experience some permanent plastic deformation in each drop. It will not be deformed to the point where it will rupture, thus maintaining confinement of the can contents.
NTIS
Accidents; Barrels (Containers); Carbon Steels; Low Temperature; Reactor Technology; Structural Analysis

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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*.

20080032723 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Polarimetric Images in L-Band of SAR-R99B and of MAPSAR (Simulated) to Distinguish Agricultural Crops

FernandodaSilva, Wagner; [2007]; 145 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-14821-TDI/1261; Copyright; Avail.: CASI: C01, CD-ROM: A07, Hardcopy

Synthetic Aperture Radar (SAR) images have been analyzed with the perspective to become an important alternative to acquire data in regions with intense cloud cover in order to obtain information about the agricultural scenario. The Amazon Surveillance System (SIVAM Sistema de Vigilancia da Amazonia) and the Operational Managing Centre of Amazon Protection System (CENSIPAM - Centro Gestor e Operacional do Sistema de Protecao da Amazonia) have three SAR-R99B airborne sensors that acquire polarimetric images at L-band and interferometric images at X-band. Moreover, a technical-scientific cooperation between Brazil and Germany through INPE and DLR, respectively, was established to evaluate the feasibility of building a polarimetric orbital SAR in L-band. The mission to develop this orbital SAR is denominated Multi-Application Purpose SAR MAPSAR. The objective of the present work was to evaluate the polarimetric images of the SAR-R99B and the multipolarized (VV, HV and HH) simulated images of the MAPSAR both in L-band, to distinguish agricultural crops. Airborne SAR-R99B images were acquired in an intense cultivated agricultural region in the western part of Bahia State. Due to the specifications followed during image acquisition phase and data similarity, complementarily, simulated MAPSAR images were generated from the SAR-R99B images. Due to the time period of image acquisition, the analyzed crops were cotton, coffee and pasture. Graphical analysis and cluster analysis were applied to evaluate the distinction among these crops. A polarimetric classifier, developed for SAR images using the Maximum Likelihood (Maxver) and Iterated Conditional Modes (ICM) algorithms, was used to analyze the SAR-R99B images. The analyses were performed for the individual polarizations and for the combinations of two and three polarizations. During the classification process, complex images represented in the form of covariance matrix, were also used. The results showed that both simulated MAPSAR and SAR-R99B images present potential to distinguish agricultural crops and are useful tools for this purpose. Cotton, coffee and pasture fields were distinguished with satisfactory precision, especially for the multipolarized images. In general, for both types of images, the combinations of two polarizations provided better results when compared to individual polarizations and best results were achieved with the combinations of three polarizations which is clear evidence that multi-polarized images provide additional and useful information for crop discrimination. During the classification process, the ICM classifier showed to be more efficient than the Maxver classifier. The complex images provided the best classifications indicating that not only polarization is important to distinguish the analyzed crops but also the phase of the backscattered radiation.

Author

Polarimetry; Synthetic Aperture Radar; Ultrahigh Frequencies; Crops; Radar Imagery; Crop Identification; Remote Sensing

20080032748 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Remote Sensing and GIS for Cotton Crop Analysis in Campo Verde and Primavera do Leste - Mato Grosso State, Brazil

Portillo, Javier Esteban; January 2008; 134 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15151-TDI/1283; Copyright; Avail.: CASI: C01, CD-ROM: A07, Hardcopy

Cotton represents 50% of textil fiber used around the world. In the second half of the 90's a new system production allowed the cotton transfer to Cerrado region. In this regard, it is necessary to count on reliable information that allows to analyze the cotton crop in this region. In this context, the hypothesis of this work was that remote sensing data and GIS allow the identification and mapping of cotton crop. The main objective of this research is to develop a metodology to analyze the cotton space-temporal evolution in Campo Verde and Primavera do Leste. Other objectives were: to analize the multitemporal spectral behavior of the main winter crops, to define the land use changes 1985 to 2006 and to develop a technique based on remote sensing and GIS to evaluate the agriculture violation of the Brazilian Forest Code. We use orbital and laborartory data to analize the multitemporal spectral behavior. Two temporal scales were considered: season and multiyear. In the season scale we tested some techniques to differentiate cotton from other crops. For the multiyear scale it was defined cotton, forest and cerrado and their multitemporal dynamic. We used Shuttle Radar Topographic Mission (SRTM) data to outline the limits of

the permanent preservation areas and calculate the violation to the Brazilian Forest Code. The spectrotemporal analysis of cotton and winter cultures supplied important information to define the main spectral confusions between crops and the better periods for their identification. The global accuracy for the five sazonal techniques tested were statististically similar. In this way we selected the technique of classification of the April image as the better because it was the easiest of among the five. In the multiyear approach we could model the cotton evolution during 1985-2006 period timeframe. Remote sensing data analysis in a GIS environment allowed to evaluate the agriculture infraction of the Brazilian Forest Code. We detected that cotton crop occupied few permanent preservation areas in the period considered. Finally, the cotton areas that were against the Brazilian Forest Code represented a minimum fraction of the total cotton cultived.
Author
Brazil; Cotton; Farm Crops; Remote Sensing; Topography; Geographic Information Systems

20080032755 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Assessing the Relationship between Deforestation and Agricultural Potential in the Amazon
NogueiradaSilva, Avelino; January 2008; 182 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15177-TDI/1293; Copyright; Avail.: CASI: C01, CD-ROM: A09, Hardcopy

Several studies have been developed in the Amazon forest biome in order to understand the advance of the agricultural frontier, and consequently to provide scientific support for sustainable politics in this region. These studies contemplate econometrics as much as spatial modeling, and few investigations have explored the importance of ecological and geographic aspects (such as soil and declivity) which are still necessary, despite the great relevance of the results found in these approaches. Since Rondonia, Mato Grosso and Para states currently have one of the highest deforestation rates, they were selected as study area in this investigation. In a Geographic Information System (GIS) environment, accumulated deforestation areas through 1997, generated by the Projeto de Estimativa do Desflorestamento Bruto da Amaz nia Legal (PRODES), overlapped by buffers of principal roads, soils, declivity and protected areas maps were used. The main goal of this study was to evaluate the relationship between deforestation and agricultural potential by using multivariate statistics (logistic regression) and non-parametric statistics procedures. These statistical analyses showed that areas with higher agricultural potential increased the occurrence of deforestation rates.
Author
Deforestation; Agriculture; Crop Inventories; Thematic Mapping; Geographic Information Systems; Statistical Analysis

20080032758 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Geographic Data Base of the Cities Gilbues and Monte Alegre do Piaui (State of the Piaui - Brazil)
Crepani, Edison; SimeaodeMedeiros, Jose; Palmeira, Alessandro Ferraz; FragadaSilva, Enio; January 2008; 258 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15186-RPQ/814; Copyright; Avail.: CASI: C01, CD-ROM: A12, Hardcopy

According to the UN program for the environment, the phenomenon of desertification is responsible for the yearly loss of about 6 million hectares of productive land, affecting directly or indirectly millions of people all around the world. From studies produced by the Ministry of Environment, considering the activities of the National Conference and Latin American Desertification Seminar (CONSLAD) in the 90's, and also by the Federal University of Piaui (UFPI), four desertification regions were identified and named as follows: Gilbues (Piaui State), Iraucuba (Ceara State), Serido (Rio Grande do Norte State) and Cabrobo (Pernambuco State). The desertification regions consist of areas where the soil and vegetal cover degradation effects have reached irreversible level. The municipalities of Gilbues and Monte Alegre do Piaui (both belonging to the Gilbues Region) are affected by the soil degradation process due to strong erosion rate and intense sediment transportation by the drainage system, so that, the traditional regional land use becomes impracticable. On the other hand, these municipalities present high agricultural activity, mainly for soya beans plantations. Therefore, this work means to develop a Geographical Data Base, as an integrated information system able to guide the Economical Ecological Zoning for the municipalities of Gilbues and Monte Alegre do Piaui. The Economical Ecological Zoning consist of a tool for the use and orientation of the territory planning which gathers information in geographical basis and may be used in negotiation among the involved agents. This information integrated system aims to stimulate the accessibility of the Geographical Data Base using freeware software such as TerraView and/or SPRING, reducing costs for the use of information in public and private institutions working in the region.
Author
Desertification; Geography; Geographic Information Systems; Data Bases; Remote Sensing

20080032760 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

ASTER Image Application in the Urban Environmental Study of Sao Paulo and Rio de Janeiro

Fuckner, Marcus Andre; January 2008; 235 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15203-TDI/1303; Copyright; Avail.: CASI: C01, CD-ROM: A11, Hardcopy

Remote Sensing images are a database for urban studies involving physical, biological and human elements of the environment. The objective of this study is to explore Terra/ASTER images applied to an environmental study of a sector from two Metropolitan Regions: Sao Paulo (SP) and Rio de Janeiro (RJ), the largest urban areas of Brazil. The FLAASH, ISAC, AsterDTM and VIPER TOOLS algorithms were evaluated for the processing of study area images in two different dates. The techniques used and the analysis of results are an important contribution to urban medium scale studies and to regional and urban planning. The Digital Elevation Model (DEM), top of the atmosphere and surface reflectance, and brightness and surface temperature images were obtained. The spectral mixture model was applied and the correlation between spectral data and air pollution data were analyzed. The DEM obtained showed high correlation with the topographic reference map. However, it was necessary to make adjustments to the results obtained because there were 20 meters less than the reference data. Another possibility for correction of this problem was integration with SRTM data. From the temperature images, using both methods (Emissivity Normalization and Reference Channel), it was possible to detect the urban heat islands as well urban cold islands . In order to unmix the spectral data, the Multiple Endmember Spectral Mixture Model (MESMA) was used. To perform this unmixing, the representative spectra of the following categories were selected: vegetation, impervious surfaces and soil (V-I-S). The vegetation fraction images are similar to inverse the impervious surface and soil fraction images. Due to this spectral confusion, impervious surface and soil were grouped together. In this sense, it is necessary for each study area and date to set up specific spectral libraries. In contrast to the results obtained in other studies, the correlation between spectral data and particulate matter was not high. The low density of the automatic air quality monitoring stations, their inadequate localization, and the remote sensing image characteristics can explain this result. The layers of the land cover/land use, along with information obtained from reference maps made by the Metropolitan Planning Agency (SP) and the Municipal Environment Agency (RJ), were selected. The mean and the standard deviation of the altitude, temperature and physical fractions mapped per class were analyzed. The integrated analysis of the results was carried out using a correlation index. This analysis showed that the temperature was influenced by altitude, the fractions mapped and the land use. The results obtained per class showed warming around 3 to 4 C in Sao Paulo, and 6 C in Rio de Janeiro. In most cases the correlation and the ranking per class did not change. We concluded that the relation among variables is stable.

Author

Remote Sensing; Urban Planning; Imaging Techniques; Algorithms; Atmospheric Models

20080032773 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA

Constraining Hydrological and Cryospheric Mass Flux in Southeastern Alaska using Space-Based Gravity Measurements

Tamisiea, M. E.; Leuliette, E. W.; Davis, J. L.; Mitrovica, J. X.; Geophysical Research Letters; October 21, 2005; Volume 32; 2 pp.; In English

Contract(s)/Grant(s): NNG04GF09G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2005GL023961

Watersheds draining into the Gulf of Alaska (GoA) experience large seasonal and inter-annual variations of water in the form of rain, snow, and ice, but accurate constraints on these variations have been difficult to obtain. Over larger geographic regions, water variations can be inferred directly from the Gravity Recovery and Climate Experiment (GRACE) data. However, because GoA variations occur over such a small region, the inferred average value of water flux increases as the applied smoothing of the GRACE data decreases. We use this observed scaling together with scaling results obtained from forward models to infer a seasonal amplitude of 115 plus or minus 20 cubic kilometers of water and an average contribution to sea level rise over the two years of data of 0.31 plus or minus 0.09 millimeters per year. These results suggest that accelerated melting that began in the late 1990s, as inferred from altimetry, continues unabated.

Author

Alaska; Gravitation; Geophysics; Remote Sensing; Hydrology; Cryospheres

20080032969 NASA Goddard Space Flight Center, Greenbelt, MD, USA

To What Extent Can Vegetation Mitigate Greenhouse Warming? A Modeling Approach

Bounoua, L.; Hall, F.G.; Collatz, G.J.; Tucker, C.J.; Sellers, P.J.; Kumar, A.; [2008]; 18 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080032969

Climate models participating in the IPCC Fourth Assessment Report indicate that under a 2xCO2 environment, runoff would increase faster than precipitation overland. However, observations over large U.S watersheds indicate otherwise. This inconsistency suggests that there may be important feedbacks between climate and land surface unaccounted for in the present generation of models. We postulate that the increase in precipitation associated with the increase in CO2 is also increasing vegetation density, which may already be feeding back onto climate. Including this feedback in a climate model simulation resulted in precipitation and runoff trends consistent with observations and reduced the warming by 0.6OC overland. This unaccounted for missing water may be linked to about 10% of the missing land carbon sink. A recent compilation of outputs from 19 coupled atmosphere-ocean general circulation models used in the IPCC Fourth Assessment Report (AR4) shows projected increases in air temperature, precipitation and river discharge for 24 major rivers in the world in response to doubling CO2 by the end of the century (1). The ensemble mean from these models also indicates that, compared to their respective baselines overland, the global mean of the runoff change would increase faster (8.9% per year) than that of the precipitation (5% per year). We analyze century-scale observed annual runoff time-series (1901-2002) over 9 hydrological units covering large regions of the Eastern USA (Fig.1) compiled by the USA Geological Survey (USGS)(2). These regions were selected because they are the most forested; the least water-limited and are not under extensive irrigation. We compare these time-series to similar time-series of observed annual precipitation anomalies spanning the period 1900-1995 (3). Both time-series exhibit a positive longterm trend (Fig. 2); however, in contrast to the analysis of (I), these historic data records show that the rate of precipitation increase is 5.5 % per year, roughly double the rate of runoff increase of 3.1 % per year.

Author

Greenhouse Effect; Vegetation; Atmospheric General Circulation Models; Air Water Interactions; Climate Models; Climate Change; Atmospheric Heating; Atmospheric Models

20080033304 Naval Postgraduate School, Monterey, CA USA

Probability Distribution Function of the Upper Equatorial Pacific Current Speeds

Chu, Peter C; Jan 2005; 19 pp.; In English

Report No.(s): AD-A480633; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480633

The probability distribution function (PDF) of the upper (0-50 rn) tropical Pacific current speeds (w), constructed from hourly ADCP data (1990-2007) at six stations for the Tropical Atmosphere Ocean project satisfies the two-parameter Weibull distribution reasonably well with different characteristics between El Nino and La Nina events: In the western Pacific, the PDF of w' has a larger peakedness during the La Nina events than during the El Nino events: and vice versa in the eastern Pacific However, the PDF of w' for the lower layer (100-200 m) does not fit the Weibull distribution so well as the upper layer This is due to the different stochastic differential equations between upper and lower layers in the tropical Pacific For the upper layer, the stochastic differential equations, established on the base of the Ekman dynamics, have analytical solution, i%e%, the Rayleigh distribution (simplest lon% of the Weibull distribution), for constant eddy viscosity K Knowledge on PDF of w during the El Nino and La Nina events will improve the ensemble horizontal flux calculation, which contributes to the climate studies Keywords: Probability distribution function, Ocean current speeds, Weibull distribution

DTIC

Distribution Functions; Ocean Currents; Probability Theory

20080033568 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Seasonal Snow Extent and Snow Mass in South America using SMMR and SSM/I Passive Microwave Data (1979-2006)

Foster, J. L.; Hall, D. K.; Kelly, R. E. J.; Chiu, L.; [2008]; 29 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

Seasonal snow cover in South America was examined in this study using passive microwave satellite data from the Scanning Multichannel Microwave Radiometer (SMMR) on board the Nimbus-7 satellite and the Special Sensor Microwave Imagers (SSM/I) onboard Defense Meteorological Satellite Program (DMSP) satellites. For the period from 1979-2006, both snow cover extent and snow water equivalent (snow mass) were investigated during the coldest months (May-September), primarily in the Patagonia area of Argentina and in the Andes of Chile, Argentina and Bolivia, where most of the seasonal snow is found. Since winter temperatures in this region are often above freezing, the coldest winter month was found to be the month having the most extensive snow cover and usually the month having the deepest snow cover as well. Sharp year-to-year

differences were recorded using the passive microwave observations. The average snow cover extent for July, the month with the greatest average extent during the 28-year period of record, is 321,674 km(exp 2). In July of 1984, the average monthly snow cover extent was 701,250 km(exp 2) the most extensive coverage observed between 1979 and 2006. However, in July of 1989, snow cover extent was only 120,000 km(exp 2). The 28-year period of record shows a sinusoidal like pattern for both snow cover and snow mass, though neither trend is significant at the 95% level.
Author
Annual Variations; Snow; Snow Cover; South America; Microwave Radiometers; Passive Satellites; Microwave Imagery

20080033580 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Evaluation of the MODIS Images Potential to Estimate Soybean Areas in Mato Grosso State
DallaValleEpiphanio, Rui; January 2008; 106 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15190-TDI/1299; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

The opportune access to trustworthy agricultural information has become very important for the decision process of national and international agents. The use of remote sensing to map agricultural crops must consider their high dynamism, therefore the use of methods that consider their spectral-temporal profile is needed. The Mato Grosso State Brazil became one of the more productive agricultural regions of the country. Currently this state occupies a prominent position in the national agricultural production, since it is first in soybean production, which corresponds to 31% of grain production in the country. In 2005, soybeans cultivated in the Mato Grosso State were responsible for generating an income of 6.3 billions Reais. The present work has a hypothesis that the use of classification techniques and spectral-temporal analysis of remote sensing images allow the identification and quantification of soybean crop areas in Mato Grosso State, through an objective method. Thus, the main objective of the present work was to evaluate the capacity of the MODerate Resolution Imaging Spectroradiometer (MODIS) images to estimate the soybean crop area cultivated in the Mato Grosso State in the 2005/2006 crop season. To test the hypothesis the Spectral-Temporal Response Surface (STRS) classification method was used, that instead of using the digital numbers or the reflectance of the multi spectral-temporal images, it uses the coefficients of a polynomial generated for each STRS, from each pixel, for this spectral-temporal series. Another technique evaluated was the Crop Enhancement Index (CEI), which explores the Enhanced Vegetation Index (EVI) temporal profile in defined agricultural calendar, allowing the identification and quantification of agricultural crops. To produce a reference, 30 segments, spread throughout the State, of 30 x 30 kilometers was elaborated for the results comparison generated from the MODIS images classifications through the STRS and CEI methods, from Landsat-5/TM images. In each segment the soybean crop area was mapped. The area estimated by the STRS method was 17.56% higher than the reference areas. However, in regions with few soybean areas the classifier overestimated the areas in 56.96%, when compared with the reference areas. The global accuracy of this method was 80%, however with a Kappa value of 0.2634. The use of the CEI method to identify the soybean crop areas was very efficient. The areas identified by this method were underestimated on average by 13.75% when compared to the reference segments and in 12.64% when compared to all segments together. The global accuracy of this mapping technique was also 80%, but with a Kappa value of 0.5137.
Author (revised)
MODIS (Radiometry); Satellite Imagery; Soybeans; Crop Inventories

20080033606 California Inst. of Tech., Pasadena, CA, USA
Aerosol Absorption and Radiative Forcing
Stier, Philip; Seinfeld, J. H.; Kinne, Stefan; Boucher, Olivier; Atmospheric Chemistry and Physics; [2007]; Volume 7, pp. 5237-5261; In English
Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

We present a comprehensive examination of aerosol absorption with a focus on evaluating the sensitivity of the global distribution of aerosol absorption to key uncertainties in the process representation. For this purpose we extended the comprehensive aerosol-climate model ECHAM5-HAM by effective medium approximations for the calculation of aerosol effective refractive indices, updated black carbon refractive indices, new cloud radiative properties considering the effect of aerosol inclusions, as well as by modules for the calculation of long-wave aerosol radiative properties and instantaneous aerosol forcing. The evaluation of the simulated aerosol absorption optical depth with the AERONET sun-photometer network shows a good agreement in the large scale global patterns. On a regional basis it becomes evident that the update of the BC refractive indices to Bond and Bergstrom (2006) significantly improves the previous underestimation of the aerosol absorption optical depth. In the global annual-mean, absorption acts to reduce the shortwave anthropogenic aerosol top-of-atmosphere (TOA) radiative forcing clear-sky from -0.79 to -0.53 W m(sup -2) (33%) and all-sky from -0.47 to -0.13W m(sup -2 (72%).

Our results confirm that basic assumptions about the BC refractive index play a key role for aerosol absorption and radiative forcing. The effect of the usage of more accurate effective medium approximations is comparably small. We demonstrate that the diversity in the AeroCom land-surface albedo fields contributes to the uncertainty in the simulated anthropogenic aerosol radiative forcings: the usage of an upper versus lower bound of the AeroCom land albedos introduces a global annual-mean TOA forcing range of 0.19W m(sup -2) (36%) clear-sky and of 0.12W m(sup -2) (92%) all-sky. The consideration of black carbon inclusions on cloud radiative properties results in a small global annual-mean all-sky absorption of 0.05W m(sup -2) and a positive TOA forcing perturbation of 0.02W m(sup -2). The long-wave aerosol radiative effects are small for anthropogenic aerosols but become of relevance for the larger natural dust and sea-salt aerosols.
Author
Aerosols; Absorption; Earth Surface; Atmospheric Models; Climate Models

20080033655 Army Belvoir Research Development and Engineering Center, Fort Belvoir, VA USA
End-Pumped Monoblock Laser For Eyesafe Targeting Systems
Schilling, Bradley W; Chinn, Stephen; Hays, A D; Goldberg, Lew; Trussell, C W; Nov 1, 2006; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480960; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe a next-generation monoblock laser capable of greater than 10 mJ, 1.5 8m output at 10 pulses per second (PPS) over broad ambient temperature extremes with no active temperature control. The transmitter design is based on a Nd:YAG laser with a Cr4+ passive Q-switch and intracavity KTP OPO. In order to achieve the repetition rate and efficiency goals of this effort, but still have wide temperature capability, we are endpumping the Nd:YAG slab with a 12-bar stack of 100 W (each) diode bars. We compare different techniques for focusing the pump radiation into the 4.25 mm x 4.25 mm end of the slab, including a lensed design, a reflective concentrator, and a lens-duct. We demonstrate widetemperature operation (-20 to 50 degrees Celsius) for each end-pumped configuration.
DTIC
Eye (Anatomy); Eye Protection; Laser Applications; Lasers; Safety; YAG Lasers; Yttrium-Aluminum Garnet

20080034462 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evaluation of Model-Derived and Remotely Sensed Precipitation Products for the Continental South America
deGoncalves, L. Gustavo Goncalves; Shuttleworth, W. James; Nijssen, Bart; Burke, Eleanor J.; Marengo, Jose A.; Chan, Chou Sin; Houser, Paul; Toll, David L.; April 21, 2006; 51 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

This paper investigates the reliability of some of the more important remotely sensed daily precipitation products available for South America as a precursor to the possible implementation of a South America Land Data Assimilation System. Precipitation data fields calculated as 6-hour predictions by the CPTEC Eta model and three different satellite-derived estimates of precipitation (PERSIANN, NESDIS, and TRMM) are compared with the available observations of daily total rainfall across South America. To make this comparison, the threat score, fractional-covered area, and relative volumetric bias of the model-calculated and remotely sensed estimates are computed for the year 2000. The results show that the Eta model-calculated data and the NESDIS product capture the area without precipitation within the domain reasonably well, while the TRMM and PERSIANN products tend to underestimate the area without precipitation and to heavily overestimate the area with a small amount of precipitation. In terms of precipitation amount, the NESDIS product significantly overestimates and the TRMM product significantly underestimates precipitation, while the Eta model-calculated data and PERSIANN product broadly match the domain average observations. However both tend to bias the zonal location of precipitation more heavily toward the equator than the observations. In general, the ETA model-calculated data outperform the several remotely sensed data products currently available and evaluated in the present study.
Author
Rain; Remote Sensing; Satellite Observation; South America

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ENERGY PRODUCTION AND CONVERSION

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

20080033419 Library of Congress, Washington, DC USA
Russian Energy Policy Toward Neighboring Countries
Woehrel, Steven; Mar 27, 2008; 27 pp.; In English
Report No.(s): AD-A480730; CRS-RL34261; No Copyright; Avail.: Defense Technical Information Center (DTIC)

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

20080033781 Office of Inspector General, Arlington, VA USA
Outcome, Cost, and Oversight of Electricity-Sector Reconstruction Contract With Perini Corporation
Warren, David R; Comfort, Benjamin; Converse, Paul; Franzen, Walt; Shimp, William; Slayton, Frank; Apr 29, 2008; 49 pp.; In English
Report No.(s): AD-A480437; SIGIR-08-011; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480437

On March 24, 2008, Mr. Paul Converse, an auditor serving with the Special Inspector General for Iraq Reconstruction and a member of the audit team responsible for this report died of wounds sustained in Baghdad, Iraq, while performing his official duties. Paul provided excellent support to the research and writing that went into the produciton of this audit. This report is issued in his memory and with gratitude for his outstanding service to SIGIR.
DTIC
Contract Management; Costs; Electric Generators; Electricity

20080034577 National Renewable Energy Lab., Golden, CO USA
17th Workshop on Crystalline Silicon Solar Cells and Modules Materials and Processes. Workshop Proceedings. Held in Vail, Colorado on August 5-8, 2007
Sopori, B. L.; Aug. 2007; 321 pp.; In English; 17th Workshop on Crystalline Silicon Solar Cells and Modules Materials and Processes. Workshop Proceedings., August 5 - 8, 2007, Vail, Colorado
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2007-913592; NREL/BK-520-42056; No Copyright; Avail.: National Technical Information Service (NTIS)

Manufacturing and sales of photovoltaic (PV) cells and modules have been growing at rates exceeding 30% for the last several years. In 2006, PV production reached beyond 1 GW and it is expected to surpass 2 GW in 2007. Currently, silicon is the dominant material for solar cells, but, cells based on other material systems such as a-Si, CdTe, and CIGS are gaining ground rapidly. The recent shortage of polysilicon feedstock has helped to further expedite the commercialization of non-silicon technologies. However, this may be viewed as a positive feature for silicon technologies because the maturing of

thin-film PV has filled the slack that could otherwise have dampened the growth because of a lack of available products. The important outcome is that the increased demand for PV will benefit all PV technologies.
NTIS
Conferences; Crystallinity; Modules; Solar Cells

20080034590 National Renewable Energy Lab., Golden, CO USA
National Solar Radiation Database 1991-2005 Update: User's Manual
Apr. 2007; 472 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2007-901864; NREL/TR-581-41364; No Copyright; Avail.: National Technical Information Service (NTIS)

This manual describes how to obtain and interpret the data products from the updated 1991-2005 National Solar Radiation Database (NSRDB). This is an update of the original 1961-1990 NSRDB released in 1992.
NTIS
Data Bases; Solar Radiation; User Manuals (Computer Programs)

20080034601 Department of Energy, Washington, DC, USA
DOE Solar Energy Technologies Program FY 2006 Annual Report
January 2006; 214 pp.; In English
Report No.(s): DE2007-912967; No Copyright; Avail.: National Technical Information Service (NTIS)

The DOE Solar Energy Technologies Program FY 2006 Annual Report chronicles the R&D results of the U.S. Department of Energy Solar Energy Technologies Program for Fiscal Year 2005. In particular, the report describes R&D performed by the Program's national laboratories (National Renewable Energy Laboratory, Sandia National Laboratories, Oak Ridge National Laboratory, and Brookhaven National Laboratory) and university and industry partners.
NTIS
Energy Technology; Solar Energy

20080034602 National Renewable Energy Lab., Golden, CO USA
High-Efficiency Amorphous Silicon and Nanocrystalline Silicon-Based Solar Cells and Modules. Annual Technical Progress Report 30 January 2006 to 29 January 2007
Guha, S.; Yang, J.; Jul. 2007; 56 pp.; In English
Report No.(s): DE2007-912958; NREL/SR-520-41866; No Copyright; Avail.: National Technical Information Service (NTIS)

United Solar used a-Si:H/a-SiGe:H/a-SiGe:H in two manufacturing plants and improved solar efficiency and reduced manufacturing cost by new deposition methods, optimized deposition parameters, and new materials and cell structures.
NTIS
Amorphous Silicon; Modules; Silicon Alloys; Solar Cells; Solar Energy

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ENVIRONMENT POLLUTION

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

20080032888 Congressional Research Service, Washington, DC, USA
Air Quality Issues and Animal Agriculture: EPA's (Environmental Protection Agency's) Air Compliance Agreement. CRS Report for Congress
Copeland, C.; Jul. 18, 2007; 15 pp.; In English
Report No.(s): PB2008-100466; CRS-RL32947; No Copyright; Avail.: CASI: A03, Hardcopy

From an environmental quality standpoint, much of the interest in animal agriculture has focused on impacts on water resources, because animal waste, if not properly managed, can harm water quality through surface runoff, direct discharges, spills, and leaching into soil and groundwater. A more recent issue is the contribution of emissions from animal feeding operations (AFO), enterprises where animals are raised in confinement, to air pollution. AFOs can affect air quality through emissions of gases such as ammonia and hydrogen sulfide, particulate matter, volatile organic compounds, hazardous air

pollutants, and odor. These pollutants and compounds have a number of environmental and human health effects.
NTIS
Agriculture; Air Pollution; Air Quality; Animals; Environment Protection

20080032902 Agency for Toxic Substances and Disease Registry, Atlanta, GA, USA
Health Consultation: Exposure Investigation Report, Meredith William C Co., Inc., East Point, Georgia. EPA Facility ID: GAD003323805
Aug. 23, 2007; 41 pp.; In English
Report No.(s): PB2008-100518; No Copyright; Avail.: National Technical Information Service (NTIS)

The William C. Meredith Wood Treatment facility (Meredith) is located in East Point, Fulton County, Georgia. The wood processing at Meredith involves the dipping of timber into a low heat treatment reservoir and the subsequent cyclical drying of that timber in the open air. The facility uses either creosote or pentachlorophenol on a rotational basis. In July 2003, the Agency for Toxic Substances and Disease Registry (ATSDR) received a petition from a resident requesting a public health evaluation of Meredith. The primary complaints in the request were the obnoxious odor, respiratory irritation and asthma exacerbations. ATSDR and the Georgia Division of Public Health (GDPH) conducted an Exposure Investigation (EI) that collected air samples for creosote and pentachlorophenol from October 2003 to March 2004. Sampling results showed that airborne levels of creosote near Meredith were below levels known to cause a public health hazard. However, the pentachlorophenol air levels in the communities surrounding Meredith posed an indeterminate public health hazard due to uncertainty of the populations internal dose. In the fall of 2004, we started a second EI to fill that data gap with an added biologic component. The air sampling was followed by urine sampling to determine pentachlorophenol levels in the urine of residents at risk of exposure. We also looked for a possible correlation between the pentachlorophenol levels in air and in urine.
NTIS
Air Pollution; Environmental Surveys; Exposure; Hazards; Health; Public Health

20080032904 Idaho Dept. of Health and Welfare, Boise, ID, USA
Health Consultation: State of Idaho, Lewiston, Nez Perce County, Idaho. Evaluation of Benzene Air Contamination in Lewiston Area, Idaho
Feb. 16, 2005; 26 pp.; In English
Report No.(s): PB2008-100515; No Copyright; Avail.: CASI: A03, Hardcopy

In 2003, the Bureau of Community and Environmental Health (BCEH) conducted a health consultation, Evaluation of Air Exposure, Potlatch Corporation Pulp and Paper Mill, Lewiston, Nez Perce County, Idaho (BCEH 2003). The purpose was to see if a possible link exists between the Potlatch Corporation pulp and paperboard mill in Lewiston and the areas elevated cancer rates. In that health consultation, BCEH reported that the levels of chloroform and benzene in the air (both indoor and outdoor) were higher than health-based comparison values of the Agency for Toxic Substances and Disease Registry (ATSDR). Chloroform and benzene in the air were designated as contaminants of concern and should be evaluated further. However, on the basis of information from the Toxics Release Inventory of U.S. Environmental Protection Agency (EPA), ambient benzene is not related to emissions from the Potlatch mill. Therefore, ATSDR and BCEH decided to separate the evaluations of benzene and chloroform air contamination into two separate health consultations. In this health consultation, BCEH will focus on the benzene air contamination in the Lewiston area. The chloroform air contamination was evaluated in 2003 (BCEH 2003).
NTIS
Air Pollution; Benzene; Contamination; Environmental Surveys; Health; Idaho; Public Health

20080032906 Congressional Research Service, Washington, DC, USA
Clean Air Issues in the 110th Congress: Climate Change, Air Quality Standards, and Oversight. CRS Report for Congress
McCarthy, J. E.; Jul. 12, 2007; 30 pp.; In English
Report No.(s): PB2008-100500; CRS-RL33776; No Copyright; Avail.: National Technical Information Service (NTIS)

Attention to environmental issues in the 110th Congress focused early and heavily on climate change--the state of the science, and whether (and, if so, how) to address greenhouse gas emissions. Ten bills had been introduced to establish caps on greenhouse gas emissions as of mid-July, and hearings on climate change have been held by at least seven committees. The

Speaker of the House has urged quick action on legislation, and established a Select Committee on Energy Independence and Global Warming to highlight the issue.
NTIS
Air Pollution; Air Quality; Climate Change; Pollution Control

20080032909 Congressional Research Service, Washington, DC, USA
Ozone Air Quality Standards: EPA's (Environmental Protection Agency's) 2007 Proposed Changes. CRS Report for Congress
McCarthy, J. E.; Jul. 13, 2007; 12 pp.; In English
Report No.(s): PB2008-100495; CRS-RL34057; No Copyright; Avail.: National Technical Information Service (NTIS)
EPA Administrator Stephen Johnson proposed changes to the National Ambient Air Quality Standard (NAAQS) for ozone on June 20, 2007; the proposal appeared in the Federal Register July 11. NAAQS are standards for outdoor (ambient) air that are intended to protect public health and welfare from harmful concentrations of pollution. If the standard is changed as proposed, EPA would be concluding that protecting public health and welfare requires lower concentrations of ozone pollution than it previously judged to be safe. This report discusses the standard-setting process, the specifics of the ozone standard, and issues raised by the proposal, and it describes the steps that will follow EPA's proposal.
NTIS
Air Pollution; Air Quality; Ambience; Environment Protection; Ozone

20080032911 Congressional Research Service, Washington, DC, USA
Particulate Matter (PM2.5): Implemenation of the 1997 National Ambient Air Quality Standards (NAAQS). CRS Report for Congress
Esworthy, R.; Oct. 06, 2006; 26 pp.; In English
Report No.(s): PB2008-100476; CRS-RL32431; No Copyright; Avail.: CASI: A03, Hardcopy
Particulate matter (PM), including fine particulate matter (PM2.5), is one of the six principal pollutants for which the U.S. Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (CAA). NAAQS are designed to protect human health within an adequate margin of safety. After years of litigation and other delays, the EPA is moving to implement the NAAQS for PM2.5 promulgated in 1997. This report provides information on the designation process for PM2.5 attainment and nonattainment areas. It also discusses issues that have been raised as EPA, the states, and nonattainment areas develop implementation strategies.
NTIS
Air Pollution; Air Quality; Ambience; Particulates; Pollution Control

20080032912 Congressional Research Service, Washington, DC, USA
Carbon Cycle: Implications for Climate Change and Congress. CRS Report for Congress
Folger, P.; Jun. 25, 2007; 14 pp.; In English
Report No.(s): PB2008-100493; CRS-RL34059; No Copyright; Avail.: CASI: A03, Hardcopy
Carbon is stored in the atmosphere, in the oceans, in vegetation, and in soils on the land surface. Huge quantities of carbon are actively exchanged between the atmosphere and the other storage pools of carbon. The exchange, or flux, of carbon between the atmosphere, oceans, and land surface is called the carbon cycle. In sheer magnitude, human activities contribute a relatively small amount of carbon, primarily as carbon dioxide (CO2), to the global carbon cycle. Burning fossil fuels, for example, adds less than 5% to the total amount of CO2 released from the oceans and land surface to the atmosphere each year. If humans add only a small amount of CO2 to the atmosphere each year, why is that contribution important to global climate change. In short, the oceans, vegetation, and soils cannot consume carbon released from human activities quickly enough to stop CO2 from accumulating in the atmosphere. Humans tap the huge pool of fossil carbon for energy, and affect the global carbon cycle by transferring fossil carbon which took millions of years to accumulate into the atmosphere over a relatively short time span. As a result, the atmosphere contains 100 parts per million more today (380 ppm vs 280 ppm) than prior to the beginning of the industrial revolution. As the CO2 concentration grows it increases the radiative forcing (more incoming radiation energy than outgoing) of the atmosphere, warming the planet. In response, Congress is considering legislative strategies that would reduce U.S. emissions of CO2, or increase the uptake of CO2 from the atmosphere, or both.
NTIS
Carbon; Carbon Cycle; Climate Change

20080032914 Congressional Research Service, Washington, DC, USA

Climate Change: The Kyoto Protocol and International Actions. CRS Report for Congress

Fletcher, S. R.; Parker, L.; Jun. 08, 2007; 19 pp.; In English

Report No.(s): PB2008-100496; CRS-RL33826; No Copyright; Avail.: National Technical Information Service (NTIS)

The concerns over climate change, often termed global warming, have emerged both in the USA and internationally as major policy issues. Reports in 2007 of the United Nations Intergovernmental Panel on Climate Change (IPCC) provided additional scientific underpinnings for these concerns, and the number of proposals and international meetings devoted to these issues has grown significantly during this year, as discussed in this report.

NTIS

Air Pollution; Climate; Climate Change; Pollution Control; Protocol (Computers)

20080032932 National Energy Technology Lab., Morgantown, WV, USA

CFD Modeling for Mecury Control Technology

Madsen, J. I.; Dec. 2006; 20 pp.; In English

Report No.(s): DE2007-912851; DOE/NETL-IR-2007-055; No Copyright; Avail.: National Technical Information Service (NTIS)

Compliance with the Clean Air Mercury Rule will require implementation of dedicated mercury control solutions at a significant portion of the U.S. coal-fired utility fleet. Activated Carbon Injection (ACI) upstream of a particulate control device (ESP or baghouse) remains one of the most promising near-term mercury control technologies. The DOE/NETL field testing program has advanced the understanding of mercury control by ACI, but a persistent need remains to develop predictive models that may improve the understanding and practical implementation of this technology. This presentation describes the development of an advanced model of in-flight mercury capture based on Computational Fluid Dynamics (CFD). The model makes detailed predictions of the induct spatial distribution and residence time of sorbent, as well as predictions of mercury capture efficiency for particular sorbent flow rates and injection grid configurations. Hence, CFD enables cost efficient optimization of sorbent injection systems for mercury control to a degree that would otherwise be impractical both for new and existing plants. In this way, modeling tools may directly address the main cost component of operating an ACI system the sorbent expense. A typical 300 MW system is expected to require between $1 and $2 million of sorbent per year, and so even modest reductions (say 10-20%) in necessary sorbent feed injection rates will quickly make any optimization effort very worthwhile.

NTIS

Air Pollution; Computational Fluid Dynamics; Pollution Control

20080032935 Arizona State Dept. of Health, Phoenix, AZ, USA

Health Consultation: North Indian Bend Wash Central Ground Treatment Facility, Scottsdale, Maricopa County, Arizona. EPA Facility ID: AZD980695969

Sep. 30, 2006; 17 pp.; In English

Report No.(s): PB2007-114280; No Copyright; Avail.: National Technical Information Service (NTIS)

The North Indian Bend Wash (NIBW) Superfund site was added to the National Priorities List in 1983. As part of the remediation, the Central Groundwater Treatment Facility (CGTF) was built by several key entities. These entities include, the USA Environmental Protection Agency (US EPA), the State of Arizona (Arizona Department of Environmental Quality ADEQ and Arizona Department of Water Resources ADWR), Participating Companies PCs (Motorola, Inc., GlaxoSmithKline, and SMI Holding LLC), and the City of Scottsdale. The CGTF uses a process called Air Stripping to remove Volatile Organic Compounds (VOCs) from water. The NIBW Community Involvement group has expressed concern regarding the release of VOCs such as trichloroethylene (TCE), perchloroethylene (PCE), and chloroform into the ambient air by this treatment facility. In response, the Arizona Department of Health Services reviewed existing data and prepared a health consultation to evaluate the potentially adverse health effects due to VOCs potentially released by air emissions from the Central Groundwater Treatment Facility.

NTIS

Arizona; Ground Water; Health; Volatile Organic Compounds; Environmental Cleanup; Environmental Quality

20080033048 ENVIRON International Corp., Novato, CA USA
Modeling Weekday/Weekend Emissions and Ozone in the Los Angeles Basin for 1997 and 2010
Yarwood, G.; Koo, B.; Grant, J.; Aug. 2007; 90 pp.; In English
Contract(s)/Grant(s): A-56
Report No.(s): PB2008-100011; CRC-A-56; No Copyright; Avail.: National Technical Information Service (NTIS)

Numerous studies of ambient ozone in the Los Angeles area have found both increases and decreases in high ozone concentrations on the weekend compared to weekdays. Furthermore, the magnitudes and locations of ozone increases and decreases change over time. The objective of CRC project A-56 was to investigate how Los Angeles weekday/weekend ozone differences are expected to evolve in the near future (2010) according to projected emission inventories and numerical ozone models. Ozone modeling was based on the August 3-7, 1997 episode that occurred during the Southern California Ozone Study (SCOS).

NTIS
Air Pollution; Exhaust Emission; Ozone

20080033052 Agency for Toxic Substances and Disease Registry, Atlanta, GA, USA
Health Consultation: Health Implications of Students (and Faculty) Exposed to Chemical Hazards at the Phillips Community College of the University of Arkansas (Arkansas Institute for Historic Building Trades), 415 Ohio Street, Helena, Phillips County, Arkansas 72342. Arkansas Facility ID: 01-00162
Mar. 31, 2006; 30 pp.; In English
Report No.(s): PB2007-114370; No Copyright; Avail.: CASI: A03, Hardcopy

In July of 2004, Arkansas Department of Environmental Quality (ADEQ) personnel notified Arkansas Department of Health and Human Services, Division of Health (ADH) personnel of a complaint investigation. ADEQ reported that past operations and construction practices in the Arkansas Institute for Historic Building Trades (AIHBT) building located in Helena, Arkansas had resulted in some contamination. The building is part of the Phillips Community College of the University of Arkansas (PCCUA) campus and was used to train students to maintain, rehabilitate, and restore historic buildings. Some documents refer to the AIHBT building as the Arkansas Institute for Building Preservation Trades. However, the 2001-2002 online PCCUA college catalog refers to the site as the AIHBT building, and it will be referred to as such throughout this document.

NTIS
Arkansas; Contamination; Hazards; Health; Streets; Students; Universities

20080033053 Agency for Toxic Substances and Disease Registry, Atlanta, GA, USA
Health Consultation: Public Health Evaluation of Environmental Sampling Data at Veteran's Field and Edgerton Elementary School, New London, New London County, Connecticut. Connecticut DEP Remediation ID: 6437
Sep. 26, 2005; 44 pp.; In English
Report No.(s): PB2007-114358; No Copyright; Avail.: CASI: A03, Hardcopy

In April 2005, the Agency for Toxic Substances and Disease Registry (ATSDR) was petitioned by a parent of an Edgerton Elementary School student, in New London, Connecticut to evaluate the public health significance of environmental sampling data at Veterans Field and Edgerton Elementary School. The main focus of this health consultation will be evaluating soil sampling data from Veterans Field. However, other environmental data such as soil, indoor air and dust wipe samples from Edgerton Elementary School and ambient air monitoring data from the Field will be evaluated as well.

NTIS
Connecticut; Health; Public Health; Sampling; Schools; Toxic Diseases

20080033059 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Optimization of Thermal-Optical Analysis for the Measurement of Black Carbon in Regional PM2.5: A Chemometric Approach
Conny, J. M.; Aug. 2007; 98 pp.; In English
Contract(s)/Grant(s): EPA-DW-13939973
Report No.(s): PB2007-114771; EPA/600/R-07/119; No Copyright; Avail.: National Technical Information Service (NTIS)

The effect of atmospheric particulate matter (PM) on health, visibility, and regional climate has become a major concern worldwide, and control of PM is now the major challenge in air pollution abatement. Many of the adverse effects are directly associated with the aerosol products of incomplete combustion, which include in large part the refractory carbon component

know as elemental carbon (EC). Unfortunately, the complex organic and inorganic nature of PM can lead to severe measurement inconsistencies, and this is particularly the case for EC. Numerous methods have been developed over the last few decades to measure refractory carbon in PM, including methods based on chemical oxidation, thermal oxidation, optical behavior alone, photoacoustic behavior, and thermal oxidation combined with optical behavior. A number of intercomparison studies have revealed that while measurements of total PM carbon are fairly consistent among different methods, EC measurements are not. These inconsistencies in EC are attributed mainly to the belief that different methods measure different mixtures of substances as EC. Thermal oxidation and wet oxidation methods in particular often disagree substantially with optical methods. However, owing to the chemical and physical complexity of refractory carbon in PM, it is not reasonable to expect that the mass of refractory carbon by non-optical oxidative methods should be equivalent to the mass of light-absorbing carbon by optical methods. The goal here was to derive optimal temperatures and durations for the critical steps in the thermal protocol.
NTIS
Air Pollution; Carbon; Particulates; Pollution Control; Thermal Analysis

20080033091 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA
Health Consultation: Lead in Dust in Homes in the Lincoln Park Neighborhood, Canon City, Fremont County, Colorado. EPA Facility ID: COD042167585
Nov. 15, 2006; 33 pp.; In English
Report No.(s): PB2008-101307; No Copyright; Avail.: CASI: A03, Hardcopy

The Canon City area has been the historical site of a number of milling and smelting facilities. Based on environmental contamination from those operations, questions and concerns have been voiced by residents of the Lincoln Park neighborhood. Among the various issues are specific concerns that lead contaminated dust from current and historical operations may have migrated into the residential neighborhood. In response to those concerns, the US Environmental Protection Agency (EPA) has requested that the Agency for Toxic Substances and Disease Registry (ATSDR) review the data related to lead contamination in the Canon City area, and assess the health risk associated with the lead contamination. After an initial review of the available data, a site visit to the Lincoln Park area in July of 2004, and conversations with concerned community members, ATSDR focused assessments on two primary issues. The first issue was the blood lead levels in children living in the area, and the second was the lead contaminated dust in homes in the Lincoln Park area. This health consultation specifically addresses concerns related to lead levels in the house dust in the Lincoln Park area. (A second health consultation will address the concerns related to blood lead levels in the Lincoln Park area, and will be released as a second document.) This health consultation addressing dust contaminants provides an assessment based on the data that has been compiled in the Canyon City Lead Data Compilation Report.
NTIS
Air Pollution; Blood; Colorado; Consulting; Dust; Health; Lead (Metal); Pollution Monitoring; Smelting

20080033092 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA
Health Consultation: Exposure Investigation Report, Lead in Indoor Dust, Outdoor Soil, and Blood of Lincoln Park Neighborhood Residents, Fremont County, Colorado. EPA Facility ID: COD042167858
Nov. 16, 2006; 18 pp.; In English
Report No.(s): PB2008-101306; No Copyright; Avail.: National Technical Information Service (NTIS)

Based on community concerns and a request for assistance from the USA Environmental Protection Agency (EPA), the Agency for Toxic Substances and Disease Registry (ATSDR) assessed lead contamination in the Lincoln Park neighborhood, located just south of Canon City, Colorado. ATSDR reviewed available lead data and concluded that both the characterization of levels of lead in samples of in-home dust, and the estimates obtained from a computer model, generated concerns related to possible lead exposures in the Lincoln Park neighborhood. Collectively, this information suggested that exposures to the lead in dust could impact the health of children residing at properties in the Lincoln Park neighborhood. Therefore, ATSDR concluded that the lead in house dust in the Lincoln Park area represented an indeterminate health hazard and recommended an exposure investigation (EI) to address unanswered questions.
NTIS
Air Pollution; Blood; Colorado; Consulting; Dust; Exposure; Health; Lead (Metal); Pollution Monitoring; Smelting; Soils

20080033094 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Blood Lead Levels in Children in the Lincoln Park Neighborhood, Canon City, Fremont County, Colorado. EPA Facility ID: COD042167585

Nov. 16, 2006; 12 pp.; In English

Report No.(s): PB2008-101305; No Copyright; Avail.: CASI: A03, Hardcopy

The Canon City area has been the historical site of at least six milling and smelting facilities. Based on environmental contamination from those operations, numerous questions and concerns have been voiced by residents of the Lincoln Park neighborhood. Among the various issues are specific concerns that lead contaminated dust from current and historical operations may have migrated into the residential neighborhood. In response to those concerns, the US Environmental Protection Agency (EPA) has requested that the Agency for Toxic Substances and Disease Registry (ATSDR) review the data related to lead contamination in the Canon City area, and assess the health risk associated with the lead contamination. After an initial review of the available data, a site visit to the Lincoln Park area in July of 2004, and conversations with concerned community members, ATSDR focused assessments on two primary issues. The first issue was the blood lead levels in children living in the area, and the second was the lead contaminated dust in homes in the Lincoln Park area. This health consultation specifically addresses concerns related to blood lead levels in children living in the Lincoln Park area.

NTIS

Air Pollution; Blood; Children; Colorado; Consulting; Health; Lead (Metal); Pollution Monitoring; Smelting

20080033537 Florida Dept. of Health, Tallahassee, FL, USA

Health Consultation: Exposure Investigation Report, Indoor Air Testing, West Lasalle Stree Site, Tampa, Hillsborough County, Florida. EPA Facility ID: FLT060077807

May 11, 2007; 56 pp.; In English

Report No.(s): PB2008-101342; No Copyright; Avail.: National Technical Information Service (NTIS)

This Exposure Investigation (EI) addresses the public health threat of possible vapor intrusion from contaminated ground water entering indoor air of homes on LaSalle Street in Tampa, Florida. In the fall of 2006, the Florida Department of Health (DOH) requested funding from the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) for indoor air testing after reviewing ground water data from monitoring wells along LaSalle Street. ATSDR provided the financial and technical support for this testing. In November/December 2006 and January 2007, the Hillsborough County Health Department (CHD) and the Florida DOH tested for 68 different volatile organic compounds (VOCs) in the indoor air of two homes near the West LaSalle Street (WLS) property. One of the homes was used as a background because it was not on top of any known ground water contamination. No significant vapor intrusion into indoor air from contaminated ground water occurred at the home tested on LaSalle Street. In most cases, the VOCs of interest were higher in the indoor air of house no. 2 the background sample.

NTIS

Air Pollution; Consulting; Exposure; Flight Tests; Florida; Health; Indoor Air Pollution; Pollution Monitoring

20080033538 Florida Dept. of Health, Tallahassee, FL, USA

Health Consultation: Evaluation of Ambient Air Sampling, Saufley Field Landfill, Pensacola, Escambia County, Florida

Jul. 20, 2006; 28 pp.; In English

Report No.(s): PB2008-101340; No Copyright; Avail.: National Technical Information Service (NTIS)

This document summarizes the Florida Department of Health's evaluation of ambient air monitoring and sampling results from the US EPA's January 2006 effort near the Saufley Field Landfill in Escambia County, Florida.

NTIS

Air Pollution; Air Sampling; Consulting; Florida; Landfills; Pollution Monitoring

20080033539 Florida Dept. of Health, Tallahassee, FL, USA

Health Consultation: Air Testing, Former Royal Oaks Charcoal Facility, Marion County, Florida

Jan. 17, 2007; 37 pp.; In English

Report No.(s): PB2008-101333; No Copyright; Avail.: CASI: A03, Hardcopy

This health consultation report evaluates March 2006 indoor and outdoor air test results near the former Royal Oaks Charcoal Facility in Ocala, Marion County, Florida.

NTIS

Air Pollution; Charcoal; Consulting; Flight Tests; Florida; Health; Pollution Monitoring; Trees (Plants)

20080033540 Florida Dept. of Health, Tallahassee, FL, USA

Health Consultation: Evaluation of Ambient Air Data, Cornet Industries, Incorporated (a/k/a Borden Feed Phosphate Complex; Consolidated Minerals, Inc.; Amax Phosphate, Incorporated), Plant City, Hillsborough County, Florida. EPA Facility ID: FLD001704741

Sep. 19, 2005; 77 pp.; In English

Report No.(s): PB2008-101326; No Copyright; Avail.: National Technical Information Service (NTIS)

The Florida Department of Health (DOH) has evaluated available air quality data collected at or near the Coronet Industries Site in Plant City, Florida. Area residents suspect that some of their health problems could be linked to poor air quality caused by emissions from Coronets phosphate processing plant.

NTIS

Air Pollution; Air Quality; Consulting; Florida; Health; Industries; Minerals; Phosphates; Pollution Monitoring

20080033895 National Center for Statistics and Analysis, Washington, DC, USA

Corporate Average Fuel Economy and Cafe Reform for MY2008-2011 Light Trucks. Final Regulatory Impact Analysis

Mar. 2006; 316 pp.; In English

Report No.(s): PB2008-101060; No Copyright; Avail.: National Technical Information Service (NTIS)

This assessment examines the costs and benefits of improving the fuel economy of light trucks for model years (MY) 2008-2011. It includes a discussion of the technologies that can improve fuel economy, analysis of the potential impact on light truck retail prices, safety, lifetime fuel savings and their value to consumers, and other societal benefits such as improved energy security and reduced emissions of pollutants and greenhouse gases.

NTIS

Air Pollution; Organizations; Pollution Control; Trucks

20080033932 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Evaluation of Indoor and Migration in Building On-Site and Adjacent to the Omega Chemical Site, Whittier, Los Angeles County, California. EPA Facility ID: CAD042245001

Mar. 20, 2007; 48 pp.; In English

Report No.(s): PB2008-101313; No Copyright; Avail.: National Technical Information Service (NTIS)

The Omega site is approximately 40,000 square feet in area and is located between 12504 and 12512 East Whittier Boulevard in the City of Whittier, Los Angeles County, California. There are two buildings on the Omega site: a 24,000 square foot warehouse and a 2,400 square foot administrative building. The Omega site is paved with concrete and is surrounded by a 7-foot high chain-link fence topped with razor wire.

NTIS

Air Pollution; California; Consulting; Health; Migration; Pollution Monitoring

20080033933 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Naval Weapons Station Seal Beach Detachment Concord, Evaluation of Soil Arsenic Concentrations at the Magazine Study Area, City of Concord, Contra Costa County, California. EPA Facility ID: CA7170024528

Mar. 28, 2005; 26 pp.; In English

Report No.(s): PB2008-101310; No Copyright; Avail.: CASI: A03, Hardcopy

Past operations and waste management practices at the Naval Weapons Station Seal Beach Detachment Concord (Detachment Concord) have resulted in some environmental contamination on-base. The Navy, under the oversight of the US Environmental Protection Agency (EPA) and the California Environmental Protection Agency (Cal/EPA), is actively investigating and remediating known and suspected areas of on-base contamination.

NTIS

Arsenic; California; Consulting; Costa Rica; Detachment; Health; Soils

20080033934 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Ambient Air and Indoor Dust, McFarland Study Area, McFarland, Kern County, California. EPA Facility ID: CA0001118603

Mar. 22, 2006; 19 pp.; In English

Report No.(s): PB2008-101308; No Copyright; Avail.: CASI: A03, Hardcopy

The community of McFarland, California petitioned the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate potential exposure to hazardous substances in their environment in response to a childhood cancer cluster for which a causal association between health data and identified contamination could not be established. ATSDR completed an assessment of potential exposure to soil and municipal water in 2001 and recommended review of air quality data when available. This health consultation evaluates potential exposures to ambient air quality and indoor dust in data submitted by the Environmental Protection Agency (EPA). ATSDR concluded that exposure to the reported individual contaminant levels would not be expected to result in adverse health effects.

NTIS

California; Consulting; Dust; Environmental Surveys; Hazards; Health; Risk

20080033935 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Former Fort Ord Site (a/k/a Fort Ord), Marina, Monterey County, California. EPA Facility ID: CA7210020676

Feb. 03, 2005; 19 pp.; In English

Report No.(s): PB2008-101302; No Copyright; Avail.: National Technical Information Service (NTIS)

As part of the long-term base closure process of the former Fort Ord (fFO) U.S. Army Base, the Army has conducted a prescribed burn of several former firing ranges. These burns were and will be conducted to remove vegetation from the firing ranges, thus allowing subsequent cleanup of unexploded munitions possibly left on the firing ranges. Burning of the vegetation will result in burning and explosion of some munitions and explosives of concern (MEC) as well as the vegetation. Before the scheduled burn in October 2003, concerns about possible adverse health effects from inhalation of the smoke from these prescribed burns prompted the Army to undertake an extensive air monitoring evaluation of the burn to quantify potential air contaminants and concentrations in the surrounding communities. ATSDR has been asked by the Army to evaluate the air monitoring data to determine whether smoke from the prescribed burn represents a potential public health hazard to the surrounding communities.

NTIS

Air Pollution; California; Consulting; Explosives; Health; Pollution Monitoring

20080033936 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Exposure Investigation Report, Former American Beryllium Site, Tallevast, Manatee County, Florida. EPA Facility ID: FLD004100731

Mar. 20, 2006; 35 pp.; In English

Report No.(s): PB2008-101301; No Copyright; Avail.: CASI: A03, Hardcopy

This exposure investigation, conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) with the help of the Florida Department of Health (DOH) and the Sarasota County Health Department (CHD), completes the retesting of participants with abnormal, borderline, or uninterpretable beryllium lymphocyte proliferation test(BeLPT) results obtained by the Manatee CHD and the Florida DOH's first exposure investigation. The Manatee County Health Department (CHD) began testing residents of the Tallevast community of Manatee County, Florida for beryllium sensitization using the BeLPT in December 2004 and January 2005 as a response to concerns about possible exposure to beryllium dust from the Loral American Beryllium Company (ABC) plant which operated from 1961 to 1996. The Loral ABC plant manufactured ultra-precision machine parts using beryllium components for the aerospace industry and the ballistic missile program for the defense industry. A total of 237 participants were tested using the BeLPT, with 7 abnormal results (3 former workers, 3 household contacts, and 1 community resident), 4 border line results (1 former worker, 1 household contact, and 2 community residents), and 2 uninterpretable results (2 community residents).

NTIS

Air Pollution; Beryllium; Consulting; Exposure; Florida; Health; Manatees

20080033937 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA
Health Consultation: CEMEX, Incorporated, Lyons, Boulder County, Colorado. EPA Facility ID: COD980957823
January 2007; 36 pp.; In English
Report No.(s): PB2008-101300; No Copyright; Avail.: CASI: A03, Hardcopy

Since the release of ATSDRs first health consultation (ATSDR 2003b) regarding the burning of tires by CEMEX, Inc., the Boulder County Public Health Department has received questions from several residents regarding that health consultation. The Health Department asked ATSDR to help address the residents concerns.

NTIS
Air Pollution; Colorado; Combustion; Consulting; Health; Tires

20080034564 Foster Wheeler Corp., Livingston, NJ, USA
Conceptual Design of Supercritical O2-Based PC Boiler. Final Report
Seltzer, A.; Fan, Z.; Robertson, A.; Nov. 2006; 165 pp.; In English
Contract(s)/Grant(s): DE-FC26-04NT42207
Report No.(s): DE2007-914572; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of the system design and analysis task of the Conceptual Design of Oxygen-Based Supercritical PC Boiler study is to evaluate the effects of oxygen firing on supercritical PC boiler design, operation and system performance. Simulations of the oxygen-fired plant with CO2 sequestration were conducted using Aspen Plus and were compared to a reference air-fired 460 MWe plant. Flue gas recycle is used to control the flame temperature and resultant wall temperature in the O2-fired PC. Parametric trade-off studies were made to determine the effect of flame temperature on system efficiency. The degree of improvement in system performance of various modifications was investigated. The objective of the advanced oxygen separation system integration task of the study is to evaluate the benefits, effects, and limitations of the integration of advanced oxygen separation technologies into a supercritical O2-fired PC. Simulations of the power generation unit, oxygen separation unit, and CO2 sequestration system were conducted using the Aspen Plus software. The improvement of the O2-fired PC system performance incorporating the Oxygen Ion Transport Membrane (OITM) and Ceramic Auto-thermal Recovery (CAR) were investigated. A parametric study was conducted to determine the sensitivity of the design and performance to various variables. Compared to the other CO2 removal and sequestration technologies, the oxygen-fired PC integrated with OITM shows substantially less CO2 removal penalty. The CO2 removal penalty of the oxygen-fired PC integrated with CAR is between cryogenic air separation and OITM.

NTIS
Boilers; Design Analysis; Oxygen; Steam Turbines; Supercritical Flow

20080034567 Georgia Inst. of Tech., Atlanta, GA, USA; Kentucky Univ., Lexington, KY, USA
Implementing Strategies for Drying and Pressing Wood Without Emissions Controls. Final Report
Banerjee, S.; Cornners, T. E.; Sep. 2007; 124 pp.; In English
Contract(s)/Grant(s): DE-FC36-96ID13439
Report No.(s): DE2007-913620; No Copyright; Avail.: Department of Energy Information Bridge

Drying and pressing wood for the manufacture of lumber, particleboard, oriented strand board (OSB), veneer and medium density fiberboard (MDF) release volatile organic compounds (VOCs) into the atmosphere. These emissions require control equipment that are capital intensive and consume significant quantities of natural gas and electricity. The objective of our work was to understand the mechanisms through which volatile organic compounds are generated and released and to develop simple control strategies. Of the several strategies developed, two have been implemented for OSB manufacture over the course of this study. First, it was found that increasing final wood moisture by about 2-4 percentage points reduced the dryer emissions of hazardous air pollutants by over 70%. As wood dries, the escaping water evaporatively cools the wood. This cooling tapers off wood when the wood is nearly dry and the wood temperature rises. Thermal breakdown of the wood tissue occurs and VOCs are released. Raising the final wood moisture by only a few percentage points minimizes the temperature rise and reduces emissions. Evaporative cooling also impacts has implications for VOC release from wood fines. Flaking wood for OSB manufacture inevitable generates fines. Fines dry out rapidly because of their high surface area and evaporative cooling is lost more rapidly than for flakes. As a result, fines emit a disproportionate quantity of VOCs. Fines can be reduced in two ways: through screening of the green furnish and through reducing their generation during flaking. The second approach is preferable because it also increased wood yield. A procedure to do this by matching the sharpness angle of the flaker knife to the ambient temperature was also developed.

NTIS
Air Pollution; Drying; Industries; Pollution Control; Wood

20080034568 CONSOL Energy Research and Development, South Park, PA, USA; Harvard School of Public Health, Boston, MA, USA
Steubenville Comprehensive Air Monitoring Program (SCAMP). (Final Report, February 1, 1999-June 30, 2006)
Connell, D. P.; Winter, S. E.; Suh, H.; Sarnat, S.; Sullivan, J.; Mar. 2007; 373 pp.; In English
Contract(s)/Grant(s): DE-FC26-00NT40771
Report No.(s): DE2007-914418; No Copyright; Avail.: National Technical Information Service (NTIS)

In 1999, CONSOL Energy Inc. Research & Development (CONSOL R&D), in cooperation with research partners and funding agencies, launched the Steubenville Comprehensive Air Monitoring Program (SCAMP) to clarify uncertainties regarding fine particulate matter (PM2.5) concentration, composition, and exposure. The study was conducted in Steubenville, Ohio, a small but heavily industrialized city located in the Upper Ohio River Valley that historically has had elevated particulate matter (PM) concentrations and been a key location for PM health effects research. In addition to providing a much-needed current assessment of PM2.5 in Steubenville, which had been studied previously during the late 1970s and 1980s as part of the Harvard Six Cities Study, SCAMP helped to fulfill a number of PM2.5 research needs that remained after the U.S. Environmental Protection Agency (EPA) promulgated a new National Ambient Air Quality Standard (NAAQS) for PM2.5 in 1997. These included the need for better estimates of the relationship between ambient concentrations of PM2.5 and its components and actual human exposures to these species, the need to characterize the potential for confounding by gaseous pollutants in PM2.5 epidemiology studies, the need for better characterization of individual chemical components of PM2.5, and the need for data to develop State Implementation Plans (SIPs) in response to the PM2.5 NAAQS.
NTIS
Air Quality; Environmental Monitoring; Exposure; Health; Public Health

20080034592 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
AQS Data Dictionary. Version 2.21
May 2006; 366 pp.; In English
Report No.(s): PB2008-101677; No Copyright; Avail.: CASI: A16, Hardcopy

The Air Quality System (AQS) is EPA's repository of ambient air quality data. AQS stores data from over 10,000 monitors, 5000 of which are currently active. As discussed in more detail elsewhere, State, Local and Tribal agencies collect the data and submit it to AQS on a periodic basis.
NTIS
Air Quality; Dictionaries

20080034593 Energy Information Administration, Washington, DC, USA
Voluntary Reporting of Greenhouse Gases 2005. Summary
Dec. 2006; 20 pp.; In English
Report No.(s): PB2008-101862; DOE/EIA-0608(2005/S); No Copyright; Avail.: National Technical Information Service (NTIS)

The Voluntary Reporting of Greenhouse Gases Program, required by Section 1605(b) of the Energy Policy Act of 1992, records the results of voluntary measures to reduce, avoid, or sequester greenhouse gas emissions. For the 2005 reporting year, 221 U.S. companies and other organizations reported to the Energy Information Administration (EIA) that they had undertaken 2,379 projects to reduce or sequester greenhouse gases in 2005. The reported greenhouse gas emission reductions for the projects included 294 million metric tons carbon dioxide equivalent (million MTCO2e) of direct reductions, 67 million MTCO2e of indirect reductions, 8 million MTCO2e of reductions from carbon sequestration, and 13 million MTCO2e of unspecified reductions. Total U.S. greenhouse gas emissions in 2005 are estimated at 7,147.2 million MTCO2e.
NTIS
Energy Policy; Greenhouse Effect; Tables (Data)

20080034595 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
AQS Data Coding Manual. Version 2.21
May 2007; 337 pp.; In English
Report No.(s): PB2008-101676; No Copyright; Avail.: CASI: A15, Hardcopy

The Air Quality System (AQS) is EPA's repository of ambient air quality data. AQS stores data from over 10,000

monitors, 5000 of which are currently active. As discussed in more detail elsewhere, State, Local and Tribal agencies collect the data and submit it to AQS on a periodic basis.
NTIS
Air Quality; Coding

20080034609 McMinnville Electric System, McMinnville, TN, USA
Agricultural Bio-Fueled Generation of Electrictiy and Development of Durable and Efficient NOx Reduction. Report for the Period of February 1, 2004 through May 1, 2007
Apr. 30, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-FG36-04GO14250
Report No.(s): DE2007-912821; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project was to define the scope and cost of a technology research and development program that will demonstrate the feasibility of using an off-the-shelf, unmodified, large bore diesel powered generator in a grid-connected application, utilizing various blends of BioDiesel as fuel. Furthermore, the objective of project was to develop an emissions control device that uses a catalytic process and BioDiesel (without the presence of Ammonia or Urea)to reduce NOx and other pollutants present in a reciprocating engine exhaust stream with the goal of redefining the highest emission reduction efficiencies possible for a diesel reciprocating generator. Process: Caterpillar Power Generation adapted an off-the-shelf Diesel Generator to run on BioDiesel and various Petroleum Diesel/BioDiesel blends. EmeraChem developed and installed an exhaust gas cleanup system to reduce NOx, SOx, volatile organics, and particulates. The system design and function was optimized for emissions reduction with results in the 90-95% range.
NTIS
Agriculture; Air Pollution; Biomass; Control Equipment; Durability; Fuels; Nitrogen Oxides; Pollution Control

20080034671 Larkin, Hoffman, Daly and Lindgren Ltd., Bloomington, MN, USA
Circumferential Slot Virtual Impactor for Concentrating Aerosols
Haglund, J. S., Inventor; McFarland, A. R., Inventor; 22 Nov 04; 23 pp.; In English
Contract(s)/Grant(s): DAAH04-96-C-0086; 015062000
Patent Info.: Filed Filed 22 Nov 04; US-Patent-Appl-SN-10-995 745
Report No.(s): PB2008-101242; No Copyright; Avail.: CASI: A03, Hardcopy

A circumferential slot virtual impactor includes a disk-shaped housing with an endless circumferential slot for receiving aerosols. The slot forms an acceleration nozzle, and a receiver nozzle spaced apart radially inwardly from the acceleration nozzle exit. In an annular gap between the two nozzles, negative pressure is selectively applied to draw a major flow of the aerosol axially away from the nozzles, while a minor flow of the aerosol is drawn radially inward and enters the receiver nozzle. A portion of the larger particles leaves the major flow and merges with the minor flow due to particle momentum, thus increasing the large-particle concentration of the minor flow. The acceleration nozzle incorporates convex curvature along its opposed interior surfaces, for a smoother aerosol flow and reduced large-particle deposition.
NTIS
Aerosols; Impactors; Patent Applications; Slots

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*.

20080032752 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Dependence of Ionospheric D-Region Properties on Solar Activity Cycle
Marques, Alessandra Abe Pacini Schmidt; January 2008; 121 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15173-TDI/1290; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

The goal of this work is to provide new clues for a better understanding of the quiescent ionosphere during different solar activity conditions. For that we study the lower ionospheric response to external perturbations, as solar X-rays emitted during flares. We use solar X-ray fluxes provided by GOES satellites, and ionospheric SPA (Sudden Phase Anomalies) observed in VLF (Very Low Frequency) phase signals received at Atibaia and Inubo stations during 1990-1992 (solar maximum) and

1994-1997 (solar minimum). We show that the lower ionosphere is more sensitive to the solar events during periods of minimum of solar activity cycle that corresponded to a higher ionospheric reference height. A careful study of the spectral distribution of the solar X-ray flare allowed us to identify the photon energy band responsible for the ionospheric effects, and to find a relation between the X-ray fluence and the size of the subsequent ionospheric response. Moreover we show that only during solar flares the flux of these photons is able to modify the electrical properties of the low D-region. Therefore the quiescent solar X-ray fluxes are not important in the formation of the day time lower ionosphere, confirming the role of the solar Lyman- radiation to maintain this region. Our results allow a better understanding of the long-term behavior of the quiescent D region, providing a new framework to study transient ionizing events (produced by photons or particles), and suggest a new genuine way of monitoring the long-term Lyman- variations, using an ionospheric index.
Author
D Region; Solar Activity; Solar Cycles; Atmospheric Electricity; Geoelectricity

20080032920 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Global Positioning System Studies of Equatorial Ionospheric Irregularities
FabianodaSilveira, Rodriques; January 2008; 180 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15222-TDI/1315; Copyright; Avail.: CASI: C01, CD-ROM: A09, Hardcopy

Signals transmitted by the Global Positioning System (GPS) satellites were used to study equatorial ionospheric irregularities over Brazil. GPS (L1=1.575 GHz) scintillation data were used to infer the occurrence of ~400m scale-size irregularities and compared with equatorial Spread F (ESF) observations carried out by several other instruments like VHF coherent backscatter radar, digisonde and airglow photometer. GPS scintillation was also used to infer the characteristics of the intermediate scale-size ionospheric irregularities occurrence over Sao Jose dos Campos (-18 dip latitude) located close to the Equatorial Anomaly crest. Local time and seasonal variations of the irregularities were inferred by using GPS scintillation data. Results agree quite well with the well-known seasonal pattern of ESF in Brazil determined from ionosonde observations. However, the time decay of GPS scintillation irregularities was much shorter due to their smaller scale-sizes. Stronger scintillations were observed during equinoctial months when the ionospheric background density is much higher. Solar cycle effects on GPS scintillation occurrence and magnitude were also determined. Scintillation magnitude and occurrence tend to increase with solar cycle. Latitudinal dependence of GPS scintillation occurrence and magnitude was estimated from several stations distributed over the Brazilian Territory. Dual - frequency GPS receivers were also used to estimate the Total Electron Content (TEC) that accounts contributions from ionosphere and plasmasphere electron densities. TEC measurements at Sao Luis (-1.73 deg. dip latitude) were used to study the ionospheric irregularity effects on the day-to-day variability of the vertical TEC (VTEC) over the magnetic equatorial region. The occurrence of ionospheric irregularities was also estimated from the RMS (Root-Mean- Square Deviation) of VTEC. Finally, latitudinal distributions of VTEC, from about 30 deg. to about +10 deg. dip latitude were estimated from simultaneous VTEC measurements performed at Sao Lu s and Sao Jose dos Campos. VTEC latitudinal distributions were successfully used to study the behavior of the ionosphere during ESF and non-ESF conditions. The Equatorial Anomaly occurrence may partially explain the observed latitudinal variation of scintillation magnitudes since they also depend on the height and thickness of the irregularities layer, besides the background electron density.
Author
Equatorial Regions; Global Positioning System; Ionospheric Disturbances; Irregularities

20080033139 Naval Postgraduate School, Monterey, CA USA
Relationship Between Thermally Forced Surface Wind and Sea Surface Temperature Gradient
Chu, P C; Jan 1989; 16 pp.; In English
Contract(s)/Grant(s): OCE85-15400
Report No.(s): AD-A480215; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480215

An important part of the influence of the oceans on the atmosphere is through direct radiation, sensible heat flux, and release of latent heat of evaporation, whereby all of these processes are directly related to the surface temperature of the oceans. A main effect of the atmosphere on the oceans is through momentum exchange at the air-ocean interface, and this process is directly related to the surface wind stress. The sea surface temperature (SST) and the surface wind stress are the two important components in the air-ocean system. If SST is given, a thermally forced boundary layer atmospheric waves and ocean currents can be computed. The relationship between SST and surface wind is a coupling of the atmosphere and the oceans. It changes a one-way effect (ocean mechanically driven by atmosphere, or atmosphere thermally forced by oceans)

into two-way air-sea interactions. Through this coupling the SST distribution, being an output from an ocean model, leads to the thermally forced surface winds, which feeds back into the ocean model as an additional forcing. Based on Kuo's planetary boundary layer model, a linear algebraic equation is established to link the SST gradient with the thermally forced surface wind. The surface wind blows across the isotherms from cold to warm region with some deflection angle x to the right (left) in the Northern (Southern) Hemisphere. Results from this study show that the atmospheric stratifications reduces both the speed and the deflection angle of the thermally forced wind, however, the Cororiolis effect increases the wind speed in stable atmosphere (RI > 10(-1) and increases the deflection angle.
DTIC
Atmospheres; Atmospheric Temperature; Ground Wind; Ocean Models; Planetary Atmospheres; Sea Surface Temperature; Shear Stress; Temperature Gradients; Wind (Meteorology); Wind Shear

20080033251 Scripps Institution of Oceanography, La Jolla, CA USA
Passive Imaging System for Measuring Atmospheric Scattering and CFLOS
Shield, J E; May 1, 2008; 4 pp.; In English
Contract(s)/Grant(s): N00014-07-1-1060
Report No.(s): AD-A480483; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480483
This quarterly report describes the work done for the 'Passive Imaging System for Measuring Atmospheric Scattering and CFLOS', under ONR Contract N00014-07-1-1060, between 1 February 2008 and 30 April 2008.
DTIC
Atmospheric Scattering; Imaging Techniques

20080033289 Naval Postgraduate School, Monterey, CA USA
Wind-Driven South China Sea Deep Basin Warm-Core/Cool-Core Eddies
Chu, Peter C; Chen, Yuchun; Lu, Shihua; Jan 1998; 15 pp.; In English
Report No.(s): AD-A480598; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480598
The formation of the South China Sea (SCS) deep basin warm-core and cool-core eddies was studied numerically using the Princeton Ocean Model (POM) with 20 km horizontal resolution and 23 sigma levels conforming to a realistic bottom topography. Numerical integration was divided into pre-experimental and experimental stages. During the preexperimental stage, we integrated the POM model for three years from zero velocity and April temperature and salinity climatological fields with climatological monthly mean wind stresses, restoring type surface salt and heat fluxes, and observational oceanic inflow/outflow at the open boundaries. During the experimental stage, we integrated the POM model for another 16 months under three different conditions: one control and two sensitivity runs (no-wind and no lateral transport). We take the fields of the last 12 months for analysis. The simulation under control run agrees well with earlier observational studies on the South China Sea surface thermal variabilities. In addition, the sensitivity study further confirms that the wind effect is the key factor for generation of the SCS deep basin warm/cool eddy and that the lateral boundary forcing is the major factor for the formation of the strong western boundary currents, especially along the southeast Chinese coast during both summer and winter monsoon seasons.
DTIC
China; Mathematical Models; Ocean Models; Seas; Vortices

20080033321 Arizona State Univ., Tempe, AZ USA
Characterization and Prediction of Clear Air and Optical Stratospheric Turbulence for DoD High Altitude Platforms
Mahalov, Alex; Nicolaenko, Basi; Mar 21, 2008; 52 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-05-1-0047
Report No.(s): AD-A480660; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480660
Stratospheric Clear Air Turbulence (CAT) is a major challenge to the safety, controllability and flight path optimization of the Global Hawk, Predator and other Unmanned Aerial Vehicles (UAVs) and Platforms. Optical Turbulence (OT) layers impact on the polarization and focusing of laser beams in communication systems and the Airborne Laser (ABL). The completed fundamental research project investigated the microscale physics of the upper troposphere/lower stratosphere (UTLS), closely correlating field measurements, high resolution numerical simulations and nonlinear mathematics to explicitly

resolve multiscale turbulent dynamics of polarized inertia-gravity waves in the UTLS region. High performance massively parallel codes for the fully compressible, nonhydrostatic 3D Navier-Stokes equations and advanced data analysis tools for atmospheric characterization were developed and validated. High resolution coupled mesoscale/microscale simulations were carried out to characterize patchy, nonhomogeneous, shear-stratified UTLS turbulence under representative local atmospheric conditions (jetstream and topography).The embedded microscale nests and adaptive vertical gridding near the tropopause fully resolved laminated turbulent structures, with localized shear gradients of vertical velocity and potential temperature in the UTLS region.
DTIC
Clear Air Turbulence; High Altitude; Optical Properties; Shear Flow; Stratosphere; Turbulence

20080033439 Environmental Security Technology Certification Program, Arlington, VA USA
High Resolution Seismic Reflection to Characterize and Plan Remediation at Hazardous Waste Sites
Oct 1999; 40 pp.; In English
Report No.(s): AD-A480774; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This report presents cost and performance data for the three-dimensional (3-D) seismic reflection survey technique used to generate a high-resolution, 3-D imaging of subsurface geologic, subsurface hydro-geologic, and subsurface dense non-aqueous phase liquid (DNAPL) contaminant source areas at four selected Department of Defense (DoD) sites. This project was sponsored by the Environmental Security Technology Certification Program (ESTCP) and managed by the Naval Facilities Engineering Service Center (NFESC) Port Huneme, CA. NFESC contracted with Battelle Memorial Institute (Contract No. N47408-95-D-0730) to perform the project work. The four sites selected were Letterkenny Army Depot near Chambersburg, PA; Alameda Naval Air Station, Alameda, CA; Tinker Air Force Base, Oklahoma City, OK; and Allegany Ballistics Laboratory, Mineral County, WV. At Allegany Ballistics Laboratory, the seismic survey and an extensive sampling effort were funded and conducted outside of this project. Furthermore, at Allegany Ballistics Laboratory, only geologic predictions, and not DNAPL targets, were investigated. The objective of the project was to verify that the 3-D seismic reflection survey is a viable technique for rapidly and effectively performing DNAPL source delineation and high-resolution site characterization. This objective would be met if 90% of the predictions for DNAPL contamination generated from the 3-D seismic survey results were verified to be correct, based on analysis of groundwater samples taken from within the surveyed regions. As a secondary objective, the surveys were also used to demonstrate high-resolution site characterization, by using the seismic output to interpret the depth to bedrock and the depth to fracture zones at several of the sites.
DTIC
Hazardous Wastes; High Resolution

20080033466 Environmental Security Technology Certification Program, Arlington, VA USA
Natural Attentuation of Explosives in Groundwater
Jun 1999; 37 pp.; In English
Report No.(s): AD-A480854; CU-9518; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Monitored natural attenuation (MNA) is a remedial alternative for explosives contaminated groundwater at sites where a decline in contaminant mass can be demonstrated to occur at a rate sufficient to ensure the protection of potential receptors. MNA is not a no action alternative, but requires careful characterization of the site hydrogeology and contaminant distribution, long-term monitoring of groundwater, and groundwater modeling to conceptualize the contaminant plume and to predict future migration and attenuation. MNA in the context of the demonstration described here does not include intervention to promote natural processes.
DTIC
Attenuation; Explosives; Ground Water

20080033559 Army Research Lab., White Sands Missile Range, NM USA
Acoustic and Seismic Sensor Placement (ASSP) Application Programming Interface (API) Version 1.0
Marlin, David; Thomas, Shane; Apr 2008; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480688; ARL-TR-4432; No Copyright; Avail.: Defense Technical Information Center (DTIC)
In this report, an Acoustic and Seismic Sensor Placement (ASSP) application programming interface (API) for acoustic sensor placement is described. The API is implemented in both C++ and Java, with functionality for the later provided through the former via the Java Native Interface (JNI). This API is based on the Sensor Performance for Battlefield Environments (SPEBE) API, but the classes are not extensions of the SPEBE API. Instead, they include SPEBE objects as encapsulated data,

accessible only through the methods. This serves the dual purpose of allowing a more natural interface dedicated to sensor placement, while at the same time protecting the user from inadvertent misuse of the more general SPEBE API. The ASSP interface includes classes to define the environment, including atmospheric, elevation, and ground characterization, define sensor locations and characteristics, compute the detection probability of these sensors for specified source type, and manage the resulting data as both a regularly-spaced grid and as a set of detection-probability contours.
DTIC
Acoustics; Application Programming Interface; Computer Programming; Signal Detectors; Sound Detecting and Ranging

20080033612 Boston Coll., Chestnut Hill, MA USA
Modeling the Effects of Atmospheric Propagation for Spectral Libraries of Natural Backgrounds
Glennon, Mary A; Anderson, Gail; Manolakis, Dimitris; Lockwood, Ronald; Grigsby, Peggy; Jacobson, John; Cipar, John; Cooley, Thomas; Oct 2007; 8 pp.; In English
Contract(s)/Grant(s): FA8718-05-C-0084; Proj-1010
Report No.(s): AD-A480868; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The statistics of natural backgrounds extracted from an Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) hyperspectral datacube collected over Fort AP Hill, VA, were used to demonstrate the effects of the two atmospheric components of a statistical end-to-end performance prediction model. New capabilities in MODTRAN(tm)5 were used to generate coefficients for linear transformations used in the atmospheric transmission and compensation components of a typical end-to-end model. Model radiance statistics, calculated using reflectance data, is found to be similar to the original AVIRIS radiance data. Moreover, if identical atmospheric conditions are applied in the atmospheric transmission and in the atmospheric compensation model components and the effects of sensor noise are disregarded, the resulting reflectance statistics are identical to the original reflectance statistics.
DTIC
Airborne Equipment; Atmospheric Models; Atmospheric Physics; Imagery; Imaging Spectrometers; Infrared Imagery; Infrared Spectrometers; Libraries; Spectra

20080034468 California Inst. of Tech., Pasadena, CA, USA
Global Impacts of Gas-Phase Chemistry-Aerosol Interactions on Direct Radiative Forcing by Anthropogenic Aerosols and Ozone
Liao, Hong; Seinfeld, John H.; Journal of Geophysical Research; January 2005; Volume 110; 2 pp.; In English
Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2005JD005907

We present here a first global modeling study on the influence of gas-phase chemistry/aerosol interactions on estimates of anthropogenic forcing by tropospheric O3 and aerosols. Concentrations of gas-phase species and sulfate, nitrate, ammonium, black carbon, primary organic carbon, secondary organic carbon, sea salt, and mineral dust aerosols in the preindustrial, present-day, and year 2100 (IPCC SRES A2) atmospheres are simulated online in the Goddard Institute for Space Studies general circulation model II' (GISS GCM II'). With fully coupled chemistry and aerosols, the preindustrial, presentday, and year 2100 global burdens of tropospheric ozone are predicted to be 190, 319, and 519 Tg, respectively. The burdens of sulfate, nitrate, black carbon, and organic carbon are predicted respectively to be 0.32. 0.18, 0.01, 0.33 Tg in preindustrial time, 1.40, 0.48, 0.23, 1.60 Tg in presentday, and 1.37, 1.97, 0.54, 3.31 Tg in year 2100. Anthropogenic O3 is predicted to have a globally and annually averaged present-day forcing of +0.22 W m(sup -2) and year 2100 forcing of +0.57 W m(sup -2) at the top of the atmosphere (TOA). Net anthropogenic TOA forcing by internally mixed sulfate, nitrate, organic carbon, and black carbon aerosols is estimated to be virtually zero in the present-day and +0.34 W m(sup -2) in year 2100, whereas it is predicted to be -0.39 W m(sup -2) in present-day and -0.61 W m(sup -2) in year 2100 if the aerosols are externally mixed. Heterogeneous reactions are shown to be important in affecting anthropogenic forcing. When reactions of N2O5, NO3, NO2, and HO2 on aerosols are accounted for, TOA anthropogenic O3 forcing is less by 20-45% in present-day and by 20-32% in year 2100 at mid to high latitudes in the Northern Hemisphere, as compared with values predicted in the absence of heterogeneous gas aerosol reactions. Mineral dust uptake of HNO3 and O3 is shown to have practically no influence on anthropogenic O3 forcing. Heterogeneous reactions of N2Os, NO3, NO2, and HO2 are predicted to have noticeable impacts on anthropogenic aerosol forcing over industrialized areas, leading to 0-2 W m(sup -2) more anthropogenic aerosol cooling in present-day and 2-8 W m(sup -2) more cooling in year 2100 in these areas as compared with forcings calculated in the absence of heterogeneous reactions. Sea salt uptake of SO2 reduces the magnitude of TOA aerosol cooling by 0.5-1 W m(sup -2) over the oceans around 60 N in the present-day and year 2100 scenarios. Near dust sources, mineral dust uptake of SO2

and HNO3 leads to less anthropogenic aerosol cooling by 0.5-1 W m(sup -2) in the present day and 1-2 W m(sup -2) in year 2100.
Derived from text
Aerosols; Ozone; Atmospheric Chemistry; Vapor Phases; Atmospheric Models

20080034552 Brookhaven National Lab., Upton, NY USA; Nuclear Regulatory Commission, Washington, DC, USA
Finite Element Analysis of JNES/NUPEC Seismic Shear WAll Cyclic and Shaking Table Test Data
Xu, J.; Nie, J.; Hofmayer, C.; Ali, S.; Apr. 2007; 13 pp.; In English
Report No.(s): DE2007-914497; BNL/NUREG-77880-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper describes a finite element analysis to predict the JNES/NUPEC cyclic and shaking table RC shear wall test data, as part of a collaborative agreement between the U.S. NRC and JNES to study seismic issues important to the safe operation of commercial nuclear power plant (NPP) structures, systems and components (SSC). The analyses described in this paper were performed using ANACAP reinforced concrete models. The paper describes the ANACAP analysis models and discusses the analysis comparisons with the test data. The ANACAP capability for modeling nonlinear cyclic characteristics of reinforced concrete shear wall structures was confirmed by the close comparisons between the ANACAP analysis results and the JNES/NUPEC cyclic test data. Reasonable agreement between the analysis results and the test data was demonstrated for the hysteresis loops and the shear force orbits, in terms of both the overall shape and the cycle-to-cycle comparisons. The ANACAP simulation analysis of the JNES/NUPEC shaking table test was also performed, which demonstrated that the ANACAP dynamic analysis with concrete material model is able to capture the progressive degrading behavior of the shear wall as indicated from the test data. The ANACAP analysis also predicted the incipient failure of the shear wall, reasonably close to the actual failure declared for the test specimen.
NTIS
Finite Element Method; Nuclear Power Plants; Shaking; Tables (Data); Walls

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080032726 National Center for Atmospheric Research, Boulder, CO, USA
Observed Enhancement of Reflectivity and Electric Field in Long-Lived Florida Anvils
Dye, James E.; Willett, John C.; Monthly Weather Review; October 2007; Volume 135, Issue 10, pp. 3362-3380; In English
Contract(s)/Grant(s): NNK05EE14G; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1175/MWR3484.1

A study of two long-lived Florida anvils showed that reflectivity greater than 20 dBZ increased in area, thickness and sometimes magnitude at mid-level well downstream of the convective cores. In these same regions electric fields maintained strengths greater than 10 kV m(sup -1) for many tens of minutes and became quite uniform over tens of kilometers. Millimetric aggregates persisted at 9 to 10 km for extended times and distances. Aggregation of ice particles enhanced by strong electric fields might have contributed to reflectivity growth in the early anvil, but is unlikely to explain observations further out in the anvil. The enhanced reflectivity and existence of small, medium and large ice particles far out into the anvil suggest that an updraft was acting, perhaps in weak convective cells formed by instability generated from the evaporation and melting of falling ice particles. We conclude that charge separation must have occurred in these anvils, perhaps at the melting level but also at higher altitudes, in order to maintain fields greater than 10 kV m(sup -1) at 9 to 10 km for extended periods of time over large distances. We speculate that charge separation occurred as a result of ice-ice particle collisions (without supercooled water being present) via either a noninductive or perhaps even an inductive mechanism, given the observed broad ice particle spectra, the strong pre-existing electric fields and the many tens of minutes available for particle interactions. The observations, particularly in the early anvil, show that the charge structure in these anvils was quite complex.
Author
Anvils; Electric Fields; Florida; Reflectance

20080032734 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Aerosol-Water Cycle Interaction: A New Challenge in Monsoon Climate Research

Lau, William K. M.; June 14, 2006; 1 pp.; In English; CIMAS Visting Science Program, 14-18 Jun. 2006, Miami, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

Long recognized as a major environmental hazard, aerosol is now known to have strong impacts on both regional and global climate. It has been estimated that aerosol may reduce by up to 10% of the seasonal mean solar radiation reaching the earth surface, producing a global cooling effect that opposes global warming (Climate Change 2001). This means that the potential perils that humans have committed to global warming may be far greater than what we can detect at the present. As a key component of the Earth climate system, the water cycle is profoundly affected by the presence of aerosols in the atmosphere. Through the so-called 'direct effect', aerosol scatters and/or absorbs solar radiation, thus cooling the earth surface and changing the horizontal and vertical radiational heating contrast in the atmosphere. The heating contrast drives anomalous atmospheric circulation, resulting in changes in convection, clouds, and rainfall. Another way aerosol can affect the water cycle is through the so-called 'indirect effects', whereby aerosol increases the number of cloud condensation nuclei, prolongs life time of clouds, and inhibits the growth of cloud drops to raindrops. This leads to more clouds, and increased reflection of solar radiation, and further cooling at the earth surface. In monsoon regions, the response of the water cycle to aerosol forcing is especially complex, not only because of presence of diverse mix of aerosol species with vastly different radiative properties, but also because the monsoon is strongly influenced by ocean and land surface processes, land use, land change, as well as regional and global greenhouse warming effects. Thus, sorting out the impacts of aerosol forcing, and interaction with the monsoon water cycle is a very challenging problem. In this talk, I will offer some insights into how aerosols may impact the Asian monsoon based on preliminary results from satellite observations and climate model experiments. Specifically, I will discuss the 'elevated heat pump' hypothesis, involving atmospheric heating by absorbing aerosols (dust and black carbon) over the southern slopes of the Himalayas, and feedback with the deep convection, in modifying monsoon water cycle over South and East Asia. The role of aerosol forcing relative to those due to sea surface temperature and land surface processes, as well as observation requirements to verify such a hypothesis will also be discussed.

Author

Aerosols; Climatology; Monsoons; Hydrological Cycle

20080032744 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Inclusion of the Momentum Perturbation in the Kain-Fritsch Cumulus Parameterization Scheme and Impacts on a Convective Rain Case

BastosdeVarvalho, Paulo Roberto; January 2008; 109 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-15145-TDI/1277; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

The objective of this work is to insert the vertical transport of momentum through the mass flux in the Kain-Fritsch convective parameterization scheme. The momentum fluxes were inserted in the KF scheme in a similar way to the existing heat fluxes. Experiments were accomplished in the two domains, one experiment with cloud updraft (FM1) and one experiment including the cloud updraft and downdraft (FM2). In this work two domains were used. The domain 1, 2000 x 2000 km, was centered at 24.5 deg S and 51.0 deg W, with 15 km horizontal resolution and 38 levels, Eta15L38. The domain 2, 200 x 200 km was positioned inside of the domain 1 and centered at Foz do Iguacu (25.6 deg S/54.6 deg W), with 5 km horizontal resolution and 60 levels, Eta05L60. A case study was carried out for a cold front case. The control experiment, without momentum (NoFM) transport, and the experiments FM1 and FM2 were accomplished for 48 h of simulation. The adjustments of the new scheme were presented for a cloud column. The new scheme accelerates, in general, the winds in altitude and near to the surface and it reduces the intensity of the maximum winds. The effects of the experiments FM1 and FM2 could be identified in the areas of convective activities generated in the simulations, which increased of the humidity convergence in 850 hPa and mass divergence in 300 hPa. These conditions were associated with the intensification of the cyclonic vorticity in 850 hPa and production of anti-cyclonic vorticity in 300 hPa. The values of the thermodynamic and dynamic instabilities indexes calculated after 24 h of simulations, in general, they were endorsed by the observations of the Foz do Iguacu sounding, which showed an improvement with the modifications in the KF scheme.

Author

Vertical Air Currents; Cumulus Clouds; Parameterization; Momentum; Perturbation; Convection; Rain; Wind (Meteorology); Atmospheric Pressure; Atmospheric Circulation

20080032745 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Assessing Climate Variability of the Brazilian Reef Ecosystems and Its Relation with Coral Biodiversity

Soppa, Mariana Altenburg; January 2008; 212 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-15147-TDI/1279; Copyright; Avail.: CASI: C01, CD-ROM: A10, Hardcopy

This work presents a study of climate variability of the Brazilian reef ecosystems and its relation with coral biodiversity. Nine regions of coral reef occurrence in Brazil were investigated using satellite-derived and reanalysis data. Time series of space-averaged, monthly climatological variables were produced for the period between 1985 and 2004. The considered variables were: sea surface temperature (SST), precipitation, outgoing long wave radiation (OLR) and surface wind. The climate variability of the study areas was firstly characterized from climatological data. This characterization showed the influence of both the Intertropical Convergence Zone and the South Atlantic Subtropical High-Pressure System on the reef environments. The interannual variability was investigated using normalized anomalies and applying the statistical techniques of autocorrelation, Fast Fourier Transform (FFT) and Wavelet Transform (WT). Both the normalized anomalies time series and the local wavelet spectra presented a tendency for the extreme anomalies to occur near or during El Nino and La Nina events. Crosscorrelation analysis resulted on correlations between the anomalies of the studied variables and the El Ni o - Southern Oscillation (ENSO) indexes. The correlations between ENSO and SST anomalies were found to be restricted only to the southern areas of the Brazilian northeast region while for the other variables the correlation tends to be higher at the northern areas. In order to compare the climate variability of the study areas, the Assimetric Fragmentation Operator (FA) was applied on the available time series. The results showed that the southern areas present a higher variability indicated by a higher value of FA in comparison to the northern areas. This difference between the southern and northern areas was confirmed by the analysis of multidimensional scaling, similarity and principal components. The results suggest that the southern and northern areas of the Brazilian northeast region present distinct patterns of climate variability. The biodiversity of the coral species was determined from the estimation of the average taxonomic distinctness, variance of the average taxonomic distinctness and the species number. The southern areas presented a lower average taxonomic distinctness and a larger species number than the northern areas. In order to answer the main question about the relationship between the climate variability and coral biodiversity, the Spearman correlation analysis was also carried out. The results suggest that there is a larger coral taxonomic distinctness at areas where FA variance is larger. A larger amount of coral species also tends to occur in areas presenting higher climate variability. The results of this study offer an unprecedented characterization of the climate variability in areas of coral reefs in Brazil.

Author

Biological Diversity; Brazil; Climatology; Coral Reefs; Ecosystems; Variability

20080032746 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Simulation of the Last Glacial Maximum Climate: A Experment with a Statistical-Dynamical Model

Shimizu, Marilia Harumi; January 2008; 92 pp.; In English; Original contains color and black and white illustrations

Report No.(s): INPE-15149-TDI/1281; Copyright; Avail.: CASI: C01, CD-ROM: A05, Hardcopy

A statistical - dynamical zonally averaged model of primitive equations was used to evaluate the capacity of the model in simulating the zonally averaged climate of the Last Glacial Maximum (LGM), studying the relative importance of the climate forcing in the LGM climate and to diagnosis the monsoon circulation in the LGM. The simulation of the LGM resulted in a global annual averaged cooling minor of that found for more complex models, whereas the reduction of the precipitation and evaporation had been consistent with results of previous studies. The enhancement of the westerlies and easterlies and of the Hadley cell was observed, as resulted of the increase of the meridional gradient of temperature in 500 hPa. The results of the simulation had indicated weakness of the monsoon activity during the boreal summer, in agreement with previous works. The more significant climate forcing had been related to changes in the ice sheets and SST, having opposed previous works that had indicated the CO2 reduction as main cause for the climatic changes of the LGM. The variation of the orbital parameters had not contributed significantly for the climate of the LGM. In the tropics, the main forcing was the variation of the TSM, whereas in the extratropics the ice sheets had the contribution most significant. The model coherently reproduced the climate and the monsoon circulation of the LGM with regard to results of more complex models.

Author

Mathematical Models; Primitive Equations; Simulation; Statistical Analysis; Dynamic Models; Climatology; Glaciers

20080032756 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Study of Mesospheric Fronts in the Equatorial Region

FechinedeAlencarFilho, Joaquim; January 2008; 316 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15179-TDI/1295; Copyright; Avail.: CASI: C01, CD-ROM: A14, Hardcopy

An extensive study on mesospheric fronts was carried out by means of mesospheric airglow image observation at at Sao Joao do Cariri, PB (7,4 deg S; 36,5 deg W) from July 2004 to December 2005. All sky airglow images, meteor radar wind and TIMED/SABER satellite temperature data were used in order to investigate physical scenario of the mesospheric front. Three different types of fronts were identified: bores with wave train, wall, and solitary waves. In addition to these, some evidences were also observed such as, front generation and/or dissipation, front destruction by background wind, double fronts and various fronts in a same night. Main subject of the present study was to investigate physical characterizations of duct where the mesospheric front propagates. The most important result in the present work was that in most of the cases Doppler ducts generated by vertical wind shear and surround by evanescent regions were responsible for supporting the mesospheric front. Further to this, it was also revealed that a strong semi-diurnal tidal oscillation which generates wind shear around the mesopause region might have an important role in formation of the ducting condition. Thermal structures in the mesopause region over Sao Joao do Cariri was also investigated in order to study the mesospheric fronts. Double mesopause with temperature inversion layers were observed during the equinox seasons (February to May and August to October), what was not predicted by CIRA-86 model atmosphere. From the gravity wave vertical propagation conditions (dispersion relation), the role of the wind (vertical gradient) and the temperature inversion were investigated in order to find which is more important. It was concluded that the mesospheric inversion layers alone could not explain the ducting condition.

Author

Mesosphere; Fronts (Meteorology); Equatorial Regions

20080032757 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Fronts and Frontogenesis during Summer: Geometrical and Dynamical Aspects and the Influence over Rainfall on the South American Subtropics

Arraut, Josefina Moraes; January 2008; 179 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15178/TDI/1294; Copyright; Avail.: CASI: C01, CD-ROM: A09, Hardcopy

Three different aspects related to summer precipitation over subtropical South America (SA) and the continental pattern of humidity transport in that season are studied. Firstly, a climatological point of view is adopted and it is shown that most of the humidity that enters SA through its northern coast, up to Para, comes from the tropical Northern Atlantic. It is also shown that most of the humidity that leaves that part of the ocean heads towards inland SA, crossing over this coast. In the subtropics and extra-tropics, the spatial distributions of the climatological daily standard deviation of the meridional humidity transport and of its magnitude are notoriously similar to each other, as well as to that of the climatological rains. This points towards an important contribution from transient disturbances to the rain and humidity transport patterns. In the following part of the work, some new aspects pertaining the interaction between the North Western Argentinean Low (NAL) and transient troughs south of it are brought to light. The combination of these two elements brings about the formation of a geometrical structure in the pressure field. The influence of this structure over the wind field is documented and explained. One of the important elements of this structure is the saddle that necessarily occurs between the NAL and the transient trough. This saddle is a preferred spot for convergence and deformation of the wind field, both warm and cold advections, frontogenesis in equivalent potential temperature and rain. In addition to this saddle, the shape and geographical location of its separatrices reveal the essential aspects of the referred structure. Both extend from the tropics to the midlatitudes, intersecting themselves on the saddle point, which is located in the subtropics. The flow over the orbits that make up these separatrices reflects the flow of the wind, which therefore approaches the saddle both from the tropics and from the midlatitudes. Two of the orbits which locally make up the separatrices merge away from the saddle forming a self connection of the saddle which contains the NAL in its interior. This allows for the formation of an extension of the transient trough, which wraps over the self connection, and is here called the ‘Low Pressure Tongue East of the Andes’ (LPTEA). The LPTEA geostrophically forces the development of a moisture corridor all the way from Amazonia to the midlatitudes, allowing the water vapour which has flowed over the forest to fuel the transient disturbance. It is illustrated how, in the absence of a saddle self connection, the geometry of the wind field causes the transient disturbance to be fueled by humidity coming directly from the South Atlantic. This is probably the typical winter situation. It is found that the geometrical structure described above is very common during summer, but does not always lead to frontogenesis and rain formation. Organized events, lasting a few days, in which frontogenesis and rain formation are strongly influenced by this structure are identified. Their occurrence is associated with

the incursion of transient disturbances coming from the Pacific. These events are separated in two categories, which can be distinguished by the displacement of the frontogenesis: towards the northeast (NE events) and towards the east (LE events). Both are studied through composites and have their basic structure described in conceptual models. The structural differences between the two categories are caused by the behaviour of the transient disturbance in the high levels. In the last part of the work, the link between the Low Pressure Tongue and its saddle and frontogenesis over the subtropics of SA is statistically evaluated. It is shown that the saddle favours frontogenesis. Furthermore, the presence of the saddle becomes more statistically likely the higher the frontogenesis, approaching 100% for very high values. A statistical link is also shown to exist between t occurrence of the saddle over northern central Argentina and rain slightly to the northeast. The rain attains maximum intensity one day after the detection of the saddle. A similar link is found between intense frontogenesis and rain over the same regions. Author

Precipitation (Meteorology); Rain; Summer; South America; Tropical Regions; Fronts (Meteorology); Climatology; Humidity; Atmospheric Pressure

20080032761 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Sensitivity Tests and Evaluation of ETA Model Near-Surface Wind Forecasts for Nordeste Region

deArrudaLyra, Andre; January 2008; 106 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15201-TDI/1301; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

The main objective of this work is to carry out sensitivity tests and evaluate the Eta Model near-surface wind forecasts. Eta model forecasts were compared against observational sites located in Northeast of Brazil. The mean diurnal cycle, the root mean square errors, bias and correlation were calculated. The experiments compared the runs with 5 and 10 km of horizontal resolution, 38 e 50 levels of vertical resolution, change of momentum and heat relation, roughness length and stability function of Paulson in the surface boundary layer parameterization. Sensitivity tests were also carry out for boundary layer height estimation and change land cover type. Model outputs were compared against five stations: Macau, Canto do Amaro and Minhoto located in Rio Grande do Norte, Pacatuba in Sergipe and Alc ntara in Maranh o. Comparisons among the resolution runs showed the advantage of increasing the horizontal and vertical resolution to the quality of near-surface wind forecast. The simulations changing Zilitinkevich parameter indicated that increase of this parameter value resulted in improvement of the surface temperature in Macau area. The parameter which controls the boundary layer height showed opposite impacts between ocean and continent. In general, the Eta modeled 10 and 50-m winds showed some sensitivity to the tested parameters, although marginal.

Author

Wind (Meteorology); Weather Forecasting; Sensitivity Analysis; Atmospheric Models

20080032772 NASA Kennedy Space Center, Cocoa Beach, FL, USA

Electric Fields, Cloud Microphysics, and Reflectivity in Anvils of Florida Thunderstorms

Dye, J. E.; Bateman, M. G.; Christian, H. J.; Defer, E.; Grainger, C. A.; Hall, W. D.; Krider, E. P.; Lewis, S. A.; Mach, D. M.; Merceret, F. J.; Willett, J. C.; Willis, P. T.; Journal of Geophysical Research; June 15, 2007; Volume 112; 2 pp.; In English Contract(s)/Grant(s): NNK05EE14G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2006JD007550

A coordinated aircraft - radar project that investigated the electric fields, cloud microphysics and radar reflectivity of thunderstorm anvils near Kennedy Space Center is described. Measurements from two cases illustrate the extensive nature of the microphysics and electric field observations. As the aircraft flew from the edges of anvils into the interior, electric fields very frequently increased abruptly from approximately 1 to more than 10 kV m(exp -1) even though the particle concentration and radar reflectivity increased smoothly. The abrupt increase in field usually occurred when the aircraft entered regions with a reflectivity of 10 to 15 dBZ. It is suggested that the abrupt increase in electric field may be because the charge advection from the storm core did not occur across the entire breadth of the anvil and was not constant in time. Screening layers were not detected near the edges of the anvils. Some long-lived anvils showed subsequent enhancement of electric field and reflectivity and growth of particles, which if localized, might be a factor in explaining the abrupt change of field in some cases. Comparisons of electric field magnitude with particle concentration or reflectivity for a combined data set that included all anvil measurements showed a threshold behavior. When the average reflectivity, such as in a 3-km cube, was less than approximately 5 dBZ, the electric field magnitude was les than kV m(exp -1). Based on these findings, the Volume Averaged Height Integrated Radar Reflectivity (VAHIRR) is now being used by NASA, the Air Force and Federal Aviation

Administration in new Lightning Launch Commit Criteria as a diagnostic for high electric fields in anvils.
Author
Cloud Physics; Electric Fields; Reflectance; Anvil Clouds; Thunderstorms; Aviation Meteorology

20080032795 NASA Marshall Space Flight Center, Huntsville, AL, USA
The NASA Energy and Water Cycle Extreme (NEWSE) Integration Project
House, P. R.; Lapenta, W.; Schiffer, R.; May 27, 2008; 1 pp.; In English; AGU 2008 Joint Assembly, 27-30 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

Skillful predictions of water and energy cycle extremes (flood and drought) are elusive. To better understand the mechanisms responsible for water and energy extremes, and to make decisive progress in predicting these extremes, the collaborative NASA Energy and Water cycle Extremes (NEWSE) Integration Project, is studying these extremes in the U.S. Southern Great Plains (SGP) during 2006-2007, including their relationships with continental and global scale processes, and assessment of their predictability on multiple space and time scales. It is our hypothesis that an integrative analysis of observed extremes which reflects the current understanding of the role of SST and soil moisture variability influences on atmospheric heating and forcing of planetary waves, incorporating recently available global and regional hydro- meteorological datasets (i.e., precipitation, water vapor, clouds, etc.) in conjunction with advances in data assimilation, can lead to new insights into the factors that lead to persistent drought and flooding. We will show initial results of this project, whose goals are to provide an improved definition, attribution and prediction on sub-seasonal to interannual time scales, improved understanding of the mechanisms of decadal drought and its predictability, including the impacts of SST variability and deep soil moisture variability, and improved monitoring/attributions, with transition to applications; a bridging of the gap between hydrological forecasts and stakeholders (utilization of probabilistic forecasts, education, forecast interpretation for different sectors, assessment of uncertainties for different sectors, etc.).
Author
Predictions; Water Vapor; Atmospheric Heating; Periodic Variations; Floods; Global Atmospheric Research Program

20080032800 NASA Marshall Space Flight Center, Huntsville, AL, USA
NASA Contributions to Improve Understanding of Extreme Events in the Global Energy and Water Cycle
Lapenta, William M.; May 27, 2008; 1 pp.; In English; Coordinated Energy and Water Cycle Observation/Global Energy and Water Cycle Experiment (CEOP/GEWES) Extreme Workshop/The International Comm. on Atm. Electric, 27-30 May 2008, Vancouver, BC, Canada; No Copyright; Avail.: Other Sources; Abstract Only

The U.S. Climate Change Science Program (CCSP) has established the water cycle goals of the Nation's climate change program. Accomplishing these goals will require, in part, an accurate accounting of the key reservoirs and fluxes associated with the global water and energy cycle, including their spatial and temporal variability. through integration of all necessary observations and research tools, To this end, in conjunction with NASA's Earth science research strategy, the overarching long-term NASA Energy and Water Cycle Study (NEWS) grand challenge can he summarized as documenting and enabling improved, observationally based, predictions of water and energy cycle consequences of Earth system variability and change. This challenge requires documenting and predicting trends in the rate of the Earth's water and energy cycling that corresponds to climate change and changes in the frequency and intensity of naturally occurring related meteorological and hydrologic events, which may vary as climate may vary in the future. The cycling of water and energy has obvious and significant implications for the health and prosperity of our society. The importance of documenting and predicting water and energy cycle variations and extremes is necessary to accomplish this benefit to society.
Author
Climate Change; Earth Sciences; Variability; Predictions; Water; Cycles; Frequency Shift

20080032807 NASA Marshall Space Flight Center, Huntsville, AL, USA
Improving Air Quality Forecasts with AURA Observations
Newchurch, M. J.; Biazer, A.; Khan, M.; Koshak, W. J.; Nair, U.; Fuller, K.; Wang, L.; Parker, Y.; Williams, R.; Liu, X.; Improving Air Quality Forecasts with AURA Observations, Eos Trans., Jt. Assem. Suppl. Abstract A23A-03; May 27, 2008; Volume 89, No. 23; 1 pp.; In English; 2008 Joint Assembly Conference, 27-30 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

Past studies have identified model initial and boundary conditions as sources of reducible errors in air-quality simulations. In particular, improving the initial condition improves the accuracy of short-term forecasts as it allows for the impact of local emissions to be realized by the model and improving boundary conditions improves long range transport through the model

domain, especially in recirculating anticyclones. During the August 2006 period, we use AURA/OMI ozone measurements along with MODIS and CALIPSO aerosol observations to improve the initial and boundary conditions of ozone and Particulate Matter. Assessment of the model by comparison of the control run and satellite assimilation run to the IONS06 network of ozonesonde observations, which comprise the densest ozone sounding campaign ever conducted in North America, to AURA/TES ozone profile measurements, and to the EPA ground network of ozone and PM measurements will show significant improvement in the CMAQ calculations that use AURA initial and boundary conditions. Further analyses of lightning occurrences from ground and satellite observations and AURA/OMI NO2 column abundances will identify the lightning NOx signal evident in OMI measurements and suggest pathways for incorporating the lightning and NO2 data into the CMAQ simulations.
Author
Air Quality; Boundary Conditions; Nitrogen Oxides; Nitrogen Dioxide; Ozone; Particulates; Aerosols; Errors; Forecasting; MODIS (Radiometry); Lightning

20080032849 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Influence of Aerosols on Monsoon Circulation and Hydroclimate
Lau, William K.M.; April 23, 2007; 1 pp.; In English; Asian Monsoon Year (AMY08) International Workshop, 23 - 25 Apr. 2007, Beijing, China; No Copyright; Avail.: Other Sources; Abstract Only

Long recognized as a major environmental hazard, aerosol is now known to have strong impacts on both regional and global water cycles and climate change. In the Asian monsoon regions, the response of the regional water cycle and climate to aerosol forcing is very complex, not only because of presence of diverse mix of aerosol species with vastly different radiative properties, but also because the monsoon is strongly influenced by ocean and land surface processes, land use, land change, as well as regional and global greenhouse warming effects. Thus, sorting out the impacts of aerosol forcing, and interaction with the monsoon water cycle is a very challenging problem. Up to now, besides the general notion that aerosols may significantly impact monsoon through altering large scale radiative heating gradients, there has been very little information regarding the specific signatures, and mechanisms of aerosol-monsoon water cycle interaction. In this talk, based on preliminary results from observations and climate model experiments, I will offer some insights into how aerosols may impact the Asian monsoon water cycle, in particular the effects of absorbing aerosols (dust and black carbon), and the role of the Tibetan Plateau. The influence of aerosol forcing relative to those due to sea surface temperature and land surface processes, and impact on potential predictability of the monsoon climate system will also be discussed.
Author
Aerosols; Monsoons; Greenhouse Effect; Climate Models; Atmospheric Heating; Global Warming; Dust; Climate Change

20080032854 Congressional Research Service, Washington, DC, USA
National Oceanic and Atmospheric Administration (NOAA): FY2008 Budget and Congressional Appropriations. CRS Report for Congress
Morrissey, W. A.; Jul. 31, 2007; 6 pp.; In English
Report No.(s): PB2008-100455; CRS-RS22614; No Copyright; Avail.: CASI: A02, Hardcopy

The National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce is funded through revised continuing resolution (P.L. 110-5) for FY2007. For FY2008, President Bush requested $3.81 billion in discretionary appropriations for NOAA. The Senate Appropriations Committee has since recommended a total of $4.21 billion for FY2008 in Commerce, Justice, Science, and Related Agencies Appropriations for FY2008 (S. 1745). The House-passed H.R. 3093 includes $3.95 billion for the agency. The Presidents budget prioritizes satellite system launch requirements to ensure that critical meteorological and climate observations and data collection are not interrupted. The Secretary of Commerce announced that for FY2008, $123 million is requested for ocean research and sustainable fisheries management in support of the Presidents 2004 Ocean Action Plan. Ocean advocates argue the amount is insufficient. NOAA has sought to have all of its programs and activities authorized under a single organic act. Congress and the Bush Administration differ on proposed authorities and agency flexibility. For FY2007, $107 million in emergency appropriations was provided for NOAA to assist the agency in recovering from 2005 Hurricane Katrina losses.
NTIS
Appropriations; Budgets; Congressional Reports

20080032874 California Inst. of Tech., Pasadena, CA, USA
Role of Climate Change in Global Predictions of Future Tropospheric Ozone and Aerosols
Liao, Hong; Chen, Wei-Ting; Seinfeld, John H.; Journal of Geophysical Research; 2006; Volume 111; 2 pp.; In English
Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2005JD006852

A unified tropospheric chemistry-aerosol model within the Goddard Institute for Space Studies general circulation model II is applied to simulate an equilibrium CO2-forced climate in the year 2100 to examine the effects of climate change on global distributions of tropospheric ozone and sulfate, nitrate, ammonium, black carbon, primary organic carbon, secondary organic carbon, sea salt, and mineral dust aerosols. The year 2100 CO2 concentration as well as the anthropogenic emissions of ozone precursors and aerosols/aerosol precursors are based on the Intergovernmental Panel on Climate Change Special Report on Emissions Scenarios (SRES) A2. Year 2100 global O3 and aerosol burdens predicted with changes in both climate and emissions are generally 5-20% lower than those simulated with changes in emissions alone; as exceptions, the nitrate burden is 38% lower, and the secondary organic aerosol burden is 17% higher. Although the CO2-driven climate change alone is predicted to reduce the global O3 concentrations over or near populated and biomass burning areas because of slower transport, enhanced biogenic hydrocarbon emissions, decomposition of peroxyacetyl nitrate at higher temperatures, and the increase of O3 production by increased water vapor at high NOx levels. The warmer climate influences aerosol burdens by increasing aerosol wet deposition, altering climate-sensitive emissions, and shifting aerosol thermodynamic equilibrium. Climate change affects the estimates of the year 2100 direct radiative forcing as a result of the climate-induced changes in burdens and different climatological conditions; with full gas-aerosol coupling and accounting for ozone and direct radiative forcings by the O2, sulfate, nitrate, black carbon, and organic carbon are predicted to be +0.93, -0.72, -1.0, +1.26, and -0.56 W m(exp -2), respectively, using present-day climate and year 2100 emissions, while they are predicted to be +0.76, -0.72, 0.74, +0.97, and -0.58 W m(exp -2), respectively, with year 2100 climate and emissions.
Author
Climate Change; Troposphere; Ozone; Aerosols; Atmospheric Chemistry; Atmospheric Models; Atmospheric Physics

20080032975 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Hebrew Univ., Jerusalem, Israel
Comment on 'Weekly Precipitation Cycles? Lack of Evidence from USA Surface Stations'
Bell, Thomas L.; Rosenfeld, Daniel; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

There is a good deal of interest lately in whether or not rainfall varies with the day of the week in response to the weekly variations in human activity. The most likely cause of such changes in the U.S. would be from the weekly variations in pollution levels that are known to occur throughout the country. A paper on this topic will soon be published by the Journal of Geophysical Research entitled, 'Midweek Increase in U.S. Summer Rain and Storm Heights Suggests Air Pollution Invigorates Rainstorms, by T. L. Bell, D. Rosenfeld, K.-M. Kim, J.-M. Yoo, M.-I. Lee, and M. Hahnenberger (referred to here as 'Bell et al.'). A paper by D. M. Schultz and co-authors was recently published in Geophysical Research Letters that claimed to contradict some of the results in Bell et al. The paper can be found here: <http://www.agu.org/journals/gVg10722/ 2007GL10838 9/>. Our Comment points out that Schultz and co-authors ignored the fact that the results from satellite data obtained by Bell et al. were for a later time period than Schultz et al. examined, and that Bell et al. in fact also analyzed rainfall data for the same time period as Schultz et al. and, like them, also failed to find signs of a weekly cycle in rainfall during this time period. The contradictions claimed by Schultz et al. are non-existent. We point out some other problems with the methods and presentation by Schultz et al.
Author
Rainstorms; Air Pollution; Activity (Biology); Geophysics; Storms

20080033093 California Inst. of Tech., Pasadena, CA, USA
Parameterization of Cloud Droplet Formation in Global Climate Models
Nenes, A.; Seinfeld, J.H.; Journal of Geophysical Research; [2003]; Volume 108, No. D14; 1 pp.; In English
Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2002JD002911

An aerosol activation parameterization has been developed based on a generalized representation of aerosol size and composition within the framework of an ascending adiabatic parcel; this allows for parameterizing the activation of chemically complex aerosol with an arbitrary size distribution and mixing state. The new parameterization introduces the concept of'population splitting', in which the cloud condensation nuclei (CCN) that form droplets are treated as two separate populations; those that have a size close to their critical diameter and those that do not.Explicit consideration of kinetic limitations of droplet growth is introduced. Our treatment of the activation process unravels much of its complexity. As a result

of this, a substantial number of conditions of droplet formation can be treated completely free of empirical information or correlations; there are, however, some conditions of droplet activation for which an empirically derived correlation is utilized. Predictions of the parameterization are compared against extensive cloud parcel model simu;lations for a variety of aerosol activation conditions that cover a wide range of chemical variability and CCN concentrations. The parameterization tracks the parcel model simulations closely and robustly. The parameterization presented here is intended to allow for a comprehensive assessment of the aerosol indirect effect in general circulation models.
Author
Clouds (Meteorology); Drops (Liquids); Climate Models; Climatology; Aerosols; Size Distribution; Parameterization; Atmospheric General Circulation Models

20080033147 Naval Postgraduate School, Monterey, CA USA
Unstable and Damped Modes in Coupled Ocean Mixed Layer and Cloud Models
Chu, P C; Garwood, Jr , R W; Muller, P; Jan 1990; 12 pp.; In English
Report No.(s): AD-A480255; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480255

The ocean mixed layer and clouds are coupled by the fluxes of momentum, heat, and water mass at the interface. The importance of the fluxes of momentum and heat is well recognized by both meteorologists and oceanographers. However, the water mass flux has been given considerable attention only in atmospheric models since the latent heat release is an importance source of energy for the atmospheric general circulation. The water mass flux is given less attention in ocean models although it is realized that evaporation and precipitation contribute to the surface buoyancy flux which influences the depth of mixing and the thermohaline circulation.
DTIC
Atmospheric Models; Meteorology; Oceans; Thermodynamic Properties

20080033149 Naval Postgraduate School, Monterey, CA USA
South China Sea Warm Pool Detected in Spring From the Navy's Master Oceanographic Observational Data Set (MOODS)
Chu, Peter C; Tseng, Hsing-Chia; Chang, C P; Chen, J M; Feb 1997; 12 pp.; In English
Report No.(s): AD-A480257; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480257

A South China Sea warm pool with sea surface temperature (SST) higher than 29.5C, recently reported by Chu and Chang [1995a, b] and Chu et al. [1997}, appears in the central South China Sea (west of the Luzon Island) in boreal spring, strengthens until the onset of the summer monsoon (mid-May) and then weakens and disappears at the end of May. The transient features and interannual variabilities of the warm pool have not yet been studied. Here we use a subset of the U.S. Navy's Master Oceanographic Observation Data Set (MOODS) to investigate the surface thermal features. First, we employed an optimal interpolation scheme to build up a 10-day interval synoptic data set for December 1963 to November 1984 on a 0.50 x 10 grids (finer resolution in zonal direction) from the MOODS SST data. An ensemble mean SST field (T) was established with a rather weak horizontal gradient (28.5C near the Palawan Island to 26C near the southeast China coast). Second, we performed a composite analysis to obtain the averaged SST anomaly field T deviating from the ensemble mean for the winter and spring seasons (December- May). During December-March, T is negative almost everywhere throughout the whole South China Sea. In early April, positive T with closed isoline (warm pool) was evident west of Luzon Island. In May, the central SCS warm anomaly becomes stronger. On May 11-20, the central SCS warm pool (114c-119c E, 14c-19c N) has T > 18C.
DTIC
China; Moods; Ocean Surface; Oceanographic Parameters; Seas; Surface Temperature

20080033203 Naval Postgraduate School, Monterey, CA USA
Response of the South China Sea to Tropical Cyclone Ernie 1996
Chu, Peter C; Veneziano, Joseph M; Fan, Chenwu; Carron, Michael J; Liu, W T; Jun 15, 2000; 20 pp.; In English
Report No.(s): AD-A480364; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480364

A moving tropical cyclone is an intense localized source of surface wind stress and wind stress curl that produces a significant response in the ocean environment, especially in the ocean thermal structure, the upper ocean currents, and the sea

surface elevation. Such a response has been well identified in the open ocean region, but not in the coastal ocean region. In this study we use the Princeton Ocean Model with 20 km horizontal resolution and 23 sigma levels conforming to a realistic bottom topography to identify the response of the South China Sea to Tropical Cyclone Ernie 1996. Results show strong similarities in the responses between open ocean and coastal regions, including near-surface strong asymmetric response such as divergent currents with near-inertial oscillations, significant sea surface temperature cooling, bias to the right of the storm track, sea surface depressions in the wake of the storm, and subsurface intense upwelling and cooling at the base of the mixed layer to the right of the storm track. The unique features of the SCS response to Ernie are also discussed.
DTIC
China; Cyclones; Marine Environments; Seas; Tropical Storms

20080033218 Naval Postgraduate School, Monterey, CA USA
Backward Fokker-Planck Equation for Determining Model Valid Prediction Period
Chu, Peter C; Ivanov, Leonid M; Fan, Chenwu; Jan 2002; 11 pp.; In English
Report No.(s): AD-A480400; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480400

A new concept, valid prediction period (VPP), is presented here to evaluate ocean (or atmospheric) model predictability. VPP is defined as the time period when the prediction error first exceeds a predetermined criterion (i.e., the tolerance level). It depends not only on the instantaneous error growth but also on the noise level, the initial error, and the tolerance level. The model predictability skill is then represented by a single scalar, VPP. The longer the VPP, the higher the model predictability skill. A theoretical framework on the basis of the backward Fokker-Planck equation is developed to determine the mean and variance of VPP. A one-dimensional stochastic dynamical system [Nicolis, 1992] is taken as an example to illustrate the benefits of using VPP for model evaluation.
DTIC
Atmospheric Models; Errors; Fokker-Planck Equation; Marine Environments; Ocean Models; Prediction Analysis Techniques; Predictions

20080033246 Pennsylvania State Univ., University Park, PA USA
Anelastic Semigeostrophic Flow Over a Mountain Ridge
Bannon, Peter R; Chu, Pe-Cheng; Oct 1987; 11 pp.; In English
Report No.(s): AD-A480459; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480459

Scale analysis indicates that five nondimensional parameters (R(0) sq, epsilon, mu, lambda and kappa lambda) characterize the disturbance generated by the steady flow of a uniform wind (U0, V0) incident on a mountain ridge of width alpha in an isothermal, uniformly rotating, uniformly stratified, vertically semi-infinite atmosphere. Here mu = h(0)/H(R) is the ratio of the mountain height h(0) to the deformation depth H(R) = fa/N where f is the Coriolis parameter and N is the static buoyancy frequency. The parameters lambda = H(R)/H and kappa lambda are the ratios of H(R), to the density scale height H and the potential temperature scale height H/R respectively. There are two Rossby numbers: One based on the incident flow that is parallel to the mountain, epsilon = V0/fa, and one normal to the mountain, R(0) = U0/fa. If R(0) sq < 1, then the mountain-parallel flow is in approximate geostrophic balance and the flow is semigeostrophic. The semigeostrophic case reduces to the quasi-geostrophic one in the limit as mu and epsilon tend to zero. If the flow is Boussinesq (lambda = 0), then the semigeostrophic solutions expressed in a streamfunction coordinate can be derived from the quasi-geostrophic solutions in a geometric height coordinate. If the flow is anelastic (lambda = 1), no direct correspondence between the two approximations was found. However the anelastic effects are qualitatively similar for the two and lead to: (i) an increase in the strength of the mountain anticyclone, (ii) a reduction in the extent (and possible elimination) of the zone of blocked, cyclonic flow, (iii) a permanent turning of the flow proportional to the mass of air displaced by the mountain, and (iv) an increase in the ageostrophic cross-mountain flow. The last result implies an earlier breakdown of semigeostrophic theory for anelastic flow over topography.
DTIC
Anelasticity; Anticyclones; Geostrophic Wind; Mountains

20080033298 Naval Research Lab., Washington, DC USA
Turning Pictures into Numbers: Extracting and Generating Information From Complex Visualizations
Trafton, J G; Kirschenbaum, Susan S; Tsui, Ted L; Miyamoto, Robert T; Ballas, James A; Raymond, Paula D; Jan 2000; 25 pp.; In English
Contract(s)/Grant(s): 55-7188-00; 55-7850-00
Report No.(s): AD-A480615; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480615

We present a study of complex visualization usage by expert meteorological forecasters. We performed a protocol analysis and examined the types of visualizations they examined. We present evidence for how experts are able to make use of complex visualizations. Our findings suggest that users of complex visualizations create qualitative mental models from which they can then generate quantitative information. In order to build their qualitative mental models, forecasters integrated information across multiple visualizations and extracted primarily qualitative information from visualizations in a goal-directed manner. We discuss both theoretical and practical implications of this study.
DTIC
Extraction; Forecasting; Heuristic Methods

20080033326 Commonwealth Scientific and Industrial Research Organization, Victoria, Australia
Effects of Convection Instability Due to Incompatibility Between Ocean Dynamics and Surface Forcings
Cai, W; Chu, P C; Feb 1997; 10 pp.; In English
Report No.(s): AD-A480665; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480665

The study demonstrates that an incompatibility between a surface temperature climatology and a given ocean model, into which the climatology is assimilated via Haney restoration, can cause model ocean climate drift and interdecadal oscillations when the ocean is switched to a weaker restoration. This is made using an idealized Atlantic Ocean model driven by thermal and wind forcing only. Initially, the temperature climatology is forcefully assimilated into the model, and an implied heat flux field is diagnosed. During this stage any incompatibility is suppressed. The restoring boundary condition is then switched to a new forcing consisting of a part of the diagnosed flux and a part of the restoring forcing in such a way that at the moment of the switching the heat flux is identical to that prior to the switching. Under this new forcing condition, the incompatibility becomes manifest, causing changes in convection patterns, and producing interdecadal oscillations. The mechanisms are described.
DTIC
Climatology; Convection; Heat Flux; Ocean Dynamics; Ocean Models; Ocean Surface

20080033329 Naval Postgraduate School, Monterey, CA USA
P-Vector Method for Determining Absolute Velocity From Hydrographic Data
Chu, Peter C; Jan 1989; 13 pp.; In English
Report No.(s): AD-A480668; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480668

No abstract available
Hydrography; Thermal Stability; Wind (Meteorology)

20080033330 Naval Postgraduate School, Monterey, CA USA
On the Two-Phase Thermodynamics of the Coupled Cloud-Ocean
Chu, P C; Garwood, Jr, R W; Jul 1990; 13 pp.; In English
Report No.(s): AD-A480669; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480669

No abstract available
Oceans; Thermodynamics; Two Phase Flow

20080033332 Naval Research Lab., Monterey, CA USA

The Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS)

Hodur, Richard M; Hong, Xiaodong; Doyle, James D; Pullen, Julie; Cummings, James; Martin, Paul; Rennick, Mary Alice; Jan 2002; 12 pp.; In English

Report No.(s): AD-A480672; NRL/JA/7530/01/0200; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA480672

Typically, data assimilation systems have been developed separately for the atmosphere and ocean. However, there is increasing evidence that suggests that the atmosphere and ocean data assimilation systems should be combined. To fully account for these observed interactions as well as to anticipate the discovery of a host of other ways in which the ocean and atmosphere modify each other, NRL has undertaken the development of the Couple Ocean/Atmosphere Mesoscale Prediction System (COAMPS). The goal of this modeling project is to gain predictive skill in simulating the ocean and atmosphere at high resolution on time-scales of hours to several days. Significant questions exist as to how tightly coupled the atmosphere and ocean data assimilation systems must be, and over what types of atmospheric and ocean conditions this coupling is important. The purpose of this paper is to provided a description of the status of COAMPS and present recent results.

DTIC

Air Water Interactions; Assimilation; Atmospheric Models; Mesometeorology; Mesoscale Phenomena; Ocean Models; Prediction Analysis Techniques; Weather Forecasting

20080033423 Agency for International Development, Washington, DC, USA

Adapting to Climate Variability and Change. A Guidance Manual for Development Planning

Aug. 2007; 31 pp.; In English

Report No.(s): PB2008-101661; No Copyright; Avail.: National Technical Information Service (NTIS)

Climate change may pose risks and/or create opportunities for development efforts in many countries. The USAID Global Climate Change Team developed this Adaptation Guidance Manual to assist Missions and other partners to understand how climate change may affect their project outcomes and identify adaptation options to integrate into the design for more resilient projects. In developing the Manual we worked under the following assumptions: Climate variability already impacts economic sectors in developing countries and addressing climate variability and change will be important for the long-term success of development assistance; Project managers and stakeholders will know more about a project than we will (or than a tool can anticipate); project managers are already dealing with uncertainty such as weather and markets; We can assist missions/project managers/project designers by providing methods and information (and we are developing a tool to provide access to appropriate climate information, past and future) to facilitate assessment of possible impacts and adaptation options for projects; Stakeholder involvement is critical local knowledge and memory of climate changes over time can help identify adaptation options; building stakeholder ownership of project design and implementation is key to project success. The methods employed should be simple enough to meet needs in the field, but provide rigorous enough information on which to base decisions. This Adaptation Guidance Manual is the first of several tools we are developing to assist planners and stakeholders as they cope with a changing climate. As we work with Missions to apply the methods described here, we will revise the Manual to reflect Mission feedback and needs. We will also develop additional tools as needed.

NTIS

Climate Change; Economic Development; Manuals; Variability

20080033604 California Inst. of Tech., Pasadena, CA, USA

Toward Aerosol/Cloud Condensation Nuclei (CCN) Closure during CRYSTAL-FACE

VanReken, Timothy M.; Rissman, Tracey, A.; Roberts, Gregory C.; Varutbangkul, Varuntida; Jonsson, Haflidi H.; Flagan, Richard C.; Seinfeld, John H.; Journal of Geophysical Research; 2003; Volume 108; 2 pp.; In English

Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2003JD003582

During July 2002, measurements of cloud condensation nuclei were made in the vicinity of southwest Florida as part of the Cirrus Regional Study of Tropical Anvils and Cirrus Layers-Florida Area Cirrus Experiment (CRYSTAL-FACE) field campaign. These observations, at supersaturations of 0.2 and 0.85%, are presented here. The performance of each of the two CCN counters was validated through laboratory calibration and an in situ intercomparison. The measurements indicate that the aerosol sampled during the campaign was predominantly marine in character: the median concentrations were 233 cm-3 (at S = 0.2%) and 371 cm(sup -3) (at S = 0.85%). Three flights during the experiment differed from this general trend; the aerosol sampled during the two flights on 18 July was more continental in character, and the observations on 28 July indicate high spatial variability and periods of very high aerosol concentrations. This study also includes a simplified aerosol/CCN

closure analysis. Aerosol size distributions were measured simultaneously with the CCN observations, and these data are used to predict a CCN concentration using Kohler theory. For the purpose of this analysis, an idealized composition of pure ammonium sulfate was assumed. The analysis indicates that in this case, there was good general agreement between the predicted and observed CCN concentrations: at S = 0.2%, N(sub predicted)/N(sub observed)= 1.047 (R(sup 2)= 0.911)); at S = 0.85%, N(sub predicted)/N(sub observed)=1.201 (R(sup 2)= 0.835)). The impacts of the compositional assumption and of including in-cloud data in the analysis are addressed. The effect of removing the data from the 28 July flight is also examined; doing so improves the result of the closure analysis at S = 0.85%. When omitting that atypical flight, N(sub predicted)/N(sub observed) = 1.085 (R(sup 2) = 0.770) at S = 0.85%.
Derived from text
Aerosols; Condensation Nuclei; Crystal Field Theory; Clouds (Meteorology); Anvil Clouds; Cirrus Clouds

20080033628 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Temperatures and Water Levels at Tanana Flats Monitoring Stations
Ferrick, Michael G; Racine, Charles H; Reidsma, Steven; Saari, Stephanie P; Gelvin, Arthur B; Collins, Charles M; Larsen, Gary; Apr 2008; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480744; ERDC/CRREL-TR-08-8; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A network of data recording stations has been progressively deployed over recent years in the Tanana Flats to better understand the hydrology of the wetlands and the hydrologic impacts of airboat use. All stations monitor logger temperature, water soil temperature profiles, and water levels. The logger temperatures at each station accurately represent local air temperatures. Winter conditions contribute significantly to fen temperature extremes the following summer, and conversely, the thermal storage in the fen in the summer is important to temperature conditions the following winter. The water level data provided overall ranges for each fen and indicated a typical annual cycle. Slow recession occurs during the cold late fall and winter months as a result of groundwater outflow, and spring melt is a time of recharge and general water level recovery. Water levels in May through October vary significantly between years, depending on rainfall. Hydrologic deficits that develop in dry years can be eliminated by 1 2 wet months. Conversely, several consecutive large rains can cause high fen water levels. Surface outflows diminish as water levels fall, and moderate levels are sustained by normal rainfall. Data from the station pair at Birch Island Well Murphy Fen indicate a direct connection throughout the year between water beneath the permafrost and that in the nearby fens. Representative stations in each fen were selected to use for management of airboat access according to local water levels. Staff gauges that can be monitored by web cameras were installed at each of these stations in August 2007. The harsh environment, remote locations, and limited opportunities for access to the stations have often interrupted the continuity of data records. As a result, hydrologic issues remain to be resolved that will require continued station maintenance and operation.
DTIC
Atmospheric Temperature; Ground Water; Water

20080033892 Global Change Research Program, Washington, DC, USA
Global-Change Scenarios. Their Development and Use. U.S. Climate Change Science Program Synthesis and Assessment Product 2.1b
Jul. 2007; 116 pp.; In English
Report No.(s): PB2008-101072; No Copyright; Avail.: National Technical Information Service (NTIS)

A scenario is a description of potential future conditions produced to inform decision-making under uncertainty. Scenarios can help inform decisions that involve high stakes and poorly characterized uncertainty, which may thwart other, conventional forms of analysis or decision support. Originally developed to study military and security problems, scenarios are now widely used for strategic planning and assessment in businesses and other organizations, and increasingly to inform planning, analysis, and decisionmaking for environmental issues, including climate change. Scenarios can serve many purposes. They can help inform specific decisions, or can provide inputs to assessments, models, or other decision-support activities when these activities need specification of potential future conditions. They can also provide various forms of indirect decision support, such as clarifying an issues importance, framing a decision agenda, shaking up habitual thinking, stimulating creativity, clarifying points of agreement and disagreement, identifying and engaging needed participants, or providing a structure for analysis of potential future decisions.
NTIS
Climate Change; Decision Making; Global Warming

20080033929 Montana State Univ., Bozeman, MT, USA

Evaluation of Utah Department of Transportation's Weather Operations/RWIS (Road Weather Information System) Program. Phase I

Shi, X.; O'Keefe, K.; Wang, S.; Strong, C.; Feb. 2007; 78 pp.; In English

Report No.(s): PB2008-101287; No Copyright; Avail.: National Technical Information Service (NTIS)

The UDOT Weather Operations/ RWIS program is unique among state departments of transportation nationally, as it assists the DOT operations, maintenance, and construction functions by providing detailed, often customized, area-specific weather forecasts. Staff meteorologists are stationed in the Traffic Operations Center (TOC), providing easily accessible weather information and quality control of weather forecasts. A national survey confirmed the benefits of such customized forecasts, including more accurate forecasts; timely forecasts and access to a forecaster; advanced warning of storm conditions; better response time and improved planning and scheduling of staff; and better use of chemical products. By examining the labor and materials cost for winter maintenance in the 04-05 season for 77 UDOT sheds, an artificial neural network model was trained and tested to establish the shed winter maintenance cost as a function of UDOT weather service usage, evaluation of UDOT weather service, level-ofmaintenance, seasonal vehicle-miles traveled, anti-icing level, and winter severity index. The model estimated the value and additional saving potential of the UDOT weather service to be 11-25 percent and 4-10 percent of the UDOT labor and materials cost for winter maintenance, respectively. It was also estimated that the risk of using the worst weather service providers to be 58-131 percent of the UDOT labor and materials cost for winter maintenance. Further evaluation of other benefits of UDOT weather service are not included in this phase, such as better traveler information, accident reduction, value added to UDOT training and risk management, and benefits to programs outside UDOT. The research findings are expected to provide planners cost-benefit information to consider integrating weather service into their TOC or Transportation Management Center (TMC), and to provide maintenance engineers useful information about the value of customized weather service.

NTIS

Forecasting; Information Systems; Roads; Transportation

20080034461 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Towards a South America Land Data Assimilation System (SALDAS): Aspects of Land Surface Model Spin Up Using the Simplified Simple Biosphere (SSIB)

deGoncalves, L. Gustavo Goncalves; Shuttleworth, William James; Burke, Eleanor J.; Houser, Paul; Rodell, Matthew; Arsenault, Kristi; January 2006; 44 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

This paper describes a spin-up experiment conducted over South America using the Simplified Simple Biosphere (SSiB) land surface model to study the process of model adjustment to atmospheric forcing data. The experiment was carried out as a precursor to the use of SSiB in a South American Land Data Assimilation System (SALDAS). The results from an 11 year-long recursive simulation using three different initial conditions of soil wetness (control, wet and dry) are examined. The control run was initiated by interpolation of the NCEP/DOE Global Reanalysis-2 (NCEP/DOE R-2) soil moisture dataset. In each case the time required for the model to reach equilibrium was calculated. The wet initialization leads to a faster adjustment of the soil moisture field, followed by the control and then the dry initialization. Overall, the final spin-up states using the SSiB-based SALDAS are generally wetter than both the NCEP/DOE R-2 and the Centro de Previsao do Tempo e Estudos Climaticos (CPTEC - Brazilian Center for Weather Forecast and Climate Studies) operational initial soil moisture states, consequently modeled latent heat is higher and sensible heat lower in the final year of simulation when compared with the first year. Selected regions, i.e. in the semi-arid northeastern Brazil, the transition zone to the south of the Amazon tropical forest, and the central Andes were studied in more detail because they took longer to spin up (up to 56 months) when compared with other areas (less than 24 months). It is shown that there is a rapid change in the soil moisture in all layers in the first 2 months of simulation followed by a subsequent slow and steady adjustment: this could imply there are increasing errors in medium range simulations. Spin up is longest where frozen soil is present for long periods such as in the central Andes.

Author

Earth Surface; Simulation; Soil Moisture; South America; Weather Forecasting; Atmospheric Models; Climate Models

20080034466 Princeton Univ., NJ, USA

Anvil Glaciation in a Deep Cumulus Updraught over Florida Simulated with the Explicit Microphysics Model. I: Impact of Various Nucleation Processes

Phillips, Vaughan T. J.; Andronache, Constantin; Sherwood, Steven C.; Bansemer, Aaron; Conant, William C.; Demott, Paul J.; Flagan, Richard C.; Heymsfield, Andy; Jonsson, Haflidi; Poellot, Micheal; Rissman, Tracey A.; Seinfeld, John H.; Vanreken, Tim; Varutbangkul, Varuntida; Wilson, James C.; The Quarterly Journal of the Royal Meteorological Society; [2005]; Volume 131, Issue 609, pp. 2019-2046; In English

Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1256/qj.04.85

Simulations of a cumulonimbus cloud observed in the Cirrus regional Study of Tropical Anvils and Cirrus Layers-Florida Area Cirrus Experiment (CRYSTAL-FACE) with an advanced version of the Explicit Microphysics Model (EMM) are presented. The EMM has size-resolved aerosols and predicts the time evolution of sizes, bulk densities and axial ratios of ice particles. Observations by multiple aircraft in the troposphere provide inputs to the model, including observations of the ice nuclei and of the entire size distribution of condensation nuclei. Homogeneous droplet freezing is found to be the source of almost all of the ice crystals in the anvil updraught of this particular model cloud. Most of the simulated droplets that freeze to form anvil crystals appear to be nucleated by activation of aerosols far above cloud base in the interior of the cloud ('secondary' or 'in cloud' droplet nucleation). This is partly because primary droplets formed at cloud base are invariably depleted by accretion before they can reach the anvil base in the updraught, which promotes an increase with height of the average supersaturation in the updraught aloft. More than half of these aerosols, activated far above cloud base, are entrained into the updraught of this model cloud from the lateral environment above about 5 km above mean sea level. This confirms the importance of remote sources of atmospheric aerosol for anvil glaciation. Other nucleation processes impinge indirectly upon the anvil glaciation by modifying the concentration of supercooled droplets in the upper levels of the mixed-phase region. For instance, the warm-rain process produces a massive indirect impact on the anvil crystal concentration, because it determines the mass of precipitation forming in the updraught. It competes with homogeneous freezing as a sink for cloud droplets. The effects from turbulent enhancement of the warm-rain process and from the nucleation processes on the anvil ice properties are assessed.

Author

Aerosols; Ice Nuclei; Drops (Liquids); Crystals; Condensation Nuclei; Anvils; Troposphere; Nucleation; Cumulonimbus Clouds

20080034467 Georgia Inst. of Tech., Atlanta, GA, USA

Cloud Condensation Nuclei Prediction Error from Application of Kohler Theory: Importance for the Aerosol Indirect Effect

Sotiropoulou, Rafaella-Eleni P.; Nenes, Athanasios; Adams, Peter J.; Seinfeld, John H.; Journal of Geophysical Research; June 2007; Volume 112; 1 pp.; In English

Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2006JD007834

In situ observations of aerosol and cloud condensation nuclei (CCN) and the GISS GCM Model II' with an online aerosol simulation and explicit aerosol-cloud interactions are used to quantify the uncertainty in radiative forcing and autoconversion rate from application of Kohler theory. Simulations suggest that application of Koehler theory introduces a 10-20% uncertainty in global average indirect forcing and 2-11% uncertainty in autoconversion. Regionally, the uncertainty in indirect forcing ranges between 10-20%, and 5-50% for autoconversion. These results are insensitive to the range of updraft velocity and water vapor uptake coefficient considered. This study suggests that Koehler theory (as implemented in climate models) is not a significant source of uncertainty for aerosol indirect forcing but can be substantial for assessments of aerosol effects on the hydrological cycle in climatically sensitive regions of the globe. This implies that improvements in the representation of GCM subgrid processes and aerosol size distribution will mostly benefit indirect forcing assessments. Predictions of autoconversion, by nature, will be subject to considerable uncertainty; its reduction may require explicit representation of size-resolved aerosol composition and mixing state.

Author

Aerosols; Condensation Nuclei; Clouds (Meteorology); Atmospheric General Circulation Models

20080034469 California Inst. of Tech., Pasadena, CA, USA

Future Climate Impacts of Direct Radiative Forcing Anthropogenic Aerosols, Tropospheric Ozone, and Long-lived Greenhouse Gases

Chen, Wei-Ting; Liao, Hong; Seinfeld, John H.; Journal of Geophysical Research; July 26, 2007; Volume 112; 2 pp.; In English

Contract(s)/Grant(s): NNG04GD53G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2006JD008051

Long-lived greenhouse gases (GHGs) are the most important driver of climate change over the next century. Aerosols and tropospheric ozone (O3) are expected to induce significant perturbations to the GHG-forced climate. To distinguish the equilibrium climate responses to changes in direct radiative forcing of anthropogenic aerosols, tropospheric ozone, and GHG between present day and year 2100, four 80-year equilibrium climates are simulated using a unified tropospheric chemistry-aerosol model within the Goddard Institute for Space Studies (GISS) general circulation model (GCM) 110. Concentrations of sulfate, nitrate, primary organic (POA) carbon, secondary organic (SOA) carbon, black carbon (BC) aerosols, and tropospheric ozone for present day and year 2100 are obtained a priori by coupled chemistry-aerosol GCM simulations, with emissions of aerosols, ozone, and precursors based on the Intergovernmental Panel on Climate Change (IPCC) Special Report on Emissions Scenario (SRES) A2. Changing anthropogenic aerosols, tropospheric ozone, and GHG from present day to year 2100 is predicted to perturb the global annual mean radiative forcing by +0.18 (considering aerosol direct effects only), +0.65, and +6.54 W m(sup -2) at the tropopause, and to induce an equilibrium global annual mean surface temperature change of +0.14, +0.32, and +5.31 K, respectively, with the largest temperature response occurring at northern high latitudes. Anthropogenic aerosols, through their direct effect, are predicted to alter the Hadley circulation owing to an increasing interhemispheric temperature gradient, leading to changes in tropical precipitation. When changes in both aerosols and tropospheric ozone are considered, the predicted patterns of change in global circulation and the hydrological cycle are similar to those induced by aerosols alone. GHG-induced climate changes, such as amplified warming over high latitudes, weakened Hadley circulation, and increasing precipitation over the Tropics and high latitudes, are consistent with predictions of a number of previous GCM studies. Finally, direct radiative forcing of anthropogenic aerosols is predicted to induce strong regional cooling over East and South Asia. Wintertime rainfall over southeastern China and the Indian subcontinent is predicted to decrease because of the increased atmospheric stability and decreased surface evaporation, while the geographic distribution of precipitation is also predicted to be altered as a result of aerosol-induced changes in wind flow.

Author

Atmospheric Chemistry; Climate Change; Ozone; Troposphere; Atmospheric Models; Aerosols

20080034470 Toronto Univ., Ontario, Canada

Land Water Storage within the Congo Basin Inferred from GRACE Satellite Gravity Data

Crowley, John W.; Mitrovica, Jerry X.; Bailey, Richard C.; Tamisiea, Mark E.; Davis, James L.; Geophysical Research Letters; October 03, 2006; Volume 33; 1 pp.; In English

Contract(s)/Grant(s): NNG04GF09G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2006GL027070

GRACE satellite gravity data is used to estimate terrestrial (surface plus ground) water storage within the Congo Basin in Africa for the period of April, 2002 - May, 2006. These estimates exhibit significant seasonal (30 +/- 6 mm of equivalent water thickness) and long-term trends, the latter yielding a total loss of approximately 280 km(exp 3) of water over the 50-month span of data. We also combine GRACE and precipitation data set (CMAP, TRMM) to explore the relative contributions of the source term to the seasonal hydrological balance within the Congo Basin. We find that the seasonal water storage tends to saturate for anomalies greater than 30-44 mm of equivalent water thickness. Furthermore, precipitation contributed roughly three times the peak water storage after anomalously rainy seasons, in early 2003 and 2005, implying an approximately 60-70% loss from runoff and evapotranspiration. Finally, a comparison of residual land water storage (monthly estimates minus best-fitting trends) in the Congo and Amazon Basins shows an anticorrelation, in agreement with the 'see-saw' variability inferred by others from runoff data.

Author

Surface Water; Ground Water; Annual Variations; Satellite Imagery; Remote Sensing; Africa

20080034472 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA; Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA

GRACE Gravity Data Constrain Ancient Ice Geometries and Continental Dynamics over Laurentia

Tamisiea, M. E.; Mitrovica, J. X.; Davis, J. L.; Science; May 11, 2007; Volume 316, No. 5826, pp. 881-883; In English

Contract(s)/Grant(s): NNG04GF09G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1126/science.1137157

The free-air gravity trend over Canada, derived from the Gravity Recovery and Climate Experiment (GRACE) satellite mission, robustly isolates the gravity signal associated with glacial isostatic adjustment (GIA) from the longer-time scale mantle convection process. This trend proves that the ancient Laurentian ice complex was composed of two large domes to the west and east of Hudson Bay, in accord with one of two classes of earlier reconstructions. Moreover, GIA models that reconcile the peak rates contribute approximately 25 to approximately 45% to the observed static gravity field, which represents an important boundary condition on the buoyancy of the continental tectosphere.

Author

Free Atmosphere; Gravitation; Ice; Climate; Dynamics

20080034473 Harvard Univ., Cambridge, MA, USA

Annual Variations in Water Storage and Precipitation in the Amazon Basin: Bounding Sink Terms in the Terrestrial Hydrological Balance using GRACE Satellite Gravity Data

Crowley, John W.; Mitrovica, Jerry X.; Bailey, Richard C.; Tamisiea, Mark E.; Davis, James L.; Journal of Geodesy; April 26, 2007; ISSN 0949-7714; Volume 82, No. 1, pp. 9-13; In English

Contract(s)/Grant(s): NNG04GF09G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1007/s00190-007-0153-1

We combine satellite gravity data from the Gravity Recovery and Climate Experiment (GRACE) and precipitation measurements from the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center's (CPC) Merged Analysis of Precipitation (CMAP) and the Tropical Rainfall Measuring Mission (TRMM), over the period from mid-2002 to mid-2006, to investigate the relative importance of sink (runoff and evaporation) and source (precipitation) terms in the hydrological balance of the Amazon Basin. When linear and quadratic terms are removed, the time series of land water storage variations estimated from GRACE exhibits a dominant annual signal of 250 mm peak-to-peak, which is equivalent to a water volume change of approximately 1800 cubic kilometers. A comparison of this trend with accumulated (i.e., integrated) precipitation shows excellent agreement and no evidence of basin saturation. The agreement indicates that the net runoff and evaporation contributes significantly less than precipitation to the annual hydrological mass balance. Indeed, raw residuals between the detrended water storage and precipitation anomalies range from plus or minus 40 mm. This range is consistent with streamflow measurements from the region, although the latter are characterized by a stronger annual signal than ow residuals, suggesting that runoff and evaporation may act to partially cancel each other.

Author

Amazon Region (South America); Annual Variations; Gravitation; Hydrology; Precipitation Measurement; Structural Basins; Water; Climate

20080034474 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA

A Statistical Filtering Approach for Gravity Recovery and Climate Experiment (GRACE) Gravity Data

Davis. J. L.; Tamisiea, M. E.; Elosegui, P.; Mitrovica, J. X.; Hill, E. M.; Journal of Geophysical Research; April 18, 2008; Volume 113; 2 pp.; In English

Contract(s)/Grant(s): NNG04GF09G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2007JB005043

We describe and analyze a statistical filtering approach for GRACE data that uses a parametrized model for the temporal evolution of the GRACE coefficients. After least-squares adjustment, a statistical test is performed to assess the significance of the estimated parameters. If the test is passed, the parameters are used by the filter in the reconstruction of the field; otherwise they are rejected. The test is performed, and the filter is formed, separately for annual components of the model and the trend. This new approach is distinct from Gaussian smoothing since it uses the data themselves to test for specific components of the time-varying gravity field. The statistical filter appears inherently to remove most of the 'stripes' present in the GRACE fields, although destriping the fields prior to filtering seems to help the trend recovery. We demonstrate that the statistical filter produces reasonable maps for the annual components and trend. We furthermore assess the statistical filter for the annual components using ground-based GPS data in South America by assuming that the annual component of the gravity signal is associated only with groundwater storage. The un-destriped, statistically filtered field has a X2 value relative

to the GPS data consistent with the best result from smoothing. In the space domain, the statistical filters are qualitatively similar to Gaussian smoothing. Unlike Gaussian smoothing, however, the statistical filter has significant sidelobes, including large negative sidelobes on the north-south axis, potentially revealing information on the errors, and the correlations among the errors, for the GRACE coefficients.
Author
Climate; Gravitational Fields; Statistical Analysis; Geophysics

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*.

20080034471 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA
Dynamic and Regression Modeling of Ocean Variability in the Tide-Gauge Record at Seasonal and Longer Periods
Hill, Emma M.; Ponte, Rui M.; Davis, James L.; Journal of Geophysical Research; May 2007; Volume 112; 2 pp.; In English
Contract(s)/Grant(s): NNG04GF09G; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2006JC003745

Comparison of monthly mean tide-gauge time series to corresponding model time series based on a static inverted barometer (IB) for pressure-driven fluctuations and a ocean general circulation model (OM) reveals that the combined model successfully reproduces seasonal and interannual changes in relative sea level at many stations. Removal of the OM and IB from the tide-gauge record produces residual time series with a mean global variance reduction of 53%. The OM is mis-scaled for certain regions, and 68% of the residual time series contain a significant seasonal variability after removal of the OM and IB from the tide-gauge data. Including OM admittance parameters and seasonal coefficients in a regression model for each station, with IB also removed, produces residual time series with mean global variance reduction of 71%. Examination of the regional improvement in variance caused by scaling the OM, including seasonal terms, or both, indicates weakness in the model at predicting sea-level variation for constricted ocean regions. The model is particularly effective at reproducing sea-level variation for stations in North America, Europe, and Japan. The RMS residual for many stations in these areas is 25-35 mm. The production of 'cleaner' tide-gauge time series, with oceanographic variability removed, is important for future analysis of nonsecular and regionally differing sea-level variations. Understanding the ocean model's strengths and weaknesses will allow for future improvements of the model.
Author
Oceanography; Regression Analysis; Tides; Measuring Instruments; Annual Variations; Time Series Analysis; Dynamic Models

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*.

20080032741 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Spatial Distribution of Risk in Rare Events for Binomial Geostatistic and Conditional Simulation
CelsoGerbiCamargo, Eduardo; March 29, 2007; 152 pp.; In Portuguese; Original contains black and white illustrations
Report No.(s): INPE-14800-TDI/1243; Copyright; Avail.: CASI: C01, CD-ROM: A08, Hardcopy

Many events of interest in public policy, such as health care and security, are of low occurrence or rare events. The occurrence of various types of cancer and of diverse types of violence are some examples. These events are associated with people, who are not distributed randomly in space; therefore, when working with registers of health care and security to evaluate risks, the event probability must be estimated. In this context, tools of analysis that allow to produce an evaluation of the risk, as well as its spatial distribution, enhance surveillance. Consequently, they make possible to provide important information towards the development of policies that promote better health care and security, considering new strategies of control and prevention. This thesis offers a contribution in this direction. A geostatistic methodology is used to estimate and map the risk in rare events. The risk is assumed to be a continuous and spatially correlated variable, whose values that are not observed directly. The available information are rates that are aggregated by units of area (towns, districts, census sectors

and others), defined as being the ratio between the number of occurred events in one determined area and the number of people susceptible to the occurrence of this event. The number of cases or events occurred in one determined area is considered a variable with binomial distribution. An estimator for the risk semivariogram is presented for analysis and definition of the spatial correlation structure of the risk. This estimator considers the instability that is observed in the data and its trend in order to estimate its parameters. This instability is related with areas of the small populations. Its behavior is verified through the binomial co-kriging and a simulation study that evaluates the structure of spatial correlation of the estimated risk against the simulated one. The structure of spatial correlation of the risk imposed by the considered estimator and the available information are used in the binomial co-kriging procedure to obtain the average risk distribution surface. To explore other moments of the risk distribution, a non-parametric conditional sequential simulation procedure is used. A set of equally representative alternative realizations of the risk is generated. This makes possible to evaluate the probability of the random field in study exceed a given cut value, and, later, to establish more adequate risk scenarios, for example, action planning for monitoring and/or intervention. As a demonstration of the proposed technique, a case study is performed for the homicide risk in the city of S o Paulo, for the period between 2002 and 2004. The results are suitable with its urban structure, through the observation of other studies, pointing a way to the advance of monitoring and decisions making support systems.
Author
Spatial Distribution; Risk Assessment; Health; Violence; Etiology

20080032753 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Effects of Sample Placement Errors on Accuracy of Species Distributions Models
Iwashita, Fabio; January 2008; 103 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Report No.(s): INPE-15174-TDI/1291; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

The study of the environment and its relationship with species spatial distribution is an old concern in biogeography. Mathematics allied with computers tools make possible a forecast of species distribution. The models known as Species Distribution Models use occurrence field data and environmental variables to point out suitable places for species. Despite many works that evaluate species distribution model performance, the placement accuracy's influence over habitat suitability models remain unevaluated. We assess the models' sensibility for sample placement errors. To keep an experimental design with few unknown factors, a control of sampling conditions are needed. Further, for placement error analysis, a control over different error is necessary. To fulfill this purpose, placement errors were evaluated through artificial data. We simulated a fundamental niche for virtual plant species and used a couple of error insertion methods; sample coordinates projection towards cellular center point and errors with normal distribution in polar coordinates parameters. We evaluated BIOCLIM, GARP Best Subsets and Maximum entropy. All models present placement errors sensibility. BIOCLIM exhibited the highest performance decrease. GARP Best Subsets had low sensibility to placement errors, nevertheless predicted a wide range occurrence. The maximum entropy presented the best performance despite of errors placement. These results show the importance of taking into account the effects of placement errors in modelling process. We need specific cautions, like method choice, its premises and sample placement accuracy.
Author (revised)
Species Diffusion; Geographic Distribution; Habitability; Environment Models; Error Analysis

20080032998 National Cheng Kung Univ., Tainan, Taiwan, Province of China
Effects of Enamel Anisotropy on Stress Singularities in Restorations of Premolar Class II Cavities
Chue, Ching-Hwei; Liu, Wei-Ju; Weng, Shih-Ming; Wong, Tung-Yiu; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 403-415; In English; See also 20080032994
Contract(s)/Grant(s): NSC 91-2815-C-0006-047-B; Copyright; Avail.: Other Sources

This paper studies the strength of inplane and antiplane stress singularities near the apex of a structure formed from the dental restoration of premolar class I1 cavity. In order to exclude the probability of failure, it is necessary to find the conditions such that singularity orders are kept to a minimum or inplane and antiplane stress fields are non-singular. The effects of enamel anisotropy on the stress singularities are emphasized at two critical positions in the restoration structure: (1) the apex of the enamel and restoration interface, and (2) the apex of the enamel, dentine and restoration junction. In the second case, the interface between the restoration and enamel may be bonded or debonded. The results of this paper show that the recommended cutting angles are strongly affected by the ratio R of transverse stiffness to the longitudinal stiffness. Besides,

if the stiffness of the restoqation material is close to the transverse stiffness of the enamel, the singularity orders will be reduced. The results of previous studies, in which the enamel is considered to be isotropic, should be modified.
Author
Dentistry; Cavities; Stress Distribution; Restoration; Enamels; Stress Analysis

20080033152 Walter Reed Army Medical Center, Washington, DC USA
Hyperkalemia After Packed Red Blood Cell Transfusion in Trauma Patients
Aboudara, Matthew C; Hurst, Frank P; Abbott, Kevin C; Perkins, Robert M; Feb 2008; 7 pp.; In English
Report No.(s): AD-A480263; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480263

A spectrum of derangements of potassium homeostasis have been reported on patients undergoing transfusion with cell-based transfusion products, specifically, packed red blood cells (PRBCs) and fresh whole blood. In both adults and children, hypokalemia has been reported more frequently than hyperkalemia. The largest reported series of which we are aware, retrospective in nature, reported an incidence of hypokalemia of 72% in children undergoing liver transplantation; hyperkalemia occurred in less than 5% of patients. Others have likewise observed hypokalemia to be more common after transfusion. In the few, small studies describing hyperkalemia after transfusion of blood products, elevations of serum potassium levels have been described alternatively as transient and clinically insignificant. We have previously reported an independent association between the number of transfused blood products, both cell and noncell-based, and the development of hyperkalemia in a noncrush trauma population undergoing acute resuscitation after major penetrating trauma. In this population, hyperkalemia was common, often severe, but transient; however, there was a trend toward higher mortality in those patients who developed hyperkalemia compared with those who did not. To better delineate the role of cell-based transfusion, specifically PRBCs and fresh whole blood, in the development of hyperkalemia, we retrospectively analyzed data for a cohort of trauma patients undergoing acute resuscitative interventions after admission to a combat support hospital in central Iraq.
DTIC
Blood; Erythrocytes; Homeostasis; Injuries; Patients; Potassium; Transfusion

20080033153 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Delphi Study of HIPAA Compliance to Battlefield Medical Evacuation
Chessman, John; Mar 2008; 48 pp.; In English
Report No.(s): AD-A480265; AFIT/GIR/ENV/08-M03; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480265

The purpose of this research was to examine the impact of HIPAA compliance on the Battlefield Medical Evacuation process. Specifically, this thesis sought to answer three research questions addressing the current Battlefield Medical Evacuation process and current HIPAA considerations for each step of the process. The research questions were answered through the use of the Delphi Technique. Eight experts, representing Air Force, Army and Civilian medical communities participated in two rounds of the Delphi Technique. The research identified how HIPAA compliance is handled now and identified suggested improvements. An original model of the battlefield medical evacuation process was developed, and this was presented to the Delphi group for changes and acceptance. The group was then tasked to identify the application of the HIPPA requirements at each stage of the model. The final model suggests that partial HIPAA compliance is the current trend in the early steps of battlefield medical evacuation. The culmination of this effort was the development of recommended improvements based upon the suggestions of knowledgeable people. The suggested improvements were: clear guidance, training and additional resources. The study may help Commanders prepare themselves and their personnel to handle HIPAA information in a deployed environment.
DTIC
Delphi Method (Forecasting); Evacuating (Transportation); Health; Insurance (Contracts); Medical Services; Military Operations

20080033156 Air Force Hospital, Lackland AFB, TX USA

Experience With Wound VAC and Delayed Primary Closure of Contaminated Soft Tissue Injuries in Iraq

Leininger, Brian E; Rasmussen, Todd E; Smith, David L; Jenkins, Donald H; Coppola, Christopher; Nov 2006; 6 pp.; In English

Report No.(s): AD-A480269; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480269

Wartime missile injuries are frequently high-energy wounds that devitalize and contaminate tissue, with high risk for infection and wound complications. Debridement, irrigation, and closure by secondary intention are fundamental principles for the management of these injuries. However, closure by secondary intention was impractical in Iraqi patients. Therefore, wounds were closed definitively before discharge in all Iraqi patients treated for such injures at our hospital. A novel wound management protocol was developed to facilitate this practice, and patient outcomes were tracked. This article describes that protocol and discusses the outcomes in a series of 88 wounds managed with it.

DTIC

Contamination; Delay; Infectious Diseases; Injuries; Iraq

20080033157 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Evolution of Burn Resuscitation in Operation Iraqi Freedom

Chung, Kevin K; Blackbourne, Lorne H; Wolf, Steven E; White, Chrsitopher E; Renz, Evan M; Cancio, Leopoldo C; Holcomb, John B; Barillo, David J; Oct 2006; 8 pp.; In English

Report No.(s): AD-A480270; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480270

Burns are common in all military conflicts, comprising approximately 10% of all casualties. Of these, nearly 20% are categorized as severe, or involving greater than 20% TBSA, and require significant intravenous resuscitation. A unique set of challenges have emerged during the present conflict associated with global evacuation of burned soldiers, adding a new dimension to the already complex and often-controversial topic of the burn resuscitation. Critical advances in air evacuation of the war wounded, thorough prewar planning, and sustained burn care education of deployed personnel have proven vital in the optimal care of our injured soldiers. During the Vietnam conflict, burned soldiers were evacuated to an Army Hospital in Japan (Camp Zama) and were treated for up to 6 months before they were evacuated to the USA. Since that time, the transfer of the patient to the burn center for definitive care has been expedited by the Army Burn Flight Team's ability to transport the most severely burned patients within the first several days after injury. With the emergence of the U.S. Air Force Critical Care Air Transport Team (CCATT) program in the 1990s, global air evacuation of burn patients became even more rapid, maximizing available U.S. Air Force aircraft for patient evacuation. The doctrine has shifted from aeromedical transport of the stable to aeromedical transport of the stabilized. In burn patients, evacuation presents a unique problem because it usually takes place while resuscitation in the first 24 to 48 hours after burn injury is ongoing. In addition to the innate complexity involved in global evacuation, war burn patients often exhibit multisystem traumatic injuries further complicating and augmenting resuscitation fluid needs above and beyond standard burn resuscitation formulas. The presence of smoke inhalation injury, occurring in 5% to 15% of patients with severe burns, also increases fluid requirements.

DTIC

Air Transportation; Evacuating (Transportation); Medical Services; Resuscitation

20080033158 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Fresh Whole Blood Transfusion: A Controversial Military Practice

Kauvar, David S; Holcomb, John B; Norris, Gary C; Hess, John R; Jul 2006; 5 pp.; In English

Report No.(s): AD-A480272; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480272

The transfusion of fresh whole blood (FWB) for trauma-induced coagulopathy is unusual in civilian practice. However, US military physicians have used FWB in every combat operation since the practice was introduced in World War I and continue to do so during current military operations. We discuss our review of all blood products administered to US military casualties in Operation Iraqi Freedom (OIF) between March and December 2003. FWB transfusions were most frequent when demands for massive transfusions wiped out existing blood supplies. FWB patients had the highest blood product requirements; however, mortality did not differ significantly between FWB and non-FWB patients overall or for massively transfused patients. We review the current military practice of FWB transfusion in combat theaters and conclude that FWB transfusion is convenient, safe, and effective in certain military situations.

DTIC

Blood; Blood Cells; Blood Coagulation; Casualties; Supplying; Transfusion

20080033159 Walter Reed Army Medical Center, Washington, DC USA

The Effectiveness of a Damage Control Resuscitation Strategy for Vascular Injury in a Combat Support Hospital: Results of a Case Control Study

Fox, Charles J; Gillespie, David L; Cox, E D; Mehta, Sumeru G; Kragh, Jr , John J; Salinas, Jose; Holcomb, John B; Feb 2008; 10 pp.; In English

Report No.(s): AD-A480273; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480273

Advancements in combat casualty care have resulted in a significant reduction in mortality when compared with previous wars as current research has focused much attention on preventable death. Hemorrhage from extremity vascular injury remains a leading cause of potentially preventable death on the modern battlefield and recent estimates suggest an increase in this injury pattern compared with previous wars. Injuries of this severity cause an early and profound coagulopathy that is often present at admission to the emergency department (ED). Standard damage control principles are routinely applied to achieve rapid hemorrhage control, and to initiate a hemostatic resuscitation plan that will correct metabolic imbalances and prevent the onset or progression of a traumatic coagulopathy. Only when this lifesaving sequence is properly executed, can the military trauma patient be expected to withstand the metabolic perturbations of a complicated operation like extremity revascularization. Standard surgical doctrine and experience has taught surgeons that the operative patient needs to be adequately resuscitated before embarking on a taxing operative course. The time needed for adequate resuscitation was the single greatest barrier to limb salvage during the Korean conflict. Convincing modern data show that acidosis and traditional resuscitation techniques using liberal amounts of crystalloid and packed red blood cells (PRBCs) can exacerbate coagulopathy. One report has recently demonstrated a survival benefit with early correction of these physiologic derangements. Given modern advances, it seems logical to optimize those strategies that promote early recovery from the metabolic consequences of hemorrhagic shock.

DTIC

Cardiovascular System; Combat; Damage; Injuries; Resuscitation; Shock (Physiology); Support Systems

20080033161 Tripler Army Medical Center, Honolulu, HI USA

Pediatric Care as Part of the US Army Medical Mission in the Global War on Terrorism in Afghanistan and Iraq, December 2001 to December 2004

Burnett, Mark W; Spinella, Philip C; Azarow, Kenneth S; Callahan, Charles W; Feb 2008; 8 pp.; In English

Report No.(s): AD-A480275; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480275

OBJECTIVE. Our objective in this report was to describe the epidemiologic features of and workload associated with pediatric admissions to 12 US Army military hospitals deployed to Iraq and Afghanistan. METHODS. The Patient Administration Systems and Biostatistics Activity database was queried for all local national patients <18 years of age who were admitted to deployed Army hospitals in Afghanistan and Iraq between December 2001 and December 2004. RESULTS. Pediatric admissions during the study period were 1012 (4.2%) of 24 227 admissions, occupying 10% of all bed-days. The median length of stay was 4 days 'interquartile range: 1-8 days'. The largest proportion of children were 11 to 17 years of age (332 of 757 children; 44%), although 45 (6%) of 757 children hospitalized were <1 year of age. The majority (63%) of pediatric patients admitted required either general surgical or orthopedic procedures. The in-hospital mortality rate for all pediatric patients was 59 (5.8%) of 1012 patients, compared with 274 (4.5%) of 6077 patients for all adult non-US coalition patients. CONCLUSIONS. Pediatric patients with injuries threatening life, limb, or eyesight are part of the primary responsibility of military medical facilities during combat and have accounted for a significant number of admissions and hospital bed-days in deployed Army hospitals in Afghanistan and Iraq. Military medical planners must continue to improve pediatric medical support, including personnel, equipment, and medications that are necessary to treat children injured during combat operations, as well as those for whom the existing host nation medical infrastructure is unable to provide care.

DTIC

Afghanistan; Biometrics; Injuries; Iraq; Medical Services; Military Operations; Terrorism; Warfare

20080033162 Chicago Univ., Chicago, IL USA

Cone-Beam Computed Tomography for Image-Guided Radiation Therapy of Prostate Cancer

Cho, Seungryong; Jan 2008; 55 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0058

Report No.(s): AD-A480276; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480276

The success of intensity-modulated radiation therapy (IMRT) or 4-D conformal radiation therapy (CRT) is heavily reliant

on accurate image guidance in prostate cancer treatment. Cone-beam computed tomography (CBCT) is becoming one of the dominant imaging modalities for image-guidance, but current technology based on Feldkamp algorithm for image reconstruction from a circular scanning trajectory does not yield sufficient quality of images. In addition, imaging-radiation dose is one of the key issues, which has to be minimized or optimized. We report innovative CBCT scanning methods and corresponding image reconstruction algorithms that can increase the accuracy of the images and/or reduce patient dose from CBCT. Reverse helical CBCT has been developed, region-of-interest image reconstruction methods have been explored, and a few-view CBCT approach has been proposed.
DTIC
Cancer; Prostate Gland; Radiation Therapy; Tomography

20080033163 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Practical Use of Emergency Tourniquets to Stop Bleeding in Major Limb Trauma
Kragh, Jr , John F; Walters, Thomas J; Baer, David G; Fox, Charles J; Wade, Charles E; Salinas, Jose; Holcomb, John B; Feb 2008; 14 pp.; In English
Report No.(s): AD-A480277; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480277

Background: Previously we showed that tourniquets were lifesaving devices in the current war. Few studies, however, describe their actual morbidity in combat casualties. The purpose of this study was to measure tourniquet use and complications. Methods: A prospective survey of casualties who required tourniquets was performed at a combat support hospital in Baghdad during 7 months in 2006. Patients were evaluated for tourniquet use, limb outcome, and morbidity. We identified potential morbidities from the literature and looked for them prospectively. The protocol was approved by the institutional review board. Results: The 232 patients had 428 tourniquets applied on 309 injured limbs. The most effective tourniquets were the Emergency Medical Tourniquet (92%) and the Combat Application Tourniquet (79%). Four patients (1.7%) sustained transient nerve palsy at the level of the tourniquet, whereas six had palsies at the wound level. No association was seen between tourniquet time and morbidity. There was no apparent association of total tourniquet time and morbidity (clots, myonecrosis, rigor, pain, palsies, renal failure, amputation, and fasciotomy). No amputations resulted solely from tourniquet use. However, six (2.6%) casualties with eight preexisting traumatic amputation injuries then had completion surgical amputations and also had tourniquets on for > 2 hours. The rate of limbs with fasciotomies with tourniquet time less than or equal to 2 hours was 28% (75 of 272) and >2 hours was 36% (9 of 25, p = 0.4). Conclusions: Morbidity risk was low, and there was a positive risk benefit ratio in light of the survival benefit. No limbs were lost because of tourniquet use, and tourniquet duration was not associated with increased morbidity. Education for early military tourniquet use should continue.
DTIC
Casualties; Emergencies; Hemorrhages; Injuries; Medical Services; Military Operations; Tourniquets

20080033164 Air Force Hospital, Lackland AFB, TX USA
The Use of Temporary Vascular Shunts as a Damage Control Adjunct in the Management of Wartime Vascular Injury
Rasmussen, Todd E; Clouse, W D; Jenkins, Donal H; Peck, Michael A; Eliason, Jonathan L; Smith, David L; Jul 2006; 9 pp.; In English
Report No.(s): AD-A480281; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480281

Historically wartime surgical experience has lead to advances in the treatment of traumatic vascular injury. Past military conflicts have provided lessons on vascular trauma that have been applied to civilian and military surgical practice. From routine injury ligation in World Wars I and II, to the principles of rapid air evacuation and in theater repair of arterial and venous injuries in Korea and Vietnam, limb salvage has steadily improved. Military operations in support of Operation Iraqi Freedom (OIF) represent the first mature military conflict since Vietnam to allow assessment of contemporary practices such as vascular shunts in the management of wartime vascular injuries. Eger et al. in 1971 were among the first to report the use of temporary vascular shunts to treat combat related vascular injuries listing six benefits of this surgical adjunct. Since this publication, understanding of the usefulness of shunts has come from case reports and small series mostly from civilian centers. This experience supports the early exploration of the injured vessel(s) and use of shunts in certain cases as part of an overall strategy in the management of vascular injury. This strategy also includes thrombectomy, administration of heparin to the injured vessel and fasciotomy of the injured extremity. Shunts in the arterial position allow for perfusion of the extremity during transport or fixation of associated orthopedic injuries. For injury patterns involving an artery and vein, shunts placed in the venous position provide drainage and decrease venous hypertension that can compound tissue ischemia and bleeding.

Despite this experience, the role of temporary vascular shunts in a present-day military vascular registry has not been reported and the frequency, pattern of use, safety, and efficacy remain unknown.
DTIC
Bypasses; Cardiovascular System; Circuits; Damage; Hemorrhages; Injuries

20080033166 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Fresh Frozen Plasma Should be Given Earlier to Patients Requiring Massive Transfusion
Gonzalez, Ernest A; Moore, Frederick A; Holcomb, John B; Miller, Charles C; Kozar, Rosemary A; Todd, S R; Cocanour, Christine S; Balldin, Bjorn C; McKinley, Bruce A; Jan 2007; 9 pp.; In English
Report No.(s): AD-A480289; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480289

Acidosis, hypothermia, and coagulopathy ,were identified more than 20 years ago as a deadly triad for patients presenting with exsanguinating hemorrhage. This led to fundamental changes in initial management of severely injured patients. Despite major advances, hemorrhage remains a leading cause of early death in trauma patients. Recent studies report most severely injured patients to be coagulopathic at admission, before resuscitation interventions, and that traditional massive transfusion practice grossly underestimates needs. The hypothesis for this study is that our pre-intensive care unit (ICU) massive transfusion (MT) protocol does not adequately correct coagulopathy, and that early uncorrected coagulopathy is predictive of mortality.
DTIC
Acidosis; Blood; Blood Coagulation; Freezing; Injuries; Patients; Plasmas (Physics); Transfusion

20080033167 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Now and Then: Combat Casualty Care Policies for Operation Iraqi Freedom and Operation Enduring Freedom Compared With Those of Vietnam
Cordts, Paul R; Brosch, Laura A; Holcomb, John B; Feb 2008; 8 pp.; In English
Report No.(s): AD-A480291; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480291

Between December 2004 and June 2007, 13 key Operation Iraqi Freedom/ Operation Enduring Freedom combat casualty care policies were published to inform medical practice in the combat theater of operations. Published policies were authored by the 44th Medical Command (1), the Office of The Army Surgeon General (11), and the Office of the Assistant Secretary of Defense (Health Affairs) (1). These policies, published as an All Army Action message (and/or in memorandum format signed by The Army Surgeon General), were compared with published medical newsletters and medical bulletins issued during the Vietnam War era, beginning in 1966. Common to both wartime eras was the recognition that the presence of a medical research team in theater was a critical element to ensure accurate data capture for subsequent analysis, to document lessons learned, and to study the impact of new wounding mechanisms, whether it be the Pungi sticks and mines of Vietnam or the types of explosions specific to Operation Iraqi Freedom/Operation Enduring Freedom. It is important to recognize that both then and now, medical practice has been a reflection of the current state of medical practice, and that in both conflicts military medical personnel have been equally devoted to saving lives of combat casualties.
DTIC
Casualties; Combat; Injuries; Medical Science; Medical Services; Physicians; Policies; Surgery; Vietnam; Warfare

20080033168 Madigan Army Medical Center, Takoma, WA USA
Colon and Rectal Injuries During Operation Iraqi Freedom: Are There Any Changing Trends in Management or Outcome
Steele, Scott R; Wolcott, Kate E; Mullenix, Philip S; Martin, Matthew J; Sebesta, James A; Azarow, Kenneth S; Beekley, Alec C; Apr 2007; 9 pp.; In English
Report No.(s): AD-A480293; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480293

%: Despite the evolution in the management of traumatic colorectal injuries in both civilian and military settings during the previous few decades they continue to be a source of significant morbidity and mortality. The purpose of this study was to analyze management and clinical outcomes from a cohort of patients suffering colorectal injuries.
DTIC
Antibiotics; Injuries; Intestines; Rectum; Trends

20080033170 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Prediction of Mortality and of the Need for Massive Transfusion in Casualties Arriving at Combat Support Hospitals in Iraq

Cancio, Leopoldo C; Wade, Charles E; West, Susan A; Holcomb, John B; Oct 2007; 7 pp.; In English

Report No.(s): AD-A480295; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480295

Our purpose was to compare the Revised Trauma Score (RTS) with the new Field Triage Score (FTS) for prediction of mortality (MORT) and of need for massive transfusion (MASS, >10 units of packed cells or whole blood) in casualties arriving at combat support hospitals in Iraq.

DTIC

Blood; Casualties; Combat; Hospitals; Injuries; Iraq; Mortality; Support Systems; Transfusion

20080033171 Texas Univ., Houston, TX USA

Cyclin E, A Powerful Predictor of Survival in Breast Cancer-A Prospective Study

Keyomarsi, Khandan; Jun 2006; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0452

Report No.(s): AD-A480297; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480297

Aberrations in expression of cyclin E, a positive cell cycle regulator at the G1 to S transition, may affect the biological behavior of breast cancer. In a retrospective analysis of tumor specimens from 395 breast cancer patients, we found that overexpression of the full-length cyclin E protein and its LMW isoforms was a very strong predictor of breast cancer death regardless of whether patients had lymph node-negative disease or lymph node-positive disease ($p < 0.0001$). Our hypothesis is that dysregulation of cyclin E is a powerful prognostic indicator of outcome in early stage breast cancer. Specifically we will: 1: use cyclin E antibody as a prognostic marker for stage I and II breast cancer in a PROSPECTIVE study, 2: examine the cyclin E associated activity and its immunecomplex formation with key cell cycle regulators in freshly resected tumor samples, and 3: develop an immunohistochemical (IHC) assay for specifically detecting the LMW forms of cyclin E in Breast Cancer. We will correlate the cyclin E alterations in samples with the expression of key cell cycle regulators and clinical biomarkers. If we prospectively confirm cyclin E overexpression correlates with poor outcome, clinicians can more appropriately tailor aggressive systemic treatment to those at greatest risk for systemic metastases.

DTIC

Breast; Cancer; Clinical Medicine; Mammary Glands; Survival

20080033172 Pittsburgh Univ., Pittsburgh, PA USA

Efficacy of Adjunct Sleep Interventions for PTSD

Germain, Anne; Mar 1, 2007; 33 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0257

Report No.(s): AD-A480298; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480298

In this first year of funding, we have successfully achieved all goals initially set in our statement of work and task timeline for the first 20 months of the award. Recruitment has been delayed and accrued at a slower pace than initially anticipated for clinician-initiated referrals. However, we have rapidly changed our recruitment strategy and continue to seek opportunities to collaborate effective with our colleagues at the VAPHS to facilitate and enhance recruitment of military veterans with sleep disturbances to our research program. This award has also significantly contributed to other reportable outcomes included a peer-reviewed manuscript currently in press, several presentations, and provided preliminary data for other applications for federal funding by the PI.

DTIC

Clinical Medicine; Diseases; Injuries; Psychology; Signs and Symptoms; Sleep

20080033173 Albany Medical Coll., NY USA

Identification of a Potent Apoptotic Peptide Produced by Fibroblasts; Studies Towards the Design of a Novel Agent for Breast Cancer Therapy

Petti, Lisa M; Sep 5, 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0764

Report No.(s): AD-A480299; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480299

We previously showed that constitutive activation of the PDGF beta receptor (PDGFR) in mortal human fibroblasts (HDFs) by certain viral oncoproteins results in partial transformation of these cells. However, two weeks after reaching their peak density, these partially transformed cells produce a small (<3 kDa) peptide that induces massive apoptosis in an autocrine manner. Specifically, this peptide induces apoptosis by promoting Bax activation and subsequent mitochondrial dysfunction. The primary goal of this project has been to identify the apoptotic peptide produced by these cells. Our recent evidence suggests that production of this peptide requires specific PDGFR signaling pathways and a matrix metalloprotease (MMP). Furthermore, we found that the peptide is negatively charged and can be competitively inhibited by a peptide derived from the N-terminus of MMP-2. Our evidence also implicated the proapoptotic protein p66Shc and increased levels of intracellular ROS in apoptosis of HDFs. We therefore speculate that the apoptotic peptide is a degradation product of an extracellular protein that binds to a cell surface receptor and enters the cell via endocytosis. We propose that the peptide, once inside the cell, affects the activity of p66Shc, which in turn promotes production of intracellular ROS followed by Bax activation and apoptosis. Although we have not yet identified the apoptotic peptide, we have discerned some of its unique characteristics and effects. We are optimistic that the information gained from these studies will allow us to identify this peptide in the future. Once identified, this peptide could be used to design a novel anti-cancer therapeutic.

DTIC

Apoptosis; Breast; Cancer; Fibroblasts; Mammary Glands; Peptides; Therapy

20080033174 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Comparison Between Civilian Burns and Combat burns From Operation Iraqi Freedom and Operation Enduring Freedom

Wolf, Steven E; Kauvar, David S; Wade, Charles E; Cancio, Leopoldo C; Renz, Evan P; Horvath, Edward E; White, Christopher E; Park, Myung S; Wanek, Sandra; Albrecht, Michael A; Jun 2006; 11 pp.; In English

Report No.(s): AD-A480300; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480300

To assess outcome differences between locally burned civilians and military personnel burned in a distant combat zone treated in the same facility. The USA Army Institute of Surgical Research (USAISR) Burn Center serves as a referral center for civilians and is the sole center for significant burns in military personnel. We made the hypothesis that outcomes for military personnel burned in the current conflict in Iraq and Afghanistan would be poorer because of delays to definitive treatment, other associated injury, and distance of evacuation.

DTIC

Burns (Injuries); Combat; Injuries; Iraq; Medical Science

20080033175 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA

A Lessons-Learned Legacy

Champion, Howard R; Feb 2008; 3 pp.; In English

Report No.(s): AD-A480301; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480301

The combat casualties of war have always provided society with substantial advances in knowledge and care of injury. The casualties of Operations Iraqi Freedom (OIF) and Enduring Freedom (OEF) are no exception. A serious sampling of the lessons learned from caring for these wounded soldiers and Marines and subsequent research initiatives are published in this Supplement to the Journal of Trauma as a result of the endeavors of the young healthcare teams at the vanguard. Many of these scholarly dispatches were created and completed in the war zone. We should all appreciate and respect their contribution and recognize the birth of a new generation of trauma expertise. To fully comprehend this achievement, however, it needs to be placed in some historical context. After lessons learned in World War I had been relearned and integrated into combat casualty care in the second half of World War II, the died of wounds (death after reaching a physician-staffed medical treatment facility) rate fell substantially. This was sustained with further improvements in care in Korea and Vietnam. In the latter conflict, 153,303 Americans were seriously injured and 58,209 were killed,1 with 16,592 deaths in 1968 alone. During that conflict,

the Army Chief of Staff, General Creighton Abrams, ordered a detailed evaluation of weapons effectiveness and dispatched seven teams to gather tactical, weapon, and wound information. This Wound Data Munitions Effectiveness Team (WDMET) database contained 7,989 combat injuries, about a 5% sample of those seriously injured in Vietnam. Despite its purpose assessment of weapons effectiveness and the fact that it has been sparsely studied, the WDMET database has driven a lot of combat casualty doctrinal thinking since that time.
DTIC
Casualties; Combat; Injuries; Lessons Learned; Medical Services

20080033176 Madigan Army Medical Center, Takoma, WA USA
Mass Casualties in Combat: Lessons Learned
Beekley, Alex C; Jan 2007; 3 pp.; In English
Report No.(s): AD-A480309; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480309

The current military trauma systems in Iraq and Afghanistan are effective at dealing with both routine multiple casualty events and the less common mass casualty event. Analysis of multiple and mass casualty events from current conflicts can provide critical lessons learned regarding triage and resource utilization that can potentially be applied to other conflicts or civilian multiple or mass casualty events. Although the findings of this study regarding blood product utilization may not be directly applicable to catastrophic, national-level events, the consistency of the findings with the Israeli experience and across a wide range of smaller multiple or mass casualty explosion-related events is striking. Hence, for such events, the number of casualties generated may provide a reliable baseline prediction of blood product needs and percentages of patients who will require transfusion and massive transfusion. This in turn can help determine the distribution of casualties among medical treatment facilities and allow for activation of additional blood resources, such as notification of more distant blood banks or initiation of fresh whole blood drives. Clearly, the experiences with mass casualty events that both military and civilian surgeons encounter must continue to be studied and shared.
DTIC
Blood; Casualties; Injuries; Lessons Learned; Resources Management; Transfusion

20080033178 Washington Univ., Seattle, WA USA
Molecular Profiling of Prostate Cancer Specimens Using Multicolor Quantum Dots
Gao, Xiaohu; Feb 2008; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0117
Report No.(s): AD-A480311; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480311

Each person's cancer is as unique as his or her fingerprint, which explains unpredictable responses to therapies and poses new biotechnology challenges for tumor characterization on the molecular level. For these reasons, it is of pivotal importance to develop novel molecular profiling methodologies for diagnosis, prognosis and individually tailored therapeutics of patients based on the biology of their tumors. We proposed to develop oligonucleotide tagged quantum dots and antibodies for multiplexed imaging of prostate cancer specimens.
DTIC
Cancer; Oligonucleotides; Prostate Gland; Quantum Dots

20080033179 Texas Univ., Galveston, TX USA
The Mechanosensory Ca2+ Channel as a Central Regulator of Prostate Tumor Cell Migration and Invasiveness
Hamill, Owen P; Jan 2008; 215 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0040
Report No.(s): AD-A480313; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480313

Our patch clamp studies indicate MscCa is expressed by the invasive prostate tumor cell PC-3. Anti-MscCa agents, Gd3+, GsmTx-4, and an anti-TRPC1 antibody block PC-3 cell migration. MscCa activity can be recorded over the surface of the PC-3 cell but is expressed at higher density on the rear compared with the front of the cell. This channel density gradient combined with a higher density of thapsigargin-sensitive Ca2+ stores in the rear of the cell enables the development of an intracellular Ca2+ gradient (low front high rear) in migrating PC- 3 cells that determines migration directionality. Gene silencing of TRPC1 and/or TRPC3, but not TRPC4 or TRPC6, blocks PC-3 cell migration. Permanently suppressing TRPC1

also reduces PC-3 cell proliferation and thereby blocks tumor invasion in vivo. The noninvasive human prostate tumor cell line LNCaP expresses MscCa but the channel undergoes rapid inactivation that prevents Ca2+ gradient development and directional cell migration. Our results indicate that specific forms of mechanical stimuli can switch the inactivating gating mode to the non-inactivating mode seen in PC-3 cells, and this switch is independent of the actin-cytoskeleton. These findings have specific implications regarding the possible role of the increases mechanical forces (e.g., solid stress and interstitial fluid compression) that develop within a growing prostate tumor in promoting its progression to malignancy.
DTIC
Cancer; Cells (Biology); Migration; Prostate Gland; Regulators; Tumors

20080033181 California Univ., Los Angeles, CA USA
The Impact of Prostate Cancer Treatment-Related Symptoms on Low-Income Latino Couples
Maliski, Sally L; Mar 2008; 271 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0069
Report No.(s): AD-A480315; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480315

Prostate cancer is the most commonly diagnosed non-skin cancer among men in the USA, and Latinos are the most rapidly growing minority in the USA. Even when prostate cancer is diagnosed and treated early, there are a number of side effects that can have an impact on men's quality of life including erectile dysfunction, incontinence, and a diminished desire for sexual relations. Because of these treatment side effects, prostate cancer is often considered a couples' disease. The purpose of our study is to describe the impact of prostate cancer treatment-related symptoms on low-income Latino couples undergoing a radical prostatectomy. We will interview couples at three time points following the man's surgery. The men will be asked to complete a questionnaire that asks about urinary, bowel, sexual, and hormonal symptoms and one that asks about his relationship with his partner. The partner will be asked to complete the same relationship questionnaire. Couples will be interviewed by telephon.
DTIC
Cancer; Couples; Income; Prostate Gland; Signs and Symptoms

20080033182 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Incidence of Posttraumatic Stress Disorder and Mild Traumatic Brain Injury in Burned Service Members: Preliminary Report
Gaylord, Kathryn M; Cooper, Douglas B; Mercado, Janyna M; Kennedy, Jan E; Yoder, Linda H; Holcomb, John B; Feb 2008; 8 pp.; In English
Report No.(s): AD-A480316; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480316

Although sustaining physical injury in theater increases service members' risk for posttraumatic stress disorder (PTSD), exposure to explosive munitions may increase the risk of mild traumatic brain injury (mTBI). The authors hypothesized a higher incidence of PTSD and mTBI in service members who sustained both burn and explosion injuries than in nonexplosion-exposed service members. A retrospective review of PTSD and mTBI assessments was completed on burned service members between September 2005 and August 2006. Subjects were divided into cohort groups: (1) PTSD and mTBI, (2) PTSD and no mTBI, (3) mTBI and no PTSD, (4) no mTBI and no PTSD. Specific criteria used for group classification were based on subjects' total score on the Posttraumatic Stress Disorder Checklist, Military version (PCL-M), a clinical interview, and record review to meet American Congress of Rehabilitation Medicine criteria for mTBI. Descriptive analyses were used. Results showed that 76 service members met the inclusion criteria. The incidence rate of PTSD was 32% and mTBI was 41%. Eighteen percent screened positive for PTSD and mTBI; 13% screened positive for PTSD, but not mTBI; 23% screened positive for mTBI but not PTSD; 46% did not screen positive for either PTSD or mTBI. The authors conclude that given the high incidence of these disorders in burned service members, further screening of PTSD and TBI appears warranted. Because symptom presentation in PTSD and mTBI is clinically similar at acute and subacute stages, and treatments can vary widely, further research investigating symptom profiles of PTSD and mTBI is warranted.
DTIC
Brain Damage; Burns (Injuries); Disorders; Explosives; Injuries; Mental Health; Signs and Symptoms

20080033183 Army Inst. of Surgical Research, San Antonio, TX USA

Admission Physiology Criteria After Injury on the Battlefield Predict Medical Resource Utilization and Patient Mortality

Eastridge, Brian J; Owsley, Jimmie; Sebesta, James; Beekley, Alec; Wade, Charles; Wildzunas, Robert; Rhee, Peter; Holcomb, John; Oct 2006; 5 pp.; In English

Report No.(s): AD-A480319; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480319

Medical resources and resource allocation are of prime importance in the modern combat environment. We hypothesized that easily measurable admission physiologic criteria and injury site as well as injury severity calculated after diagnostic evaluation or surgical intervention, would be strongly correlated with resource utilization and in theater mortality outcomes. We retrospectively reviewed the Joint Theater Trauma Registry for all battlefield casualties presenting to surgical component facilities during Operation Iraqi Freedom from Jan-Jul 2004. Data were collected from battlefield casualty patients with respect to demographics, mechanism, presentation physiology (blood pressure, heart rate, temperature), base deficit, admission hematocrit, Glasgow Coma Score (GCS), Injury Severity Score (ISS), operating room utilization, blood transfusion, and mortality. Univariate and multivariate analyses were conducted to determine the degree to which admission physiology and injury severity correlated with blood utilization, necessity for operation, and acute mortality. From our analyses, easily measurable physiologic variables, including temperature, hematocrit, and base deficit, as well as the anatomic characteristics of ISS, were soundly correlated with resource utilization in the contemporary battlefield environment. In the future, the use of such predictive physiologic data could be very useful for triage and medical logistics in the resource constrained environment of war.

DTIC

Forecasting; Injuries; Mortality; Patients

20080033184 Army Medical Research and Materiel Command, Fort Detrick, MD USA

Establishing a Human Research Protection Program in a Combatant Command

Brosch, Laura R; Holcomb, John B; Thompson, Jennifer C; Cordts, Paul R; Feb 2008; 6 pp.; In English

Report No.(s): AD-A480320; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480320

Extensive USA combat operations commenced for the first time in over decade in 2003. Early in 2004 there was no human research protection regulatory review and approval mechanism based in a deployed military combatant command. The absence of such a system presented a critical impediment to implementation of the time-honored tradition of a robust combat casualty care research effort. A coalition of concerned military medical personnel from the US Army proposed a novel mechanism to meet Department of Defense (DOD) requirements for the human research protection oversight of studies conducted in the combat theater of operations. In 2005, the Commander of Task Force 44 Medical Command (44th MEDCOM), who was serving as the Multi-National Corps Iraq (MNC-I) Surgeon, was charged with negotiating a DOD Assurance and implementing a new system of research review and protections. He deployed an Army Medical Department Medical Corps officer to assist in this endeavor and operationalize the plan. On March 19, 2005, the Multi-National Corps Iraq Commander signed a historic agreement with the US Army Surgeon General who developed a regulatory support and oversight mechanism to conduct research in theater. This innovative system not only honored the Army's commitment to human research protections, but also provided much needed support in the form of scientific and ethical review and compliance oversight to those deployed medical personnel with the vision to conduct healthcare studies in the combat environment. On July 20, 2005, the first DOD Assurance of Compliance for the Protection of Human Research Subjects was approved for MNC-I. This assurance allows the conduct of human subjects research in full compliance with all Federal, DOD, and Army regulatory requirements. This article describes that unique process.

DTIC

Data Acquisition; Ethics; Medical Science; Policies; Protection; Research Management

20080033185 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Joint Theater Trauma System Implementation of Burn Resuscitation Guidelines Improves Outcomes in Severely Burned Military Casualties

Ennis, Jody L; Chung, Kevin K; Renz, Evan M; Barillo, David J; Albrecht, Michael C; Jones, John A; Blackbourne, Lorne H; Cancio, Leopoldo C; Eastridge, Brian J; Flaherty, Steven F; Oct 2007; 8 pp.; In English

Report No.(s): AD-A480322; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480322

Between March 2003-June 2007, our burn center received 594 casualties from Iraq and Afghanistan. Ongoing acute burn

resuscitation as severely burned casualties are evacuated is very challenging. To help standardize care, burn resuscitation guidelines (BRG) were devised along with a burn flow sheet (BFS) and disseminated via the new operational Joint Theater Trauma System (JTTS) to assist deployed providers. After the BRG was implemented in January 2006, BRF data were prospectively collected in consecutive military casualties with >30% total body surface area (TBSA) burns (BRG Group). Baseline demographic data and fluid requirements for the first 24 hours of the burn resuscitation were collected from the BFS. Percentage full thickness TBSA burns, presence of inhalation injury, injury severity score, resuscitation-related abdominal compartment syndrome, and mortality were collected from our database. Individual charts were reviewed to determine the presence of extremity fasciotomies and myonecrosis. These results were compared with consecutive military casualties admitted during the 2-year period before the system-wide implementation of the BRG (control group). One hundred eighteen military casualties with burns >30% TBSA were admitted between January 2003 and June 2007, with 56 in the BRG group and 62 in the control group. The groups were different in age, but similar in %TBSA, %full thickness, presence of inhalation injury, and injury severity score. There was no difference in the rate of extremity fasciotomies or the incidence of myonecrosis between groups. The composite endpoint of abdominal compartment syndrome and mortality was significantly lower in the BRG group compared with the control group. Implementation of the BRG and system-wide standardization of burn resuscitation improved outcomes in severely burned patients. Utilization of the joint theater trauma system to implement system-wide guidelines is effective and can help improve outcomes.
DTIC
Air Transportation; Body Fluids; Casualties; Evacuating (Transportation); Injuries; Medical Services; Resuscitation

20080033186 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Incidence and Severity of Combat Hand Burns After All Army Activity Message
Hedman, Travis L; Renz, Evan M; Richard, Reginald L; Quick, Charles D; Dewey, William S; Barillo, David J; Cancio, Leopoldo C; Baer, David G; Wolf, Steven E; Holcomb, John B; Aug 2007; 6 pp.; In English
Report No.(s): AD-A480323; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480323

Operations Enduring Freedom and Iraqi Freedom have resulted in severe burns to the hands. Because of the frequency and severity of hand burns, an All Army Activity (ALARACT) message was distributed emphasizing the importance of hand protection (HP). Our purpose was to assess the effectiveness of the ALARACT in reducing the incidence and severity of hand burns. A retrospective review of the US Army Institute of Surgical Research Burn Registry for active duty personnel with hand burns 17 months before and after the ALARACT was conducted. Data include percentage total body surface area (% TBSA), % full-thickness injury, depth of hand burn, and ratio of hand burn to TBSA. Statistical analysis was performed using Mann-Whitney U test. Results: Four hundred fifty-one military personnel were admitted during the 34- month period: 257 (56.9%) pre-ALARACT; 194 (43.1%) post-ALARACT. Two hundred thirty-nine (52.9%) sustained hand burns: 138 (53.7%) pre-ALARACT; 101 (52.1%) post-ALARACT (p NS). Mean TBSA: 21.5% pre-ALARACT; 28.8% post- ALARACT (p = 0.01). Mean full-thickness TBSA: 14.5% pre-ALARACT; 21.9% post- ALARACT (p = 0.02). Mean hand TBSA: 3.2% pre-ALARACT; 3.2% post-ALARACT (p = NS). Mean ratio, hand burn to TBSA: 36% pre-ALARACT; 25% post-ALARACT (p < 0.001). Post-ALARACT, the incidence of hand burns remained unchanged. Despite an increase in burn severity, ratio of hand burn to TBSA decreased, suggesting a possible relationship between increased awareness and use of HP and decreased injury. Based on the data collected, the impact of the ALARACT is unclear. The importance of HP remains a priority. The fact that the incidence of hand burns remains unchanged demands our continued awareness and increased efforts.
DTIC
Burns (Injuries); Combat; Messages

20080033189 Madigan Army Medical Center, Takoma, WA USA
Prehospital Tourniquet Use in Operation Iraqi Freedom: Effect on Hemorrhage Control and Outcomes
Beekley, Alec C; Sebesta, James A; Blackbourne, Lorne H; Herbert, Garth S; Kauvar, David S; Baer, David G; Walters, Thomas J; Mullenix, Philip S; Holcomb, John B; Feb 2008; 11 pp.; In English
Report No.(s): AD-A480327; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480327

We hypothesized that prehospital tourniquet use decreased hemorrhage from extremity injuries and saved lives, and was not associated with a substantial increase in adverse limb outcomes. Methods: This was an institutional review board-approved, retrospective review of the 31st combat support hospital for 1 year during Operation Iraqi Freedom. Inclusion criteria were any patient with a traumatic amputation, major extremity vascular injury, or documented prehospital tourniquet.

Results: Among 3,444 total admissions, 165 patients met inclusion criteria. Sixty-seven patients had prehospital tourniquets (TK); 98 patients had severe extremity injuries but no prehospital tourniquet (No TK). Extremity Acute Injury Scores were the same (3.5 TK vs. 3.4 No TK) in both groups. Differences ($p < 0.05$) were noted in the numbers of patients with arm injuries (16.2% TK vs. 30.6% No TK), injuries requiring vascular reconstruction (29.9% TK vs. 52.5% No TK), traumatic amputations (41.8% TK vs. 26.3% No TK), and in those patients with adequate bleeding control on arrival (83% TK vs. 60% No TK). Secondary amputation rates (4 (6.0%) TK vs. 9 (9.1%) No TK); and mortality (3 (4.4%) TK vs. 4 (4.1%) No TK) did not differ. Tourniquet use was not deemed responsible for subsequent amputation in severely mangled extremities. Analysis revealed that four of seven deaths were potentially preventable with functional prehospital tourniquet placement. Conclusions: Prehospital tourniquet use was associated with improved hemorrhage control, particularly in the worse injured (Injury Severity Score >15) subset of patients. Fifty-seven percent of the deaths might have been prevented by earlier tourniquet use. There were no early adverse outcomes related to tourniquet use.
DTIC
Hemorrhages; Injuries; Therapy; Tourniquets

20080033190 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Continuous Renal Replacement Therapy Improves Survival in Severely Burned Military Casualties With Acute Kidney Injury
Chung, Kevin K; Juncos,, Luis A; Wolf, Steven E; Mann, Elizabeth E; Renz, Evan M; White, Christopher E; Barillo, David J; Clark, Richard A; Jones, John A; Edgecombe, Harcourt P; Oct 2007; 10 pp.; In English
Report No.(s): AD-A480328; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480328

Background: Acute kidney injury in severely burned patients is associated with high mortality. We wondered whether early use of continuous renal replacement therapy (CRRT) changes outcomes in severely burned military casualties with predetermined criteria for acute kidney injury. Methods: Between November 2005 and June 2007, casualties admitted to our burn intensive care unit after sustaining burns in Iraq and Afghanistan, who subsequently developed acute kidney injury or circulatory shock or both, underwent CRRT. Baseline demographic, laboratory, and hemodynamic parameters were recorded. Both 28-day mortality and in-hospital mortality were evaluated and compared with a consecutive group of burn casualties with greater than 40% total body surface area (TBSA) burns, acute kidney injury, or nephrology consultation in the 2 years before the existence of our CRRT program. Conclusion: Aggressive application of CRRT in severely burned casualties with kidney injury significantly improves survival.
DTIC
Casualties; Injuries; Kidneys; Replacing; Survival; Therapy

20080033191 Naval Medical Research Inst., Bethesda, MD USA
Transfusion-Associated Microchimerism in Combat Casualties
Dunne, James R; Lee, Tzong-Hae; Burns, Christopher; Cardo, Lisa J; Curry, Kathleen; Busch, Michael P; Oct 2007; 8 pp.; In English
Report No.(s): AD-A480329; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480329

Background: Fresh whole blood (FrWB) is routinely used in the resuscitation of combat casualties in Operation Iraqi Freedom and Operation Enduring Freedom. However, studies have shown high rates (20%-40%) of transfusion-associated microchimerism (TA-MC) in civilian trauma patients receiving allogenic red blood cell (RBC) transfusions. We explored the incidence of TA-MC in combat casualties receiving FrWB compared with patients receiving standard stored RBC transfusions. Methods: Prospective data on TA-MC at > or = 14 days post-transfusion were collected on 26 severely injured combat casualties admitted to the National Naval Medical Center between December 2006 and March 2007. Demographic variables included age, sex, Injury Severity Score, and transfusion history. Data are expressed as mean + or - SD. Results: The mean age of the study cohort was 24 + or - 7; mean Injury Severity Score was 17 + or - 12. All were men and suffered penetrating injury. Average hospital length of stay was 46 + or - 35 days. TA-MC was present in 45% (10 of 22) patients who were transfused at least 1 unit of blood. The four nontransfused patients all tested negative for TA-MC. Among six patients who received 4 to 43 units of FrWB, five also received RBCs and one apheresis platelets. The remaining 16 transfused patients who received RBCs (no FrWB) included seven who also received platelets in theater. The prevalence of TA-MC was 50% (3 of 6) in FrWB patients, 50% in patients given platelets (4 of 8), and 38% (3 of 8) in those given only RBCs as a cellular component ($p = 0.61$). Conclusions: Although these preliminary data do not demonstrate a significantly increased rate of TA-MC in FrWB or apheresis platelets recipients compared with RBC recipients, the overall 45% (10 of 22) rate of TA-MC

in transfused soldiers warrants further study to ascertain possible clinical consequences such as graft-versus-host or autoimmune disease syndromes.
DTIC
Blood; Casualties; Combat; Immunology; Transfusion

20080033192 Brooke Army Medical Center, Fort Sam Houston, TX USA
Ventilator Associated Pneumonia in a Military Deployed Setting: The Impact of an Aggressive Infection Control Program
Landrum, Michael L; Murray, Clinton K; Feb 2008; 7 pp.; In English
Report No.(s): AD-A480330; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480330

Background: Since the onset of military operations in Iraq and Afghanistan, there has been a marked increased in multidrug resistant bacterial infections among combat casualties. We describe the rates of ventilator-associated pneumonia (VAP) before and after the implementation of aggressive infection control measures at the Air Force Theater Hospital in Iraq. Methods: All patients admitted to the intensive care unit (ICU) were followed prospectively for the development of VAP. Baseline VAP rate was determined in May 2006, and preventive measures were implemented by June 2006. Interventions included hand hygiene, contact barrier precautions, patient and staff cohorting, chlorhexidine oral care, and reducing the duration and spectrum of surgical antimicrobial prophylaxis. Additionally, each ICU tent was closed periodically for cleaning and disinfection. Daily inspections provided ongoing staff education and enforcement of procedures. Monthly VAP rates were calculated and compared for trend. Results: There were 475 ICU admissions from May 2006 through August 2006 for a mean admission rate of 119 per month. The rate of VAP per 1,000 ventilator days was 60.6 in May, 31.6 in June, 21.3 in July, and 11.1 in August ($p = 0.029$). Targeted surveillance in November and December revealed VAP rates of 11.6 and 9.7, respectively. Notably, the most common bacteria, Acinetobacter, had improved antimicrobial susceptibilities after the interventions. Conclusions: Implementation of aggressive infection control procedures in a combat military hospital was associated with a significant decrease in the rate of VAP. Despite the numerous challenges in theater, infection control can have measurable and sustainable impact in a combat theater hospital.
DTIC
Antiseptics; Deployment; Infectious Diseases; Pneumonia; Ventilators

20080033195 Rochester Univ., NY USA
To Investigate the Therapeutic Efforts of the COX-2 Inhibitor NS-398 as a Single Agent, and in Combination with Vitamin D, in Vitro and in Vivo
Lee, Yi-Fen; Jan 1, 2008; 53 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0121
Report No.(s): AD-A480335; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480335

With disease progression, the majority of the prostate cancers would eventually evolve into lethal aggressive hormone refractory disease; therefore, there are needs for developing new strategies to prevent the disease progression. We have identified a cross-talk between vitamin D and COX-2 inhibitor, two chemopreventative agents for prostate cancer, and conducted series investigations of their anti-prostate cancer effects with the funding support from DOD, which have led to generation of three publications. First, we identified the molecular mechanism by which vitamin D inhibits prostate cancer angiogenesis through IL-8, finding a strong correlation of IL-8 expression with prostate cancer disease progression, therefore, inhibition of IL-8 by vitamin D supports the chemotherapeutic effects of vitamin D in preventing prostate cancer progression. Second, we studied the vitamin D-based combination with docetaxel therapy. Docetaxel is the only treatment shown to improve overall survival in hormonal refractory prostate cancer patients (HRPC); however the survival benefit is modest. Treatment with docetaxel in combination with the active form of vitamin D has shown promising results in prostate specific antigen (PSA) response, time to progression and survival in HRPC patients. Our detailed mechanism of this combination therapy was studied to provide a further therapeutic design. Third, the mechanism(s) of elevation of COX-2 expression in late stage of disease and its contribution to the cancer progression were further explored. We found that androgen/AR signals suppressed COX-2 activity, therefore the blockage of androgen signals in complete androgen blockage therapy would then consequently result in elevated COX-2 expression and promote the disease progression. The clinical use of COX-2 inhibitors

has recently become controversial due to cardiovascular complications associated with the use of COX-2 inhibitor for prolonged periods of time.
DTIC
Calciferol; Cancer; Carbon Dioxide; In Vitro Methods and Tests; In Vivo Methods and Tests; Inhibitors; Prostate Gland; Therapy

20080033196 Baylor Coll. of Medicine, Houston, TX USA
MicroRNA and Breast Cancer Progression
Galaktionov, Konstantin; Aug 2007; 10 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0428
Report No.(s): AD-A480336; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480336

We hypothesized that certain miRNA species are differentially expressed in the normal breast epithelium and breast cancer cells. Our concept was that these miRNAs are involved in breast cancer progression by promoting either loss or alternatively an increase (in case of miRNA downregulation) in specific target mRNA translation or stability. In order to determine if certain miRNAs are involved in breast cancer we proposed to: 1. Identify the changes in miRNA expression in primary breast tumors and/or breast cancer cell lines. 2. Establish the alterations in miRNA target(s) expression or translation in breast cancer cells. Accordingly, we investigated miRNA expression in several breast cancer cell lines, including MCF10A. We consistently observed decreased expression of mir-125b and mir-145 miRNA s and increased expression of mir-21 and mir-155. Interestingly, mir-21 was progressively upregulated during oncogenic progression of MCF10A cells. In silico analysis of the potential target mRNAs include oncogenes (fos, N-myc, Fli-1) and cell cycle proteins (cdc2, cyclin D1, wee1), suggesting that miRNAs might regulate expression of these genes in breast cancer cells.
DTIC
Breast; Cancer; Mammary Glands; Ribonucleic Acids

20080033198 Walter Reed Army Inst. of Research, Silver Spring, MD USA
Mental Health Problems, Use of Mental Health Services, and Attrition From Military Service After Returning From Deployment to Iraq or Afghanistan
Hoge, Charles W; Auchterlonie, Jennifer L; Milliken, Charles S; Mar 1, 2006; 11 pp.; In English
Report No.(s): AD-A480354; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480354

The US military has conducted population-level screening for mental health problems among all service members returning from deployment to Afghanistan, Iraq, and other locations. To date, no systematic analysis of this program has been conducted, and studies have not assessed the impact of these deployments on mental health care utilization after deployment. To determine the relationship between combat deployment and mental health care use during the first year after return and to assess the lessons learned from the postdeployment mental health screening effort, particularly the correlation between the screening results, actual use of mental health services, and attrition from military service. Design, Setting, and Participants Population-based descriptive study of all Army
DTIC
Afghanistan; Deployment; Iraq; Medical Services; Mental Health

20080033199 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
A Special Report on the Chitosan-Based Hemostatic Dressing: Experience in Current Combat Operations
Wedmore, Ian; McManus, John G; Pusateri, Anthony E; Holcomb, John B; Mar 2006; 5 pp.; In English
Report No.(s): AD-A480357; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480357

Hemorrhage remains a leading cause of death in both civilian and military trauma patients. The Hem-Con chitosan-based hemostatic dressing is approved by the US Food and Drug Administration (FDA) for hemorrhage control. Animal data have shown the HemCon dressing to reduce hemorrhage and improve survival. The purpose of this article is to report preliminary results of the hemostatic efficacy of the HemCon dressing used in the prehospital setting on combat casualties.
DTIC
Blood Coagulation; Combat; Hemorrhages; Medical Services; Military Operations; Military Personnel

20080033200 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

The 2004 Fitts Lecture: Current Perspective on Combat Casualty Care

Holcomb, John B; Jul 2005; 14 pp.; In English

Report No.(s): AD-A480359; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480359

I would like to thank the American Association for the Surgery of Trauma and President Cryer for the opportunity to deliver the 2004 Fitts Lecture. When Dr. Cryer asked me to deliver this lecture, I actually wondered whether he had called the wrong number. Dr. Basil Pruitt described Dr. William P. Fitts in his 1992 Fitts Lecture as a physician soldier in World War II, an author, a chairman, an editor of the Journal of Trauma, and a past President of our association .1 To deliver a talk named after such an esteemed surgeon soldier is indeed a privilege. So, as Commander of the U.S. Army Institute of Surgical Research (USAISR), and Trauma Advisor to the Army Surgeon General, I am here to represent the men and women who serve in uniform, and I hope to do them justice today. At this point, I would like all Operation Iraqi Freedom and Operation Enduring Freedom personnel to please stand and be recognized. Dr. Donald Trunkey discussed his experiences as a deployed Chief of Professional Services of the 50th Field Hospital during Desert Shield/Desert Storm in the 1991 Fitts Lecture and in a paper in The Archives of Surgery in 1993.2,3 Subsequently, he lectured and wrote multiple afteraction reports, resulting in numerous Government Accounting Reports about these experiences. 10 In summary, Dr. Trunkey believed there was significant room for improvement in our ability to care for injured casualties in a deployed setting. Dr. Basil Pruitt eloquently described the interaction between the AAST and military medicine. Both men are retired Army Colonels who have spent the better part of their careers serving in the military. To prepare for this lecture, I went back and read their articles and reports and discussed their findings with the respective authors, among many others.

DTIC

Casualties; Combat; Injuries; Medical Science; Medical Services; Military Operations

20080033201 Emory Univ., Atlanta, GA USA

Identification of the Transformational Properties and Transcriptional Targets of the Oncogenic SRY Transcription Factor SOX4

Scharer, Christopher; Jan 2008; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0044

Report No.(s): AD-A480360; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480360

The exact role of SOX4 in development and promoting tumorigenesis however is currently unknown. Here we sought to identify the direct transcriptional targets of SOX4 on a global scale to determine the gene networks affected in human cancers and development. Using chromatin immunoprecipitation coupled to DNA microarrays tiling the promoters of 25,000 known genes (ChIP-chip), we identified 140 high confidence promoter regions bound by SOX4 in living human prostate cancer cells. We have also used a unique protein-binding double-stranded DNA microarray to determine a novel SOX4 specific position-weight matrix for in silico SOX4 binding site searches. Direct targets of SOX4 include several key cellular regulators and 11 other transcription factors such as SOX11, ZNF281, and ZHX2. SOX4 impacts the Notch pathway, FGF signaling via regulation of FGFRL1, as well as the Hedgehog pathway via regulation GLIS2. These data provide new insights into how SOX4 impacts growth factor and developmental signaling pathways and how these changes may influence cancer progression and development.

DTIC

Cancer; Carcinogens; Deoxyribonucleic Acid; Prostate Gland; Targets; Tumors

20080033202 Brooke Army Medical Center, Fort Sam Houston, TX USA

The Ratio of Blood Products Transfused Affects Mortality in Patients Receiving Massive Transfusions at a Combat Support Hospital

Borgman, Matthew A; Spinella, Philip C; Perkins, Jeremy G; Grathwohl, Kurt W; Repine, Thomas; Beekley, Alec C; Sebesta, James; Jenkins, Donald; Wade, Charles E; Holcomb, John B; Oct 2007; 10 pp.; In English

Report No.(s): AD-A480363; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480363

Background: Patients with severe traumatic injuries often present with coagulopathy and require massive transfusion. The risk of death from hemorrhagic shock increases in this population. To treat the coagulopathy of trauma, some have suggested early, aggressive correction using a 1:1 ratio of plasma to red blood cell (RBC) units. Methods: We performed a retrospective chart review of 246 patients at a US Army combat support hospital, each of who received a massive transfusion (> or = 10

units of RBCs in 24 hours). Three groups of patients were constructed according to the plasma to RBC ratio transfused during massive transfusion. Mortality rates and the cause of death were compared among groups. Results: For the low ratio group the plasma to RBC median ratio was 1:8 (interquartile range, 0:12-1:5), for the medium ratio group, 1:2.5 (interquartile range, 1:3.0-1:2.3), and for the high ratio group, 1:1.4 (interquartile range, 1:1.7-1:1.2) ($p < 0.001$). Median Injury Severity Score (ISS) was 18 for all groups (interquartile range, 14- 25). For low, medium, and high plasma to RBC ratios, overall mortality rates were 65%, 34%, and 19%, ($p < 0.001$); and hemorrhage mortality rates were 92.5%, 78%, and 37%, respectively, ($p < 0.001$). Upon logistic regression, plasma to RBC ratio was independently associated with survival (odds ratio 8.6, 95% confidence interval 2.1-35.2). Conclusions: In patients with combat-related trauma requiring massive transfusion, a high 1:1.4 plasma to RBC ratio is independently associated with improved survival to hospital discharge, primarily by decreasing death from hemorrhage. For practical purposes, massive transfusion protocols should utilize a 1:1 ratio of plasma to RBCs for all patients who are hypocoagulable with traumatic injuries.
DTIC
Blood; Blood Plasma; Combat; Erythrocytes; Hospitals; Injuries; Mortality; Patients; Support Systems; Transfusion

20080033205 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Combining Early Coagulation and Inflammatory Status Improves Prediction of Mortality in Burned and Nonburned Trauma Patients
Park, Myung S; Salinas, Jose; Wade, Charles E; Wang, Jingjing; Martini, Wenjun; Pusateri, Anthony E; Merrill, Gerald A; Chung, Kevin; Wolf, Steven E; Holcomb, John B; Feb 2008; 8 pp.; In English
Report No.(s): AD-A480367; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480367

Background: After injury, there is a synergistic response between inflammation and coagulation systems. We hypothesized that combining markers of these processes and standard clinical indices would improve early prediction of inhospital mortality in burned and nonburned trauma patients. Methods: Patients admitted to the surgical or burn intensive care unit within 24 hours of injury with an anticipated stay >3 days were enrolled during a one year period. Upon admission, blood was drawn for thromboelastography, plasma-based clotting assays, and cytokine levels. Clinical indices and multiple organ dysfunction syndrome (MODS) scores were recorded. Candidate variables evaluated included age, percentage third degree burns, inhalation injury, percentage total body surface area burns, interleukin-6, tumor necrosis factor alpha, interleukin-8, prothrombin time, partial thromboplastin time (PTT), maximal amplitude reflective of clot strength, group (burn or nonburn) and admission MODS. Results: For model development, we enrolled 25 burned and 33 nonburned trauma patients (20 blunt and 13 penetrating injuries). Fifteen deaths occurred. Multiple logistic regression analysis identified six independent risk factors for death: age, percentage third degree burns, inhalation injury, tumor necrosis factor alpha level, maximal amplitude, and MODS score with an area under ROC curve of 0.961. Conclusion: Our model improves prediction of in-hospital mortality in comparison to previous methods for burn and nonburn trauma patients. Furthermore, our model is equally applicable to all patients regardless of type of traumatic injury (nonburn or burn). This improvement is because of the inclusion of patient's early coagulation and inflammatory status in addition to standard clinical indices. These data provide a baseline within which to measure incremental improvements in care.
DTIC
Blood Coagulation; Coagulation; Death; Injuries; Mortality; Patients

20080033207 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Tympanic Membrane Perforation and Hearing Loss From Blast Overpressure in Operation Enduring Freedom and Operation Iraqi Freedom Wounded
Ritenour, Amber E; Wickley, Aaron; Ritenour, Joshua S; Kriete, Brian R; Blackbourne, Lorne H; Holcomb, John B; Wade, Charles E; Oct 2007; 6 pp.; In English
Report No.(s): AD-A480371; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480371

Primary blast injury is tissue destruction caused by the blast wave of high-pressure air that travels outward from an explosion. Tympanic membrane (TM) rupture is the most common form of primary blast injury. Since the ear is, by design, the body's most sensitive pressure transducer, it is the organ most commonly affected by the dramatic changes in ambient air pressure that occur close to an explosion. Studies of service members injured in combat have demonstrated that TM perforation occurs in approximately 9% of patients wounded by explosives. (Ritenour AE, Blackbourne LH, Kelly JF, et al. Primary blast injury in OEF/OIF: 2003 2006. Unpublished data.) TM rupture occurs more frequently when an explosion takes place in a closed space and when victims are in close proximity to the detonation center. The lowest pressure necessary to

perforate a TM is about 5 psi; approximately 50% of TMs will rupture at 15 psi. Various factors have proven to positively or negatively affect an individual's susceptibility to TM rupture. Studies have demonstrated that disease or previous injury, increased age, inadequate pneumatization, and TM position perpendicular to the incident wave all increase the likelihood of perforation. Conversely, plugs of cerumen may exert a protective effect when loose in the external auditory canal, but may serve as a ramrods increasing injury if they are in contact with the TM at the time of the explosion. Simple ear plugs are very effective in reducing the incidence of TM rupture, but are impractical in situations, such as combat, where accurate understanding of quiet verbal communication is critical. Investigators have demonstrated that up to 80% of all perforated TMs heal spontaneously with relatively few requiring operative intervention. Large size of perforation (high grade) and peripheral location of the defect have both been associated with lower rates of spontaneous healing.
DTIC
Auditory Defects; Explosions; Injuries; Membranes; Overpressure

20080033208 Brooke Army Medical Center, Fort Sam Houston, TX USA
The Ratio of Fibrinogen to Red Cells Transfused Affects Survival in Casualties Receiving Massive Transfusions at an Army Combat Support Hospital
Stinger, Harry K; Spinella, Philip C; Perkins, Jeremy G; Grathwohl, Kurt W; Salinas, Jose; Martini, Wenjun Z; Hess, John R; Dubick, Michael A; Simon, Clayton D; Beekley, Alec C; Oct 2007; 8 pp.; In English
Report No.(s): AD-A480372; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480372

Background: To treat the coagulopathy of trauma, some have suggested early and aggressive use of cryoprecipitate as a source of fibrinogen. Our objective was to determine whether increased ratios of fibrinogen to red blood cells (RBCs) decreased mortality in combat casualties requiring massive transfusion. Methods: We performed a retrospective chart review of 252 patients at a U.S. Army combat support hospital who received a massive transfusion (>10 units of RBCs in 24 hours). The typical amount of fibrinogen within each blood product was used to calculate the fibrinogen-to-RBC (F:R) ratio transfused for each patient. Two groups of patients who received either a low (<0.2 g fibrinogen/RBC Unit) or high (>0.2 g fibrinogen/RBC Unit) F:R ratio were identified. Mortality rates and the cause of death were compared between these groups, and logistic regression was used to determine if the F:R ratio was independently associated with survival. Conclusions: In patients with combat-related trauma requiring massive transfusion, the transfusion of an increased fibrinogen: RBC ratio was independently associated with improved survival to hospital discharge, primarily by decreasing death from hemorrhage. Prospective studies are needed to evaluate the best source of fibrinogen and the optimal empiric ratio of fibrinogen to RBCs in patients requiring massive transfusion.
DTIC
Blood; Casualties; Combat; Death; Erythrocytes; Fibrinogen; Hospitals; Support Systems; Survival; Transfusion

20080033209 Oregon Health Sciences Univ., Portland, OR USA
A Comparison Between Patients Treated at a Combat Support Hospital in Iraq and a Level I Trauma Center in the USA
Schreiber, Martin A; Zink, Karen; Underwood, Samantha; Sullenberger, Lance; Kelly, Matthew; Holcomb, John B; Oct 2007; 6 pp.; In English
Report No.(s): AD-A480375; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480375

The delivery of medicine during war time presents numerous complex challenges that differ significantly from civilian practice. Medical care in the Global War on Terrorism is delivered 12,000 miles from home. Conditions are austere and resources are limited forcing caregivers to draw on all of their medical expertise. The safety of personnel cannot be guaranteed as American hospitals represent strategic targets for terrorists. Care is delivered both to American soldiers, coalition forces, and noncoalition forces spanning incredibly diverse cultural populations. Both routine and unusual medical problems must be treated as well as combat casualties. The operational tempo is intense as mass casualty incidents are common and US patients are transported from the Mideast to Germany and then to the USA frequently in less than 4 days, receiving operations at each destination. Modern combat wounding patterns differ dramatically from those seen in civilian practice. High powered explosives like improvised explosive devices, rocket propelled grenades, and rockets or mortars have been reported to produce 55% of the casualties seen. High powered automatic rifles are typically used as opposed to handguns in civilian casualties. Despite these facts, overall mortality has been shown to be comparable between a Forward Resuscitative Surgical System functioning in Iraq and a major urban Level I trauma center in the USA. The overall case fatality rate in Iraq is 9.1% which is the lowest in recorded war time history and roughly half of that recorded in World War II and Vietnam. The potentially

preventable death rate has been reported to be 15% and the majority of these deaths are from hemorrhage. Better training could play a significant role in improving this statistic.
DTIC
Casualties; Combat; Explosive Devices; Hospitals; Injuries; Iraq; Military Personnel; Patients; Support Systems; United States

20080033210 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
The Effect of Recombinant Activated Factor VII on Mortality in Combat-Related Casualties With Severe Trauma and Massive Transfusion
Spinella, Philip C; Perkins, Jeremy G; McLaughlin, Daniel F; Niles, Sarah E; Grathwohl, Kurt W; Beekley, Alec C; Salinas, Jose; Mehta, Sumeru; Wade, Charles E; Holcomb, John B; Feb 2008; 10 pp.; In English
Report No.(s): AD-A480377; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480377

Background: The majority of patients with potentially survivable combat-related injuries die from hemorrhage. Our objective was to determine whether the use of recombinant activated factor VII (rFVIIa) decreased mortality in combat casualties with severe trauma who received massive transfusions and if its use was associated with increased severe thrombotic events. Methods: We retrospectively reviewed a database of combat casualty patients with severe trauma (Injury Severity Score [ISS] >15) and massive transfusion (red blood cell [RBCs] >10 units/24 hours) admitted to one combat support hospital in Baghdad, Iraq, between December 2003 and October 2005. Admission vital signs and laboratory data, blood products, ISS, 24-hour and 30-day mortality, and severe thrombotic events were compared between patients who received rFVIIa (rFVIIa+) and did not receive rFVIIa (rFVIIa-). Conclusions: The early use of rFVIIa was associated with decreased 30- mortality in severely injured combat casualties requiring massive transfusion, was not associated with increased risk severe thrombotic events.
DTIC
Blood; Blood Coagulation; Casualties; Combat; Death; Drugs; Injuries; Mortality; Transfusion

20080033211 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Complications After Fasciotomy Revision and Delayed Compartment Release in Combat Patients
Ritenour, Amber E; Dorlac, Warren C; Fang, Raymond; Woods, Timothy; Jenkins, Donald H; Flaherty, Stephen F; Wade, Charles E; Holcomb, John B; Feb 2008; 11 pp.; In English
Report No.(s): AD-A480383; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480383

Background: Incomplete or delayed fasciotomies are associated with muscle necrosis and death in civilian trauma. Combat explosions severely damage tissue and distort normal anatomy making fasciotomies challenging. Rapid air evacuation may delay treatment of patients with evolving extremity compartment syndrome. We investigated the impact of fasciotomy revision and delayed compartment release on combat casualties after air evacuation. Methods: A retrospective review was performed of combat casualties who underwent fasciotomies in Iraq, Afghanistan, or at Landstuhl Regional Medical Center between January 1, 2005 and August 31, 2006. Outcomes were rates of muscle excision, major amputation, and mortality. Conclusion:Fasciotomy revision was associated with a fourfold increase in mortality. The most common revision procedures were extension of fascial incisions and opening new compartments. The most commonly unopened compartment was the anterior compartment of the lower leg. Patients who underwent delayed fasciotomies had twice the rate of major amputation and a threefold higher mortality.
DTIC
Combat; Compartments; Death; Delay; Patients; Signs and Symptoms; Surgery

20080033213 Brooke Army Medical Center, Fort Sam Houston, TX USA
Infectious Complications of Open Type III Tibial Fractures among Combat Casualties
Johnson, Erica N; Burns, Travis C; Hayda, Roman A; Hospenthal, Duane R; Murray, Clinton K; Aug 15, 2007; 8 pp.; In English
Report No.(s): AD-A480393; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480393

Background. Combat is associated with high-energy explosive injuries, often resulting in open tibial fractures complicated by nonunion and infection. We characterize the infections seen in conjunction with combat-associated type III tibial fractures.

Results. Of the 62 patients with open tibial fractures who were identified in our initial search, 40 had fractures that met our inclusion criteria as type III diaphyseal tibial fractures. Three patients were excluded because their fractures were managed with early limb amputation, and 2 were excluded because of incomplete follow-up records. Twenty-seven of these 35 patients had at least 1 organism present in initial deep-wound cultures that were performed at admission to the hospital. The pathogens that were identified most frequently were Acinetobacter, Enterobacter species, and Pseudomonas aeruginosa. Thirteen of the 35 patients had union times of 19 months that appeared to be associated with infection. None of the gram-negative bacteria identified in the initial wound cultures were recovered again at the time of a second operation; however, all patients had at least 1 staphylococcal organism. One patient had an organism present during initial culture and in the nonunion wound; this organism was a methicillin-resistant Staphylococcus aureus strain that was inadvertently not treated. Five of 35 patients ultimately required limb amputation, with infectious complications cited as the reason for amputation in 4 of these cases. Conclusions. Combat-associated type III tibial fractures are predominantly associated with infections due to gram-negative organisms, and these infections are generally successfully treated. Recurrent infections are predominantly due to staphylococci.
DTIC
Bacteria; Bones; Casualties; Combat; Fractures (Materials); Infectious Diseases; Microorganisms; Pathogens; Tibia

20080033215 Brooke Army Medical Center, Fort Sam Houston, TX USA
Osteomyelitis in Military Personnel Wounded in Iraq and Afghanistan
Yun, Heather C; Branstetter, Joanna G; Murray, Clinton K; Feb 2008; 7 pp.; In English
Report No.(s): AD-A480395; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480395

Background: Orthopedic injuries occurring in Operations Iraqi Freedom and Enduring Freedom (OIF/OEF) are complicated by infections with multidrug resistant bacteria. We describe demographics and microbiology of OIF/OEF casualties with primary and recurrent osteomyelitis. Methods: A retrospective cohort study was performed of OIF/OEF casualties admitted to our facility from February 1, 2003 to August 31, 2006. Electronic records were queried for demographic information, bacteria recovered, antibiotic therapies and duration, site of osteomyelitis, orthopedic devices, and outcomes. Results: There were 110 patients with 139 hospitalizations for osteomyelitis; 94 involved lower extremities, 43 involved upper extremities, and 2 involved the axial skeleton. One hundred three admissions were initial episodes whereas 36 admissions were recurrences. The median age was 27 years; 95% were men. Duration of follow-up ranged from 2 weeks to 36 months. Those patients with orthopedic devices had recurrent infections more frequently (26 vs. 5%, $p < 0.01$). Bacteria, antibiotics, or infection site were not predictive of recurrence. Acinetobacter spp. (70 vs. 5%, $p < 0.01$), Klebsiella pneumoniae (18 vs. 5%, $p = 0.04$), and Pseudomonas aeruginosa (24 vs. 5%, $p < 0.01$) were more likely to be recovered during original episodes than during recurrences. Gram-positive organisms were more likely during recurrences; Staphylococcus aureus (13 vs. 53%, $p < 0.01$); methicillin susceptible S. aureus (5 vs. 22%, $p < 0.01$), methicillin resistant S. aureus (8 vs. 31%, $p < 0.01$). Conclusions: The microbiology of osteomyelitis in veterans of OIF/OEF differs substantially depending upon whether the infection is new or recurrent. Gram-negative pathogens predominate early, being replaced with staphylococci after treatment, despite nearly universal use of gram-positive therapy.
DTIC
Afghanistan; Bacteria; Bacterial Diseases; Bones; Iraq; Military Personnel

20080033216 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
A Case Series Describing Thermal Injury Resulting From Zeolite Use for Hemorrhage Control in Combat Operations
McManus, John; Hurtado, Timothy; Pusateri, Anthony; Knoop, Kevin J; Jan 2007; 7 pp.; In English
Report No.(s): AD-A480396; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480396

Four cases are presented to illustrate cutaneous burns sustained with the use of zeolite in the treatment of major hemorrhage secondary to combat wounds. Zeolite, a microporous crystalline aluminosilicate granular hemostatic agent, can cause secondary thermal injuries through an exothermic reaction that is likely related to the absorption of free fluid at the hemorrhage site. Understanding of this process may help both military and civilian EMS personnel avoid or minimize secondary thermal injury while still benefiting from zeolite's hemostatic capabilities.
DTIC
Blood Coagulation; Combat; Drugs; Hemorrhages; Injuries; Zeolites

20080033220 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Vaccination with F1-V Fusion Protein Protects Black-Footed Ferrets (Mustela Nigripes) Against Plague Upon Oral Challenge with Yersinia Pestis

Rocke, Tonie E; Smith, Susan; Marinari, Paul; Kreeger, Julie; Enama, Jeffrey T; Powell, Bradford S; Jan 2008; 8 pp.; In English

Report No.(s): AD-A480405; TR-07-083; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480405

Earlier studies established that vaccination of black-footed ferrets (Mustela nigripes) with F1-V fusion protein by subcutaneous (SC) injection protected animals against plague upon injection of the bacterium Yersinia pestis. This study demonstrates that the F1-V antigen can also protect ferrets against plague contracted via ingestion of a Y. pestis-infected mouse, a probable route for natural infection. Eight black-footed ferret kits were vaccinated with F1-V protein by SC injection at approximately 60 days-of-age. A booster vaccination was administered 3 mo later via SC injection. Four additional ferret kits received placebos. The animals were challenged 6 wk after the boost by feeding each one a Y. pestis-infected mouse. All eight vaccinates survived challenge, while the four controls succumbed to plague within 3 days after exposure. To determine the duration of antibody post-vaccination, 18 additional black-footed ferret kits were vaccinated and boosted with F1-V by SC injection at 60 and 120 days-of-age. High titers to both F1 and V (mean reciprocal titers of 18,552 and 99,862 respectively) were found in all vaccinates up to 2-yr post-vaccination, whereas seven control animals remained antibody negative throughout the same time period.

DTIC

Immunology; Infectious Diseases; Proteins

20080033223 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Trauma System Development in a Theater of War: Experiences From Operation Iraqi Freedom and Operation Enduring Freedom

Eastride, Brian J; Jenkins, Donald; Flaherty, Stephen; Schiller, Henry; Holcomb, John B; Sep 2006; 9 pp.; In English

Report No.(s): AD-A480411; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480411

Medical lessons learned from Vietnam and previous military conflicts led to the development of civilian trauma systems in the USA. Operation Iraqi Freedom represents the first protracted, large-scale, armed conflict since the advent of civilian trauma systems in which to evaluate a similar paradigm on the battlefield. Collaborative efforts between the joint military forces of the USA initiated development of a theater trauma system in May 2004. Formal implementation of the system occurred in November 2004, the collaborative effort of the three Surgeons General of the U.S. military, the USA Army Institute of Surgical Research, and the American College of Surgeons Committee on Trauma. One trauma surgeon (Trauma System Director) and a team of six trauma nurse coordinators were deployed to theater to evaluate trauma system component issues. Demographic, mechanistic, physiologic, diagnostic, therapeutic, and outcome data were gathered for 4,700 injured patients using the Joint Theater Trauma Registry. Interview and survey methods were utilized to evaluate logistic aspects of the system. System implementation identified more than 30 systemic issues requiring policy development, research, education, evaluation of medical resource allocation, and alterations in clinical care. Among the issues were transfer of casualties from point of injury to the most appropriate level of care, trauma clinical practice guidelines, standard forms, prophylactic antibiotic regimens, morbidity/mortality reporting, on-line medical evacuation regulation, improved data capture for the trauma registry, and implementation of a performance improvement program. The implementation of a theater trauma system demonstrated numerous opportunities to improve the outcome of soldiers wounded on the battlefield.

DTIC

Injuries; Military Operations; Systems Engineering

20080033225 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Risks Associated with Fresh Whole Blood and Red Blood Cell Transfusions in a Combat Support Hospital

Spinella, Philip C; Perkins, Jeremy G; Grathwohl, Kurt W; Repine, Thomas; Beekley, Alec C; Sebesta, James; Jenkins, Donald; Azarow, Kenneth; Holcomb, John B; Jan 2007; 7 pp.; In English

Report No.(s): AD-A480413; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480413

B Objective: Fresh whole blood (FWB) and red blood cells (RBCs) are transfused to injured casualties in combat support hospitals. We evaluated the risks of FWB and RBCs transfused to combat-related casualties. Design: Retrospective chart review. Setting: Deployed U.S. Army combat support hospitals. Subjects: Donors of FWB and recipients of FWB and RBCs.

Measurements and Results: The storage age of RBCs at transfusion was measured as an indicator of overall risk associated with the storage lesion of RBCs between January 2004 and December 2004 at one combat support hospital. Between April 2004 and December 2004, FWB was prescreened only at one combat support hospital for human immunodeficiency virus, hepatitis C virus, and hepatitis B surface antigen before transfusion. To estimate the general incidence of infectious agent contamination in FWB units, samples collected between May 2003 and February 2006 were tested retrospectively for human immunodeficiency virus, hepatitis B surface antigen, hepatitis C virus, and human lymphotropic virus. Results were compared between FWB samples prescreened and not prescreened for infectious agents before transfusion. At one combat support hospital in 2004, 87 patients were transfused 545 units of FWB and 685 patients were transfused 5,294 units of RBCs with a mean age at transfusion of 33 days (6 days). Retrospective testing of 2,831 samples from FWB donor units transfused in Iraq and Afghanistan between May 2003 and February 2006 indicated that three of 2,831 (0.11%) were positive for hepatitis C virus recombinant immunoblot assay, two of 2,831 (0.07%) were positive for human lymphotropic virus enzyme immunoassay, and none of 2,831 were positive for both human immunodeficiency virus 1/2 and hepatitis B surface antigen by Western blot and neutralization methods, respectively.
DTIC
Blood; Blood Cells; Combat; Erythrocytes; Hepatitis; Hospitals; Infectious Diseases; Risk; Support Systems; Transfusion; Viruses

20080033227 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Damage Control Resuscitation: Directly Addressing the Early Coagulopathy of Trauma
Holcomb, John B; Jenkins, Don; Rhee, Peter; Johannigman, Jay; Mahoney, Peter; Mehia, Sumeru; Cox, Darrin; Gehrke, Michael J; Bellman, Greg J; Schreiber, Martin; Feb 2007; 5 pp.; In English
Report No.(s): AD-A480415; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480415

Rapid progress in trauma care occurs when the results of translational research are promptly integrated into clinical practice. Experience with a high volume of severely injured casualties expedites the process. Historically, these conditions have converged during times of conflict, improving the care of combat casualties and subsequently that of civilian trauma patients. In the most severely injured casualties, we know that when the lethal triad of hypothermia, acidosis, and coagulopathy are present, death is imminent. Current teaching is to avoid reaching these conditions by using damage control surgery. However, conventional resuscitation practice for damage control focuses on rapid reversal of acidosis and prevention of hypothermia, and surgical techniques focus on controlling hemorrhage and contamination. Direct treatment of coagulopathy has been relatively neglected, viewed as a byproduct of resuscitation, hemodilution, and hypothermia, and delayed by blood banking logistics. Damage control resuscitation addresses the entire lethal triad immediately upon admission to a combat hospital. By demonstrating that in the severely injured the coagulopathy of trauma is present at admission, recent studies have brought back to light the importance of treating this disorder at an earlier stage. Reports of lactated Ringer s solution and normal saline increasing reperfusion injury and leukocyte adhesion lead one to conclude that the standard crystalloid based resuscitation guidelines in pre hospital trauma life support (PHTLS) and advanced trauma life support (ATLS) may worsen the presenting acidosis and coagulopathy in severely injured trauma patients, and possibly increase ARDS, SIRS, and MOF. The safety of withholding PRBCs in hemodynamically stable patients has been demonstrated,18 and the risks associated with blood transfusion are well described.
DTIC
Blood Coagulation; Casualties; Damage; Injuries

20080033228 Library of Congress, Washington, DC USA
Military Health Care: The Issue of 'Promised' Benefits
Burrelli, David F; Aug 12, 2003; 15 pp.; In English
Report No.(s): AD-A480417; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480417

Many military health care beneficiaries, particularly military retirees, their dependents, and those representing their interests, state that they were promised 'free health care for life at military facilities' as part of their 'contractual agreement' when they entered the armed forces. Efforts to locate authoritative documentation of such promises have not been successful. Congressional report language and recent court decisions have rejected retiree claims seeking 'free care at military facilities' as a right or entitlement. These have held that the current medical benefit structure made up of military health care facilities, Tricare and Medicare provide lifetime health care to military members, retirees and their respective dependents. Nevertheless,

claims continue to be made, particularly by those seeking additional benefits from the Department of Defense, or attempting to prevent an actual or perceived reduction in benefits.
DTIC
Health; Medical Services; Military Operations

20080033230 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
A Predictive Model for Massive Transfusion in Combat Casualty Patients
McLaughlin, Daniel F; Niles, Sarah E; Salinas, Jose; Perkins, Jeremy G; Cox, E D; Wade, Charles E; Holcomb, John B; Feb 2008; 8 pp.; In English
Report No.(s): AD-A480419; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480419

Massive transfusion (MT) is associated with increased morbidity and mortality in severely injured patients. Early and aggressive use of blood products in these patients may correct coagulopathy, control bleeding, and improve outcomes. However, rapid identification of patients at risk for MT has been difficult. We postulated that evaluation of clinical variables routinely assessed upon admission would allow identification of these patients for earlier, more effective intervention. Methods: A retrospective cohort
DTIC
Blood; Casualties; Clinical Medicine; Combat; Injuries; Patients; Predictions; Transfusion

20080033232 Brooke Army Medical Center, Fort Sam Houston, TX USA
Bacteriology of War Wounds at the Time of Injury
Murray, Clinton K; Roop, Stuart A; Hospenthal, Duane R; Dooley, David P; Wenner, Kimberly; Hammock, John; Taufen, Neil; Gourdine, Emmett; Sep 2006; 5 pp.; In English
Report No.(s): AD-A480421; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480421

Bacterial contamination of war wounds occurs either at the time of injury or during the course of therapy. Characterization of the bacteria recovered at the time of initial trauma could influence the selection of empiric antimicrobial agents used to prevent infection. In the spring of 2004, U.S. military casualties who presented to the 31st Combat Support Hospital in Baghdad, Iraq, with acute traumatic injuries resulting in open wounds underwent aerobic culture of their wounds to identify the bacteria colonizing the wounds. Forty-nine casualties with 61 separate wounds were evaluated. Wounds were located predominantly in the upper and lower extremities and were primarily from improvised explosive devices or mortars. Thirty wounds (49%) had bacteria recovered on culture, with 40 bacteria identified. Eighteen casualties (20 wounds) had undergone field medical therapy (irrigation and/or antimicrobial treatment); six of these had nine bacterial isolates on culture. Of the 41 wounds from 31 patients who had received no previous therapy, 24 grew 31 bacteria. Gram-positive bacteria (93%), mostly skin-commensal bacteria, were the predominant organisms identified. Only three Gram-negative bacteria were detected, none of which were characterized as broadly resistant to antimicrobial agents. The only resistant bacteria recovered were two isolates of methicillin-resistant Staphylococcus aureus (MRSA). Our assessment of war wound bacterioly soon after injury reveals a predominance of Gram positive organisms of low virulence and pathogenicity. The presence of MRSA in wounds likely reflects the increasing incidence of community-acquired MRSA bacteria. These data suggest that the use of broad-spectrum antibiotics with efficacy against more resistant, Gram-negative bacteria, such as Pseudomonas aeruginosa and Acinetobacter spp., is unnecessary in early wound management.
DTIC
Antibiotics; Antiinfectives and Antibacterials; Bacteriology; Casualties; Infectious Diseases; Injuries; Microorganisms; Shock (Physiology); Warfare

20080033235 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
A Reduction in Clot Formation Rate and Strength Assessed by Thrombelastography Is Indicative of Transfusion Requirements in Patients With Penetrating Injuries
Plotkin, Amy J; Wade, Charles E; Jenkins, DOnald H; Smith, Kimberly A; Noe, Jody C; Park, Myung S; Perkins, Jeremy G; Holcomb, John B; Feb 2008; 6 pp.; In English
Report No.(s): AD-A480424; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480424

Bleeding is a major cause of death in patients with traumatic injuries. Recently, thrombelastograph (TEG) has been

suggested as an additional means of evaluating coagulation in trauma patients. We hypothesized that TEG data would aid in defining the coagulopathy of trauma in patients with penetrating traumatic injuries.
DTIC
Blood Coagulation; Clotting; Coagulation; Hemorrhages; Injuries; Patients; Shock (Physiology); Transfusion

20080033236 Walter Reed Army Medical Center, Washington, DC USA
Resuscitative Hyperkalemia in Noncrush Trauma: A Prospective, Observational Study
Perkins, Robert M; Aboudara, Matthew C; Abbott, Kevin C; Holcomb, John B; Dec 2006; 8 pp.; In English
Report No.(s): AD-A480426; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480426

The trauma patient is exposed to physiologic processes and life-saving interventions that predispose to hyperkalemia. Severe elevations in potassium levels subject this compromised patient to additional cardiac risks in the periresuscitative period. Recent advances in the care of the massively traumatized patient may or may not increase the risk for hyperkalemia. This prospective, observational study was undertaken to define the period prevalence of hyperkalemia (plasma potassium level >5.5 mmol/L) in a noncrush trauma population during the initial resuscitative period and to identify potential risk factors for the development of hyperkalemia. A total of 131 patients were studied during the initial 12 h after admission for noncrush trauma. The period prevalence of hyperkalemia was 29.0%. Hyperkalemic patients had dramatic shifts in plasma potassium levels compared with nonhyperkalemic patients. Five patients, all from the hyperkalemic group, died. By multivariate logistic regression analysis, independent risk factors for hyperkalemia were an emergency department plasma potassium level of 4.0 mmol/L or higher (relative risk 3.40; 95% confidence interval 1.17 to 9.84; P 0.024 versus baseline potassium level <4.0 mmol/L) and transfusion of cell- or plasma-based products (relative risk 10.56; 95% confidence interval 3.62 to 30.78; P < 0.001 per log-transformed unit). The prevalence of hyperkalemia during trauma resuscitation was not reported previously. Given the arrhythmic risks of hyperkalemia, particular caution is necessary with trauma patients who present with plasma potassium levels >4.0 mmol/L and require aggressive transfusion support.
DTIC
Blood; Injuries; Patients; Potassium; Transfusion

20080033238 Madigan Army Medical Center, Takoma, WA USA
Supporting the Global War on Terror: A Tale of Two Campaigns Featuring the 250th Forward Surgical Team (Airborne)
Rush, Jr , Robert M; Stockmaster, Neil R; Stinger, Harry K; Arrington, Edward D; Devine, John G; Atteberry, Linda; Starnes, Benjamin W; Place, Ronald J; Jan 2005; 8 pp.; In English
Report No.(s): AD-A480436; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480436

Forward Surgical Teams (FSTs) are 20-person units designed to perform front-line, life-saving combat surgery. This study compares the employment, injuries encountered, and workload of an airborne FST in two widely varying campaigns.
DTIC
Medical Personnel; Medical Services; Military Operations; Warfare

20080033240 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Status of Trauma Care in U.S. Army Hospitals
Wojcik, Barbara E; Stein, Catherine R; Devore, Jr , Raymond B; Hassell, L H; Holcomb, John B; Feb 2005; 9 pp.; In English
Report No.(s): AD-A480442; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480442

This study documents the recent trends and current state of inpatient trauma care in U.S. Army hospitals. Methods: Inpatient trauma cases from Army hospitals worldwide from October 1988 through April 2001 were analyzed. Facilities included 3 Certified Trauma Centers (CTCs), 7 non- CTC Army Medical Centers, and 42 Army Community Hospitals. Logistic regression identified mortality risk factors. Results: Overall, the Army treated 166,124 trauma cases, with a mortality rate of 0.8% (trend of 0.66% to 1.18% in fiscal years 1989 2000, p 0.0001). The number of Army hospitals decreased by 44% and the number of trauma cases decreased by nearly 75%. Injury severity, patient age, hospital trauma volume, beneficiary category, hospital type, and a resource intensity measure were all significantly associated with the probability of death. Conclusions: The overall trauma mortality rate at Army hospitals during the study period was lower than that reported for

civilian trauma centers. However, changes in patient profiles, increased average severity, and decreased trauma volume might have contributed to a 13% increase in mortality rates at CTCs.
DTIC
Hospitals; Injuries; Medical Services

20080033241 Madigan Army Medical Center, Takoma, WA USA
The Impact of Hypothermia on Trauma Care at the 31st Combat Support Hospital
Arthurs, Zachary; Cuadrado, Daniel; Beekley, Alec; Grathwohl, Kurt; Perkins, Jeremy; Rush, Robert; Sebesta, James; Jan 17, 2006; 6 pp.; In English
Report No.(s): AD-A480443; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480443

The primary objective of this study was to review the incidence of hypothermia, and its effect on surgical management, resource utilization, and survival at the 31st Combat Support Hospital (CSH).
DTIC
Combat; Hospitals; Hypothermia; Injuries; Medical Services; Support Systems

20080033243 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Fluid Resuscitation in Modern Combat Casualty Care: Lessons Learned from Somalia
Holcomb, John B; May 2003; 7 pp.; In English
Report No.(s): AD-A480446; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480446

The medical issues faced by military medics in the combat environment frequently represent a significant variation from their training and civilian experience. The differences between care delivered by military medics under fire and care rendered by civilian medics are profound. The lessons assimilated from extensive discussion and focused conferences form the basis for the proposed changes in combat prehospital care. These differences revolve around a lack of basic monitoring capability, significant logistical constraints, and prolonged evacuation times. The resuscitation algorithm presented in this article represents a consensus of military and civilian trauma experts.
DTIC
Casualties; Combat; Hospitals; Injuries; Lessons Learned; Medical Services; Military Operations; Resuscitation; Somalia

20080033248 Walter Reed Army Medical Center, Washington, DC USA
Operation Enduring Freedom: The 48th Combat Support Hospital in Afghanistan
Bettler, Alan L; Wortmann, Glenn W; Hofmann, Luke J; Goff, Jr, James M; Mar 2006; 6 pp.; In English
Report No.(s): AD-A480478; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480478

To examine the experience of the 48th Combat Support Hospital (CSH) while deployed to Afghanistan, with an emphasis on trauma care. Materials and Methods: Before redeployment, a retrospective review was performed on the medical records of all patients treated at the 48th CSH from December 6, 2002 through June 7, 2003. Results: During the 6-month period, 10,679 patients were evaluated and/or treated. There were 477 hospital admissions (adults, 387; children, 90; trauma, 204) and 634 operating room procedures. The most common mechanisms of injury were land mines/unexploded ordinance (74 36%) and gunshot wounds (41 20%). Extremities were the most common site. A total of 358 cases was performed on 168 trauma patients (mean, 2 cases per patient; range, 1 12). There were 63 complications in 40 trauma patients and 11 patients died. Conclusions: The 48th CSH supported military and humanitarian operations with an ongoing process of re-evaluation, adaptation, and medical education that resulted in low morbidity and mortality rates.
DTIC
Afghanistan; Combat; Hospitals; Injuries; Support Systems

20080033249 Connecticut Children's Medical Center, Hartford, CT USA
Effect of Plasma and Red Blood Cell Transfusions on Survival in Patients with Combat Related Traumatic Injuries
Spinella, Philip C; Perkins, Jeremy G; Grathwohl, Kurt W; Beekley, Alec C; Niles, Sarah E; McLaughlin, Daniel F; Wade, Charles E; Holcomb, John B; Oct 2007; 11 pp.; In English
Report No.(s): AD-A480479; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480479

Hemorrhage from traumatic injuries is the second most common cause of death and the most common cause of potentially

preventable deaths from combat related injuries. Upon autopsy review, it was estimated that 15% to 20% of deaths that occur in combat were preventable with appropriate treatment, with 66% to 80% of these deaths occurring from hemorrhagic shock. Death from severe traumatic injuries occurs quickly, usually within 6 hours to 12 hours from hospital admission. Strategies or therapeutic principles that can be rapidly applied have the potential to prevent death from hemorrhagic shock and have a significant impact on improving survival for patients with traumatic injuries. According to Advanced Trauma Life Support guidelines, the standard approach to the resuscitation of patients with hemorrhagic shock includes the initial bolus of 2 L of crystalloid solutions and then red blood cell (RBC) transfusion. Plasma products are transfused based on the laboratory documentation of coagulopathy. This approach emphasizes the use of crystalloids and RBCs to potentially improve cardiac output and oxygen delivery and delays the use of plasma. Recent reports in the literature have documented adverse effects of excessive crystalloid use and the independent association of RBC transfusion with increased mortality in critically ill patients. There is also a lack of evidence that the transfusion of stored RBCs improves oxygen consumption for patients with an oxygen debt or who are in shock. Current review articles describing damage control or hemostatic resuscitation principles, coupled with those describing the early coagulopathy of trauma, suggest a change from this classic approach maybe in order. Our objective in this study was to determine the effect of fresh frozen plasma (FFP) and RBC transfusion on in-hospital survival for patients with combat-related injuries who required any blood product administration.
DTIC
Armed Forces (United States); Blood; Blood Plasma; Combat; Erythrocytes; Injuries; Patients; Plasmas (Physics); Survival; Transfusion

20080033250 North Carolina Univ., Chapel Hill, NC USA
Infrared Imaging for Battle Injuries
Katz, Laurence M; Apr 2008; 28 pp.; In English
Contract(s)/Grant(s): FA9550-06-1-0437
Report No.(s): AD-A480481; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480481
The proposal is based on a hypothesis that certain traumatic injuries produce unique skin temperature signatures that can be identified and quantified. The specific aims are to determine the efficacy of passive JR imaging in diagnosis of life-threatening pneumothoraces and related pulmonary injuries, and of limb-threatening traumatic injuries such as compartment syndrome. Following successful demonstration of effectiveness, specifications will be developed for field deployable JR imaging devices.
DTIC
Infrared Imagery; Injuries; Surface Temperature

20080033254 Respiratory Research, Inc., Austin, TX USA
Instrumentation for Monitoring Breath Biomarkers for Diagnosis of Health Condition Toxic Exposure and Disease
Hunt, John F; Baddour, A R; Dec 2007; 15 pp.; In English
Contract(s)/Grant(s): FA9550-05-C-0188
Report No.(s): AD-A480488; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480488
All goals of this program were reached and are listed below: (1) Improve the efficiency of the Exhaled Breath Condensate collection system when attached to the exhaust port of a ventilator; (2) Implement a gas-standardization methodology for the continuous EBC pH monitoring system that is uniformly reliable, and does not depend on the availability of argon; (3) Assure that the EBC pH measurement system assures error-free removal of accumulated EBC from the pH assay chamber. Implement a simple system for pH probe calibration; and (4) Development of the necessary electronics functionality for the continuous EBC pH monitoring system to be easily used in the clinical setting for the critical care management of war fighters and civilians.
DTIC
Biomarkers; Condensates; Diagnosis; Exhalation; Exposure; Health; pH; pH Factor; Toxic Diseases

20080033255 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Management of Mass Casualty Burn Disasters
Cancio, Leopoldo C; Pruitt, Basil A; May 2005; 17 pp.; In English
Report No.(s): AD-A480491; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480491
Mass casualty burn disasters are potentially challenging, in part because the majority of health care providers are

inexperienced in the care of thermally injured patients and in part because of the multisystem response elicited by the thermal injury. Management expertise is generally concentrated in burn centres, whereas in a true mass casualty event, personnel at other hospitals may need to provide burn care for extended periods of time. In addition, burn care is time-, manpower- and resource-intensive. Finally, the risk of terrorist attacks which can result in large numbers of burn casualties persists; inhalation injury and burns were the leading causes of injury among survivors of the 11 September 2001 attacks in New York City (1) and the 12 October 2002 bombing in Bali (2). This reflects the observation that terrorists prefer simple, easily accessible weapons, such as fertilizer, cellular telephones, box cutters, and jet fuel, to complex and hard-to-deploy weapons such as biologic and chemical agents (3). The purpose of this article is to review recent experience with burn disasters worldwide, to recommend a set of general principles for burn disaster management, and to describe the current status of burn disaster planning at the national level in the USA.
DTIC
Casualties; Disasters; Health; Injuries; Medical Services

20080033256 Baylor Univ., Houston, TX USA
Nurse Staffing at Methodist Heathcare Ministries: Factors Influencing Recruiting and Retention
Mooney, Leah; Apr 2007; 62 pp.; In English
Report No.(s): AD-A480493; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480493

The purpose of this study was to recognize the salient factors nurses consider ill their employment decision-making process. The nurse assessment questionnaire represented a cross-sectional analysis. It was distributed electronically during January of 2007 to two populations, all nursing staff at MHM and nursing students at UTMSCSA. The research questions stated: What factors influence the recruiting and retention of a qualified nursing staff at Methodist Healthcare Ministries? Is there a relationship between specific factors and the likelihood of a nurse remaining until retirement? There were three dependent variables dealing with the nurses' plans to remain a nurse until retirement. There were numerous independent variables that were identified as the factors affecting recruiting and retention. Descriptive statistics summarized the results. A multiple linear regression was used to conduct the inferential analysis. There were no significant predictors associated with the nurses' plans toward retirement, but this analysis did outline some employee concerns and suggested some of the best methods to motivate the nursing staff.
DTIC
Medical Personnel; Qualitative Analysis

20080033257 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Combat Burn Life Support: A Military Burn-Education Program
Barillo, David J; Canclo, Leopoldo C; Hutton, Brad G; Mittelsteadt, Paul J; Gueller, Glen E; Holcomb, John B; Apr 2005; 5 pp.; In English
Report No.(s): AD-A480494; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480494

The Advanced Burn Life Support Course has been used to train military physicians and nurses for more than 16 years. Although% it useful for teaching the fundamentals of burn care, the course is designed for a civilian audience, covers only the first 24 hours of burn care, and presumes the availability of a burn center for patient transfer. In preparation for hostilities in Iraq, we developed several add-on modules to the standard Advanced Burn Life Support course to meet specific needs of military audiences. These modules cover the treatment of white phosphorus burns; the treatment of mustard gas exposure; the long- range aeromedical transfer of burn patients; the management of burn patients beyond the first 24 hours; and the delivery of burn care in austere environments. These add on modules are termed Combat Burn Life Support. Between January 22, 2003, and May 12, 2003, Advanced Burn Life Support and/or Combat Burn Life Support courses were provided to a total of 1035 military health care providers in the USA, Germany, and the Middle East. Student feedback was largely positive and is being used for further course refinement. The Combat Burn Life Support Course is designed to augment, rather than replace, the Advanced Burn Life Support Course. Although intended for a military audience, the course material is equally applicable to civilian terrorist or mass casualty situations.
DTIC
Combat; Education; Medical Services; Military Operations

20080033258 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA

A Profile of Combat Injury

Champion, Howard R; Bellamy, Ronald F; Roberts, Colonel P; Leppaniemi, Ari; Dec 2002; 8 pp.; In English

Report No.(s): AD-A480495; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480495

Traumatic combat injuries differ from those encountered in the civilian setting in terms of epidemiology, mechanism of wounding, pathophysiologic trajectory after injury, and outcome. Except for a few notable exceptions, data sources for combat injuries have historically been inadequate. Although the pathophysiologic process of dying is the same (i.e., dominated by exsanguination and central nervous system injury) in both the civilian and military arenas, combat trauma has unique considerations with regard to acute resuscitation, including (1) the high energy and high lethality of wounding agents; (2) multiple causes of wounding; (3) preponderance of penetrating injury; (4) persistence of threat in tactical settings; (5) austere, resource-constrained environment; and (5) delayed access to definitive care. Recognition of these differences can help bring focus to resuscitation research for combat settings and can serve to foster greater civilian-military collaboration in both basic and transitional research.

DTIC

Combat; Epidemiology; Hemorrhages; Injuries; Military Personnel; Pathology; Personnel; Shock (Physiology)

20080033259 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Understanding Combat Casualty Care Statistics

Holcomb, John B; Stansbury, Lynn G; Champion, Howard R; Wade, Charles; Bellamy, Ronald F; Feb 2006; 6 pp.; In English

Report No.(s): AD-A480496; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480496

Maintaining good hospital records during military conflicts can provide medical personnel and researchers with feedback to rapidly adjust treatment strategies and improve outcomes. But to convert the resulting raw data into meaningful conclusions requires clear terminology and well-thought-out equations, using consistent numerators and denominators. The authors' objective was to arrive at terminology and equations that would produce the best insight into the effectiveness of care at different stages of treatment, either pre- or post-medical treatment facility care. They first clarified three essential terms: (1) the case fatality rate (CFR) as a percentage of fatalities among all wounded, (2) killed in action (KIA) as a percentage of immediate deaths among all seriously injured (not returning to duty), and (3) died of wounds (DOW) as a percentage of deaths following admission to a medical treatment facility among all seriously injured (not returning to duty). These equations were then applied consistently across data from World War II, the Vietnam War, and the current Global War on Terrorism. Using this clear set of definitions, the authors used the equations to ask two basic questions: What is the overall lethality of the battlefield and How effective is combat casualty care? To answer these questions with current data, the three services have collaborated to create a joint theater trauma registry (JTTR), cataloging all the serious injuries, procedures, and outcomes for the current war. These definitions and equations, consistently applied to the JTTR, will allow meaningful comparisons and help direct future research and appropriate application of personnel. Key Words: Combat, Casualty, Statistics.

DTIC

Casualties; Combat; Hospitals; Injuries; Lethality; Mortality; Statistics

20080033260 Naval Hospital, Camp Pendleton, CA USA

Initial Experience of US Marine Corps Forward Resuscitative Surgical System during Operation Iraqi Freedom

Chambers, Lowell W; Rhee, Peter; Baker, Bruce C; Perciballi, John; Cubano, Miguel; Compeggie, Michael; Nace, Michael; Bohman, Harold R; Jan 2005; 8 pp.; In English

Report No.(s): AD-A480500; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480500

Modern U.S. Marine Corps (USMC) combat tactics are dynamic and nonlinear. While effective strategically, this can prolong the time it takes to transport the wounded to surgical capability, potentially worsening outcomes. To offset this, the USMC developed the Forward Resuscitative Surgical System (FRSS). By operating in close proximity to active combat units, these small, rapidly mobile trauma surgical teams can decrease the interval between wounding and arrival at surgical intervention with resultant improvement in outcomes. Design: Case series. Setting: Echelon 2 surgical units during the invasion phase of Operation Iraqi Freedom. Patients: Ninety combat casualties, consisting of 30 USMC and 60 Iraqi patients, were treated in the FRSS between March 21 and April 22, 2003. Interventions: Tactical surgical intervention consisting of selectively applied damage control or definitive trauma surgical procedures. Main Outcome Measures: Time to surgical intervention and outcome following treatment in the FRSS. Results: Ninety combat casualties with 170 injuries required 149

procedures by 6 FRSS teams. The USMC patients were received within a median of 1 hour of wounding with the critically injured being received within a median of 30 minutes. Fifty-three USMC personnel were killed in action and 3 died of wounds for a killed in action rate of 13.5% and a died of wounds rate of 0.8% during the invasion phase of Operation Iraqi Freedom. All Marines treated in the FRSS survived. Conclusion: The use of the FRSS in close proximity to the point of engagement during the initial, dynamic combat phase of Operation Iraqi Freedom prevented delays in surgical intervention of USMC combat casualties with resultant beneficial effects on patient outcomes.
DTIC
Injuries; Medical Personnel; Surgery

20080033263 Brooke Army Medical Center, Fort Sam Houston, TX USA
USA Army Rangers in Somalia: An Analysis of Combat Casualties on an Urban Battlefield
Mabry, Robert L; Holcomb, John B; Baker, Andrew M; Cloonan, Clifford C; Uhorchak, John M; Perkins, Denver E; Canfield, Anthony J; Hagmann, John H; Sep 2000; 16 pp.; In English
Report No.(s): AD-A480509; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480509

This study was undertaken to determine the differences in injury patterns between soldiers equipped with modern body armor in an urban environment compared with the soldiers of the Vietnam War. From July 1998 to March 1999 data were collected for a retrospective analysis of all combat casualties sustained by USA military forces in Mogadishu, Somalia, on October 3 and 4, 1993. This was the largest and most recent urban battle involving USA ground forces since the Vietnam War. The results show that there were 125 combat casualties. The casualty distribution was similar to that of Vietnam: 11% died on the battlefield, 3% died after reaching a medical facility, 47% were evacuated, and 39% returned to duty. The incidence of bullet wounds in Somalia was higher than in Vietnam (55% vs. 30%), whereas there were fewer fragment injuries (31% vs. 48%). Blunt injury (12%) and burns (2%) caused the remaining injuries in Somalia. Fatal penetrating injuries in Somalia compared with Vietnam included wounds to the head and face (36% vs. 35%), neck (7% vs. 8%), thorax (14% vs. 39%), abdomen (14% vs. 7%), thoracoabdominal (7% vs. 2%), pelvis (14% vs. 2%), and extremities (7% vs. 7%). No missiles penetrated the solid armor plate protecting the combatants' anterior chests and upper abdomens. Most fatal penetrating injuries were caused by missiles entering through areas not protected by body armor, such as the face, neck, pelvis, and groin. Three patients with penetrating abdominal wounds died from exsanguination, and two of these three died after damage-control procedures. In conclusion, the incidence of fatal head wounds was similar to that in Vietnam in spite of modern Kevlar helmets. Body armor reduced the number of fatal penetrating chest injuries. Penetrating wounds to the unprotected face, groin, and pelvis caused significant mortality. These data may be used to design improved body armor.
DTIC
Armor; Black Sea; Casualties; Combat; Injuries; Somalia; United States; Vietnam; Warfare

20080033265 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Injury Severity and Causes of Death from Operation Iraqi Freedom and Operation Enduring Freedom: 2003-2004 Versus 2006
Kelly, Joseph F; Ritenour, Amber E; McLaughlin, Daniel F; Bagg, Karen A; Apodaca, Amy N; Mallak, Craig T; Pearse, Lisa; Lawnick, Mary M; Champion, Howard R; Wade, Charles E; Feb 2008; 8 pp.; In English
Report No.(s): AD-A480515; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480515

The opinion that injuries sustained in Iraq and Afghanistan have increased in severity is widely held by clinicians who have deployed multiple times. To continuously improve combat casualty care, the Department of Defense has enacted numerous evidence-based policies and clinical practice guidelines. The authors hypothesized that the severity of wounds has increased over time. In this study, they examined cause of death looking for opportunities to improve clinical research and training for the battlefield. Autopsies of the earliest combat deaths in Iraq and Afghanistan and the latest deaths in 2006 were analyzed to assess changes in injury severity and causes of death. Fatalities were classified as nonsurvivable (NS) or potentially survivable (PS). PS deaths were then reviewed in depth to analyze mechanism and cause. The results showed that there were 486 PS cases from March 2003 to April 2004 (group 1) and 496 from June 2006 to December 2006 (group 2) that met the inclusion criteria. Of the PS fatalities (group 1: 93 and group 2: 139), the injury severity score was lower in the first group (27 +/- 14 vs. 37 +/- 16, $p < 0.001$), and had a lower number of abbreviated injury scores greater than tor equal to 4 (1.1 +/- 0.79 vs. 1.5 +/- 0.83 per person, $p < 0.001$). The main cause of death among the PS fatalities was truncal hemorrhage (51% vs. 49%, p = NS). Deaths per month between groups doubled (35 vs. 71), whereas the case fatality rates between the two time periods were equivalent (11.0 vs. 9.8, p = NS). In the time periods of the wars studied, deaths per month have

doubled, with increases in both injury severity and number of wounds per casualty. Truncal hemorrhage is the leading cause of potentially survivable death. Arguably, the success of the medical improvements during this war has served to maintain the lowest case fatality rate on record.
DTIC
Death; Injuries; Military Personnel; Mortality

20080033267 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
The Correlation between Ketamine and Posttraumatic Stress Disorder in Burned Service Members
McGhee, Laura L; Maani, Christopher V; Garza, Thomas H; Gaylord, Kathryn M; Black, Ian H; Feb 2008; 6 pp.; In English
Report No.(s): AD-A480518; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480518

Predisposing factors for posttraumatic stress disorder (PTSD) include experiencing a traumatic event, threat of injury or death, and untreated pain. Ketamine, an anesthetic, is used at low doses as part of a multimodal anesthetic regimen. However, since ketamine is associated with psychosomatic effects, there is a concern that ketamine may increase the risk of developing PTSD. This study investigated the prevalence of PTSD in Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) service members who were treated for burns in a military treatment center. The PTSD Checklist-Military (PCL-M) is a 17-question screening tool for PTSD used by the military. A score of 44 or higher is a positive screen for PTSD. The charts of all OIF/OEF soldiers with burns who completed the PCL-M screening tool (2002-2007) were reviewed to determine the number of surgeries received, the anesthetic regime used, including amounts given, the total body surface area burned, and injury severity score. Morphine equivalent units were calculated using standard dosage conversion factors. The prevalence of PTSD in patients receiving ketamine during their operation(s) was compared with patients not receiving ketamine. Of the 25,000 soldiers injured in OIF/OEF, USA Army Institute of Surgical Research received 603 burn casualties, of which 241 completed the PCL-M. Of those, 147 soldiers underwent at least one operation. Among the 119 patients who received ketamine during surgery and 28 who did not, the prevalence of PTSD was 27% (32 of 119) versus 46% (13 of 28), respectively ($p = 0.044$). Contrary to expectations, patients receiving perioperative ketamine had a lower prevalence of PTSD than soldiers receiving no ketamine during their surgeries despite having larger burns, higher injury severity scores, undergoing more operations, and spending more time in the ICU.
DTIC
Anesthetics; Correlation; Disorders; Mental Health; Military Personnel; Risk; Surgery

20080033270 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
The Symbiosis of Combat Casualty Care and Civilian Trauma Care: 1914-2007
Pruitt, Jr, Basil A; Feb 2008; 6 pp.; In English
Report No.(s): AD-A480526; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480526

Over the past 93 years, experience in the care of combat casualties and biomedical research activities by the U.S. military, focused on the problems occurring in combat casualties, have contributed significantly to overall surgical progress. Treatment refinements developed during wartime and research findings generated during conflict and the interbellum periods have been transferred to the civilian community to improve the care of all trauma patients. Similarly, technological developments and research findings generated in civilian laboratories have been readily integrated into military trauma care. Advances in wound care include effective topical antimicrobial chemotherapy for burns and other problem wounds, and the use of infection monitoring and surveillance systems to facilitate infection control in the ICU. Refinements of fluid resuscitation have essentially eliminated acute renal failure as a complication in combat casualties and have identified the hazards of excessive resuscitation (which are of considerable current interest). Civilian trauma patients have benefited by the transfer of prophylactic hemodialysis, the use of high pressure interrupted flow-positive pressure lung-protective ventilation, and the development of full-spectrum metabolic support regimens. The organization and delivery of civilian trauma care has been materially enhanced by adopting and adapting the military use of helicopters for patient transport and the establishment of trauma and burn centers within hierarchical regional trauma systems. This article reviews the advances in combat casualty care and civilian trauma care that have occurred from 1914 through 2007, and the symbiotic quality of the relationship between the two systems of care. The review encompasses World War I, World War II, the Korean War, the Vietnam War, advances in burn care, Operations Desert Shield/Desert Storm, and Operations Enduring Freedom and Iraqi Freedom.
DTIC
Casualties; Combat; Injuries; Medical Science; Military Personnel; Personnel; Symbiosis; Therapy

20080033271 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Long Range Transport of War-Related Burn Casualties

Renz, Evan M; Cancio, Leopoldo C; Barillo, David J; White, Christopher E; Albrecht, Michael C; Thompson, Charles K; Ennis, Jody L; Wanek, Sandra M; King, James A; Chung, Kevin K; Feb 2008; 11 pp.; In English

Report No.(s): AD-A480532; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480532

U.S. military burn casualties are evacuated to the U.S. Army Institute of Surgical Research (USAISR) Burn Center in San Antonio, TX. Patients are transported by USAISR Burn Flight Teams, Air Force Critical Care Air Transport Teams, or routine aeromedical evacuation. This study characterizes the military burn casualties transported by each team and reports associated outcomes. The authors performed a retrospective review of burn center registry data, identifying all U.S. burn casualties admitted to the Army's burn center between March 2003 and February 2007. Data included total body surface area (TBSA) burn, ventilatory status, inhalational injury, associated injuries, injury severity, disposition, morbidity, and mortality. During 4 years of military operations in Iraq and Afghanistan, 540 casualties were admitted to the burn center for treatment of injuries resulting from war-related operations. Mean burn size was 16.7% total body surface area (range, < 1%-95%) with a mean Injury Severity Score of 12.2 +/- 13.7. One hundred eight-one (33.5%) casualties required ventilatory support in flight; inhalation injury was confirmed in 69 (12.7%) patients. Two hundred six (38.1%) were transported by the Burn Flight Team and 174 (32.2%) were transported by the Critical Care Air Transport Team, with a mean transit time of 4 days after injury. One hundred sixty (29.6%) patients were routine aeromedical evacuees. There were no in-flight deaths reported; 30 (5.6%) patients died of their wounds at the burn center. Burn casualties represent a group of patients with severe traumatic injuries. The current system of selectively using specialty medical transport teams for the long-range transport of burn casualties is safe and effective.

DTIC

Air Transportation; Casualties; Combat; Evacuating (Transportation); Medical Services; Military Personnel; Patients; Therapy; Warfare

20080033274 Air Force Academy Hospital, USA

Business Case Analysis: Identifying Concerns for the Continuum of Care for USA Air Force Cadets with the Implementation of Base Realignment and Close Initiatives at the Air force Academy Hospital

McShane, Katie A; Dec 31, 2006; 57 pp.; In English

Report No.(s): AD-A480556; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480556

This business case analysis (BCA) projects the likely financial results and other business consequences to the USA Air Force Academy (USAFA) Hospital, 10th Medical Group (MDG), associated with the impending loss of inpatient services as directed under the 2005 Base Realignment and Closure Commission (BRAC) initiatives. Authorized under the BRAC Act of 1990, Public Law 101-510, 10 U.S.C 2687, these initiatives are public law. This BCA will focus on the continuum ofcare and the special needs of Air Force (AF) Academy cadets (BRAC, 2005). Understandably, the issue of caring for the cadets in the BRAC environment has become a main focal point for the 10 MDG. There are many options that could be considered; however, this BCA will focus on four options. These options are I) utilization of Fort (FT) Carson, 2) utilization of FT Carson with expansion of cadet ambulatory care services, 3) utilization of network care with admitting privileges for any physician treating a cadet, or 4) utilization of network care with admitting privileges for cadet physicians and expansion of cadet ambulatory care services.

DTIC

Armed Forces (United States); Closures; Commerce; Continuums; Hospitals; Identifying; Medical Services; Patients; United States; Universities

20080033275 Naval Research Lab., Stennis Space Center, MS USA

Applications of Environmental Cell - Transmission Electron Microscopy for the Microcharacterization of Bio-alteration Products and the Study of Bio-processes

Daulton, Tyrone L; Jan 2004; 3 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480558; XB-NRL/CR/7401; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480558

Environmental Cell (EC)- Transmission Electron Microscopy (TEM) is a powerful technique in which hydrated specimens (at tens of torr pressure) can be examined at high spatial resolution in more or less their natural state. Two methods have been used in environmental TEM instruments: closed-cell specimen holders (e.g., see Fig. 1) and open-cell differential

column pumping. Several applications of closed-cell EC-TEM are discussed in which chemical and high-resolution structural information were obtained on hydrated, microbial alteration products. Also discussed is the profound application of closed-cell EC-TEM for the in-situ study of functioning biomolecules.
DTIC
Biochemistry; Electron Microscopy; Transmission Electron Microscopy

20080033294 Naval Hospital, Camp Pendleton, CA USA
The Experience of the US Marine Corps' Surgical Shock Trauma Platoon with 417 Operative Combat Casualties during a 12 Month Period of Operation Iraqi Freedom
Chambers, Lowell W; Green, D J; Gillingham, Bruce L; Sample, Kenneth; Rhee, Peter; Brown, Carlos; Brethauer, Stacy; Nelson, Thomas; Narine, Nalan; Baker, Bruce; Jun 2006; 11 pp.; In English
Report No.(s): AD-A480611; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480611

The Forward Resuscitative Surgical System (FRSS) is a small, mobile trauma surgical unit designed to support modern U.S. Marine Corps combat operations. The experience of two co-located FRSS teams during 1 year of service in Operation Iraqi Freedom is reviewed to evaluate the system's efficacy. Between March 1, 2004 and February 28, 2005, two FRSS teams and a shock trauma platoon were co-located in a unit designated the Surgical Shock Trauma Platoon (SSTP). Data concerning patient care before and during treatment at the SSTP was maintained prospectively. Prospective determination of outcomes was obtained by e-mail correspondence with surgeons caring for the patients at higher echelons. The Los Angeles County medical center (LAC) trauma registry was queried to obtain a comparable database with which to compare outcomes. During the year reviewed there were 895 trauma admissions to the SSTP. Excluding 25 patients pulseless on arrival and 291 minimally injured patients, 559 of 579 (97%) combat casualties survived; 417 casualties underwent 981 operative procedures in the two SSTP operating shelters. There were 79 operative patients with a mean injury severity score of 26 (range, 16-59) and mean revised trauma score of 6.963 (range, 4.21-7.841) who had sustained severe injuries. Ten (12.7%) of these casualties died while 43 of 337 (12.8%) deaths were seen with comparable cases treated at LAC. The authors conclude that small task-oriented surgical units are capable of providing effective trauma surgical care to combat casualties. Further experience is needed to better delineate the balance between early, forward-based surgical intervention and more prolonged initial casualty evacuation to reach more robust surgical facilities.
DTIC
Casualties; Combat; Injuries; Surgery

20080033295 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Burn Support for Operation Iraqi Freedom and Related Operations, 2003 to 2004
Cancio, Leopoldo C; Horvath, E E; Barillo, David J; Kopchinski, Bernard J; Charter, Keith R; Montalvo, Alfredo E; Buescher, Teresa M; Brengman, Matthew L; Brandt, Mary-Margaret; Holcomb, John B; Apr 2005; 12 pp.; In English
Report No.(s): AD-A480612; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480612

Thermal injury historically constitutes approximately 5% to 20% of conventional warfare casualties. This article reviews medical planning for burn care for the war in Iraq and experience with burns during the war at the U.S. Army Burn Center; aboard the USNS Comfort hospital ship; and at Combat Support Hospitals in Iraq and Afghanistan. Two burn surgeons were deployed to the military hospital in Landstuhl, Germany, and to the Gulf Region to assist with triage and patient care. From March 2003 to May 2004, 109 burn casualties from the war were hospitalized at the U.S. Army Burn Center in San Antonio, Texas, and U.S. Army Burn Flight Teams moved 51 critically ill burn casualties to the Burn Center. Ten Iraqi burn patients underwent surgery and were hospitalized for up to 1 month aboard the Comfort, including six with massive wounds. Eighty-six burn casualties were hospitalized at the 28th Combat Support Hospital for up to 53 days. This experience highlights the importance of anticipating the burn care needs of both combatants and the local civilian population during war.
DTIC
Casualties; Medical Services; Planning

20080033297 Naval Hospital, Camp Pendleton, CA USA

Tactical Surgical Intervention with Temporary Shunting of Peripheral Vascular Trauma Sustained during Operation Iraqi Freedom: One Unit's Experience

Chambers, Lowell W; Green, D J; Sample, Kenneth; Gillingham, Bruce L; Rhee, Peter; Brown, Carlos; Narine, Nalan; Uecker, John M; Bohman, Harold R; Oct 2006; 8 pp.; In English

Report No.(s): AD-A480614; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480614

Rapidly restoring perfusion to injured extremities is one of the primary missions of forward military surgical teams. The austere setting, limited resources, and grossly contaminated nature of wounds encountered complicates early definitive repair of complex combat vascular injuries. Temporary vascular shunting of these injuries in the forward area facilitates rapid restoration of perfusion while allowing for deferment of definitive repair until after transport to units with greater resources and expertise. Standard Javid or Sundt shunts were placed to temporarily bypass complex peripheral vascular injuries encountered by a forward U.S. Navy surgical unit during a 6-month interval of Operation Iraqi Freedom. Data from the time of injury through transfer out of Iraq were prospectively recorded. Each patient's subsequent course at Continental U.S. medical centers was retrospectively reviewed once the operating surgeons had returned from deployment. Twenty-seven vascular shunts were used to bypass complex vascular injuries in 20 combat casualties with a mean injury severity score of 18 (range 9-34) and mean mangled extremity severity score of 9 (range 6-11). All patients survived although three (15%) ultimately required amputation for nonvascular complications. Six (22%) shunts clotted during transport but an effective perfusion window was provided even in these cases. Conclusion: Temporary vascular shunting appears to provide a simple and effective means of restoring limb perfusion to combat casualties at the forward level.

DTIC

Bypasses; Cardiovascular System; Circuits; Hemorrhages; Injuries; Surgery

20080033306 California Univ., Berkeley, CA USA

The Key Involvement of Poly(ADP-Ribosyl)ation in Defense Against Toxic Agents: Molecular Biology Studies

Vila-Sanjurjo, Anton; Bustamante, Carlos; Feb 19, 2008; 40 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0412

Report No.(s): AD-A480637; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480637

Our study during the period 2006-2007 focused on the creation of a minimal synthetic organism by reversing the endosymbiosis of mitochondria.

DTIC

Molecular Biology; Toxicity

20080033322 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Effectiveness of Self-Applied Tourniquets in Human Volunteers

Walters, Thomas J; Wenke, Joseph C; Kauvar, David S; McManus, John G; Holcomb, John B; Baer, David G; May 2005; 8 pp.; In English

Report No.(s): AD-A480661; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480661

Tourniquets are not commonly used in routine extremity trauma, but can be vital for hemorrhage control in austere conditions. Objective. To determine the effectiveness in human volunteers of currently available self applied tourniquets for extremity hemorrhage. Methods. Seven tourniquets were tested on the thigh for elimination of detectable distal pulse by Doppler auscultation at the popliteal artery (experiment I, n= 18 subjects). The tourniquets that were effective in >80% of subjects in experiment I were tested for effectiveness on the upper arm by auscultation at the radial artery (experiment II, n=12 subjects).

DTIC

Cardiovascular System; Diseases; Hemorrhages; Injuries; Supplying; Tourniquets

20080033324 Walter Reed Army Medical Center, Washington, DC USA

Contemporary Management of Wartime Vascular Trauma

Fox, Charles J; Gillespie, David L; O'Connell, Sean D; Rasmussen, Todd E; Goff, James M; Johnson, Chatt A; Galgon, Richard E; Sarac, Timur P; Rich, Norman M; Jun 2004; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480663; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480663

The treatment of wartime injuries has led to advances in the diagnosis and treatment of vascular trauma. Recent experience has stimulated a reappraisal of the management of such injuries, specifically assessing the effect of explosive devices on injury patterns and treatment strategies. The objective of this report is to provide a single-institution analysis of injury patterns and management strategies in the care of modern wartime vascular injuries.

DTIC

Cardiovascular System; Clinical Medicine; Injuries

20080033422 Air Force Research Lab., Wright-Patterson AFB, OH USA

Stochastic Simulations of Cellular Biological Processes

Chushak, Yaroslav; Foy, Brent; Frazier, John; Jun 2007; 10 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480737; No Copyright; Avail.: Defense Technical Information Center (DTIC)

INTRODUCTION: From a systems engineering point of view, cells consist of a complex set of nested, nonlinear control systems dominated by feed-back and feed-forward loops. The more complex the system is, the more important are the issues concerning the robustness and parameter optimization, therefore modeling and simulations are important for both engineering and reverse-engineering of biosystems. OBJECTIVE: At the functional level, all biological processes in cells can be represented as a series of biochemical reactions. Since such reactions are stochastic in nature, the user must run thousands of simulations to characterize the ensemble behavior of biological systems. We developed a software package called Biomolecular Network Simulator (BNS) to model and simulate complex biomolecular reaction networks using High Performance Computing (HPC). METHODOLOGY: The Biomolecular Network Simulator uses the Gillespie stochastic algorithm to simulate the evolution of a system of biochemical reactions. The BNS code is a combination of MATLAB and C-coded modules. This combination allows one to use the interactive features and visualization tools of MATLAB, while achieving high speed for the computationally intensive part of the software. The software is parallelized with the MPI library to run on multiprocessor architectures. RESULT: The Biomolecular Network Simulator consists of two sets of tools: for simulations of the system and for the analysis of simulation results. The Graphical User Interface of BNS allows users to easily set parameters for the model and simulations and to select analysis method. Multiple types of post-simulation analyses are available. SIGNIFICANCE to DoD: The Developed software allows DoD scientists to build, simulate and analyze complex cellular biomolecular networks utilizing the capacities of HPC. It provides the foundational capability to design and integrate biological constructs into a new generation of biotechnology products.

DTIC

Activity (Biology); Biochemistry; Biotechnology; Cytology; Simulation; Simulators; Stochastic Processes

20080033425 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Association of Posttraumatic Stress Disorder with Somatic Symptoms, Health Care Visits, and Absenteeism among Iraq War Veterans

Hoge, Charles W; Terhakopian, Artin; Castro, Carl A; Messer, Stephen C; Engel, Charles C; Jan 2007; 5 pp.; In English

Report No.(s): AD-A480742; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Studies of soldiers from prior wars conducted many years after combat have shown associations between combat-related posttraumatic stress disorder (PTSD) and physical health problems. The current Iraqi War has posed a considerable PTSD risk, but the association with physical health has not been well studied. The authors studied 2,863 soldiers using standardized self-administered screening instruments 1 year after their return from combat duty in Iraq. Among all participants, 16.6% met the screening criteria for PTSD. PTSD was significantly associated with lower ratings of general health, more sick call visits, more missed workdays, more physical symptoms, and high somatic symptom severity. These results remained significant after controlling for wounds and injuries. The authors conclude that the high prevalence of PTSD and its strong association with physical health problems among Iraqi War veterans have important implications for the delivery of medical services to these veterans. The medical burden of PTSD includes physical health problems; combat veterans with serious somatic concerns should be evaluated for PTSD.

DTIC

Health; Iraq; Medical Services; Signs and Symptoms; Warfare

20080033426 Army Medical Research and Materiel Command, Fort Detrick, MD USA

DOVIS: A Tool for High-throughput Virtual Screening

Jiang, Xiaohui; Kumar, Kamal; Wallqvist, Anders; Reifman, Jaques; Jun 2007; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480743; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Molecular docking is a computational technique to predict how a small molecule may interact with a protein. Docking-based virtual high-throughput screening is an in silico approach that uses molecular docking to rank a large database of molecules against a given protein target. This approach has been successfully used in drug discovery programs in the pharmaceutical industry. Typically, docking a molecule may take 1 to 5 minutes. With the explosive growth of known molecular structures, High Performance Computing (HPC) is necessary to screen millions of molecules of potential interest. The objective of the current project is to develop a DOcking-based VIrtual Screening (DOVIS) pipeline based on AutoDock, a molecular docking program developed at the Scripps Research Institute. The DOVIS pipeline has a graphic user interface (GUI) for end users to specify input parameters, submit jobs and visualize results. The pipeline automates docking tasks with AutoDock and is integrated with queuing systems to run parallel jobs. Access to HPC resources to run DOVIS are made available from a local Web-browser running on the user's desktop.

DTIC

Molecules; Queueing Theory; Warfare

20080033432 Library of Congress, Washington, DC USA

The Global Fund to Fight AIDS, Tuberculosis, and Malaria: Progress Report and Issues for Congress

Salaam-Blyther, Tiaji; Apr 14, 2008; 23 pp.; In English

Report No.(s): AD-A480766; CRS-RL33396; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Global Fund to Fight AIDS, Tuberculosis, and Malaria, headquartered in Geneva, Switzerland, is an independent foundation that seeks to attract and rapidly disburse new resources in developing countries aimed at countering the three diseases. The origins of the Fund as an independent entity to fight the three diseases lie partly in a French proposal made in 1998, in ideas developed in the 106th Congress, and in recommendations made by UN Secretary-General Kofi Annan in April 2001. As of March 20, 2008, donors have pledged more than $19 billion to the Fund, of which nearly $10 billion has been paid. The funds have been used to support more than 500 grants totaling more than $10 billion for projects in 136 countries. Each year, the Fund awards grants through Proposal Rounds. The Fund launched its 8th Round on March 3, 2008. The USA is the largest single contributor to the Global Fund. From FY2001 through FY2008, Congress has appropriated $3.8 billion to the Fund, providing $840.3 million in FY2008, the single largest U.S. contribution to date. There has been some debate about the level of U.S. contributions to the Fund. Some critics argue that the USA should temper its support to the Fund, because the Fund has not demonstrated strong reporting and monitoring practices; because contributions made to the Fund in excess of the President's request are provided at the expense of U.S. bilateral HIV/AIDS, TB, and malaria programs; and because the Fund needs to secure support from other sources. Supporters of current funding levels counter that the Fund has improved its reporting and monitoring practices; U.S. contributions to the Fund parallel increases in U.S. bilateral HIV/AIDS, TB, and malaria programs; and the Fund has raised the participation of the private sector through the launching of Product Red. This report discusses the Fund's progress to date, describes U.S. contributions to the fund, and presents some issues Congress might consider.

DTIC

Developing Nations; Federal Budgets; Parasitic Diseases; Tuberculosis; United States; Viruses

20080033435 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase II Part C&D. User's Manual V 3.0: Dynamic Load Carriage Compliance Tester Automated Test Cell

Reid, S A; Bryant, J T; Stevenson, J M; Aug 2005; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480770; DRDC-T-CR-2005-119; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report represents the User's Manual for the 3D dynamic load carriage simulator and automated test cell. Contained within this report are the hardware and software components in addition to instructions for users to run the system. If the system is ever moved to a new location, this manual must be taken with it for set-up and data acquisition. The changes to the automated programmable motion control system have created a number of functions not possible with the previous system. These functions include: (1) highly repeatable motion profiles independent of the operator: (2) determination of the system stiffness under dynamic conditions: (3) provision for quantitative validation of models of load carriage devices: (4) determination of the frequency response of LC suspension systems and (5) creation of an automated test cell requiring minimal

operator expertise and low cost for possible sale to support other countries modelling efforts.
DTIC
Anatomy; Biodynamics; Carriages; Dynamic Loads; Dynamic Models; Loads (Forces); Manuals; Simulators; User Manuals (Computer Programs)

20080033440 National Marrow Donor Program, Minneapolis, MN USA
Quarterly Performance/Technical Report of the National Marrow Donor Program (Trademark)
Setterholm, Michelle; Apr 30, 2008; 21 pp.; In English
Contract(s)/Grant(s): N00014-06-1-0704
Report No.(s): AD-A480777; No Copyright; Avail.: Defense Technical Information Center (DTIC)

1. Contingency Prepardness: Collect information from transplant centers, build awareness of the Transplant Center Contingency Planning Committee and educate the transplant community about the critical importance of establishing a nationwide contingency response plan. 2. Rapid Identification of Matched Donors : Increase operational efficiencies that accelerate the search process and increase patient access are key to preparedness in a contingency event. 3. Immunogenetic Studies: Increase understanding of the immunologic factors important in Hematopoietic Stem Cell (HSC) transplantation. 4. Clinical Research in Transplantation: Create a platform that facilitates multicenter collaboration and data management.
DTIC
Bone Marrow; Stem Cells; Transplantation

20080033443 Army Medical Research and Materiel Command, Fort Detrick, MD USA
A High-Throughput Pipeline for Designing Microarray-Based Pathogen Diagnostic Assays
Vijaya Satya, Ravi; Zavaljevski, Nela; Kumar, Kamal; Reifman, Jaques; Apr 10, 2008; 15 pp.; In English
Report No.(s): AD-A480786; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Background: We present a methodology for high-throughput design of oligonucleotide fingerprints for microarray-based pathogen diagnostic assays. The oligonucleotide fingerprints, or DNA microarray probes, are designed for identifying target organisms in environmental or clinical samples. The design process is implemented in a high-performance computing software pipeline that incorporates major algorithmic improvements over a previous version to both reduce computation time and improve specificity assessment. Results: The algorithmic improvements result in significant reduction in runtimes, with the updated pipeline being nearly up to five-times faster than the previous version. The improvements in specificity assessment, based on multiple specificity criteria, result in robust and consistent evaluation of cross-hybridization with nontarget sequences. In addition, the multiple criteria provide finer control on the number of resulting fingerprints, which helps in obtaining a larger number of fingerprints with high specificity. Simulation tests for Francisella tularensis and Yersinia pestis, using a well-established hybridization model to estimate cross-hybridization with nontarget sequences, show that the improved specificity criteria yield a larger number of fingerprints as compared to using a single specificity criterion. Conclusion: The faster runtimes, achieved as the result of algorithmic improvements, are critical for extending the pipeline to process multiple target genomes. The larger numbers of identified fingerprints, obtained by considering broader specificity criteria, are essential for designing probes for hard-to-distinguish target sequences.
DTIC
Assaying; Deoxyribonucleic Acid; Genome; Microorganisms; Pathogens; Pipelines

20080033446 Air Force Research Lab., Tyndall AFB, FL USA
Continuous-Flow Applications of Silica-Encapsulated Enzymes
Luckarift, Heather R; Johnson, Glenn R; Tomczak, Melanie M; Naik, Rajesh R; Spain, Jim C; Oct 13, 2006; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08637-03-C-6006; Proj-4915
Report No.(s): AD-A480795; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent studies have demonstrated the applicability of biomineralization reactions to create an inorganic support matrix suitable to enzyme immobilization. The enzyme/inorganic nanocomposites exhibit excellent mechanical stability and provide an effective method for developing immobilized enzyme reactors, applicable to biocatalysis, biosensors and drug discovery. Enzymes are remarkably versatile catalysts, but in their native soluble form are often labile in the absence of stabilizing agents and are difficult to recover from reaction mixtures. Immobilization of enzymes is therefore frequently employed in an attempt to stabilize enzyme activity and allow reuse of the catalyst. Enzyme immobilization methods primarily involve adsorption, attachment or encapsulation of biomolecules onto or into a solid phase (1-7). A range of silicates have been investigated for

enzyme immobilization, either by attachment to functionalized mesoporous silica or encapsulation within sol-gel composites, but processing limitations have restricted widespread applicability (2,4,6,7).
DTIC
Continuum Flow; Enzymes; Silicon Dioxide

20080033460 National Inst. of Standards and Technology, Gaithersburg, MD USA
Independent Control of Grafting Density and Conformation of Single-Stranded DNA Brushes
Opdahl, Aric; Petrovykh, Dmitri Y; Kimura-Suda, Hiromi; Tarlov, Michael J; Whitman, Lloyd J; Jan 2, 2007; 8 pp.; In English
Report No.(s): AD-A480830; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe self-assembly of ssDNA brushes that exploits the intrinsic affinity of adenine nucleotides (dA) for gold surfaces. The grafting density and conformation of these brushes is deterministically controlled by the length of the anchoring dA sequences, even in the presence of thymine nucleotides (dT). We produce and characterize brushes of model block-oligonucleotides, d(Tm-An), with systematically varied lengths m and n of the thymine and adenine blocks [denoted d(Tm) and d(An), respectively]. The hairpin conformation, dominant for self-complementary d(Tm-An) oligos in solution, is disrupted by the high preferential affinity of dA for gold surfaces. As a result, the d(Tm-An) oligos adsorb as a brush of d(T) strands immobilized via the d(A) blocks. Quantitative analysis by FTIR spectroscopy and x-ray photoelectron spectroscopy (XPS) reveals a unique feature of DNA immobilization via d(A) blocks: The surface density of dA nucleotides is close to saturation and is nearly independent of d(A) block length. Accordingly, the lateral spacing (grafting density) of the d(T) blocks is determined by the length of the d(A) blocks. The d(T) blocks extend away from the surface in a brush-like conformation at a lateral spacing 2 3 times larger (a grafting density 5 10 times lower) than in analogous films immobilized via standard thiol linkers. This combination of brushlike conformation and low saturation grafting density is expected to increase the efficiency of DNA hybridization at surfaces. Therefore, immobilization via d(A) blocks offers a method of producing DNA brushes with controlled properties for applications in biotechnology and nanotechnology.
DTIC
Brushes; Deoxyribonucleic Acid; Gold; Grafting

20080033467 Naval Research Lab., Washington, DC USA
Rapid, Femtomolar Bioassays in Complex Matrices ComBining Microfluidics and Magnetoelectronics
Mulvaney, S P; Cole, C L; Kniller, M D; Malito, M; Tamanaha, C R; Rife, J C; Stanton, M W; Whitman, L J; Mar 22, 2007; 32 pp.; In English
Report No.(s): AD-A480855; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A significant challenge for all biosensor systems is to achieve high assay sensitivity and specificity while minimizing sample preparation requirements, operational complexity, and sample-to-answer time. We have achieved multiplexed, unamplified, femtomolar detection of both DNA and proteins in complex matrices 'including whole blood, serum, plasma, and milk' in minutes using as few as two reagents by labeling conventional assay schemes with micrometerscale magnetic beads, and applying fluidic force discrimination 'FFD'. In FFD assays, analytes captured onto a microarray surface are labeled with microbeads, and a controlled laminar flow is then used to apply microfluidic forces sufficient to preferentially remove only nonspecifically bound bead labels. The density of beads that remain bound is proportional to the analyte concentration and can be determined with either optical counting or magnetoelectronic detection of the magnetic labels. Combining FFD assays with chip-based magnetoelectronic detection enables a simple, potentially handheld, platform capable of both nucleic acid hybridization assays and immunoassays, including orthogonal detection and identification of bacterial and viral pathogens, and therefore suitable for a wide range of biosensing applications.
DTIC
Beads; Bioassay; Biological Effects; Deoxyribonucleic Acid; Detection; Magnetic Fields; Matrices (Mathematics)

20080033478 Carnegie-Mellon Univ., Pittsburgh, PA USA
Conceptual Study of LSTAT Integration to Robotics and Other Advanced Medical Technologies
Osborn, Jim; Rocca, Miltra; Jul 31, 2004; 45 pp.; In English
Report No.(s): AD-A480891; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Battlefield medicine is moving toward adoption of several new technologies to both improve the quality of care and protect healthcare providers. One example of this trend is use of the Life Support for Trauma and Transport (LSTAT) patient transport litter in combat conditions. LSTATs are sustaining lives on land, in the air and at sea from Alaska to Iraq. LSTAT

was recently introduced into the nation's largest trauma center, Los Angeles County Trauma Center, where initial indications are that LSTAT not only helps save lives, but also helps save money. LSTAT has been deployed to 28th and 31st CSH in Iraq and Afghanistan and with a Navy amphibious assault ship. This includes LSTAT systems currently deployed with National Guard units in Alaska and Hawaii. LSTAT systems have recently been deployed with Special Operations teams in The Philippines, Cambodia and elsewhere. Military medical teams are being trained on the use of the LSTAT system at the Navy Trauma Training Center at Los Angeles County as well as University of Southern California (USC) Trauma Center. The 207th Alaska Army National Guard (ARNG) reports aeromedical rescue using the LSTAT system. The Alaska ARNG was tasked by 11th US Air Force to medevac a 70-year old male in Toksook bay with respiratory failure. The civilian air ambulance was not capable of flying due to high winds in Toksook Bay. The ARNG in Bethel was tasked and transported the patient in stable condition using the LSTAT. The patient was transported from Toksook bay to Bethel and his life was saved. Johnson and Pearce conducted a study where thirty-one anesthesiologists and recovery room nurses compared the LSTAT with conventional monitors while managing four simulated critical events. The preliminary evaluation of LSTAT in simulated and postoperative environments demonstrated that the LSTAT provided appropriate equipment to detect and manage critical events in patient care [1].
DTIC
Air Transportation; Evacuating (Transportation); Life Support Systems; Medical Services; Military Operations; Robotics

20080033566 Biotechnology HPC Software Applications Inst., Fort Detrick, MD USA
The Development of PIPA: An Integrated and Automated Pipeline for Genome-Wide Protein Function Annotation
Yu, Chenggang; Zavaljevski, Nela; Desai, Valmik; Johnson, Seth; Stevens, Fred J; Reifman, Jaques; Jan 25, 2008; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480821; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Background: Automated protein function prediction methods are needed to keep pace with high-throughput sequencing. With the existence of many programs and databases for inferring different protein functions, a pipeline that properly integrates these resources will benefit from the advantages of each method. However, integrated systems usually do not provide mechanisms to generate customized databases to predict particular protein functions. Here, we describe a tool termed PIPA (Pipeline for Protein Annotation) that has these capabilities. Results: PIPA annotates protein functions by combining the results of multiple programs and databases, such as InterPro and the Conserved Domains Database, into common Gene Ontology (GO) terms. The major algorithms implemented in PIPA are: (1) a profile database generation algorithm, which generates customized profile databases to predict particular protein functions, (2) an automated ontology mapping generation algorithm, which maps various classification schemes into GO, and (3) a consensus algorithm to reconcile annotations from the integrated programs and databases. PIPA's profile generation algorithm is employed to construct the enzyme profile database CatFam, which predicts catalytic functions described by Enzyme Commission (EC) numbers. Validation tests show that CatFam yields average recall and precision larger than 95.0%. CatFam is integrated with PIPA. We use an association rule mining algorithm to automatically generate mappings between terms of two ontologies from annotated sample proteins. Incorporating the ontologies' hierarchical topology into the algorithm increases the number of generated mappings. In particular, it generates 40.0% additional mappings from the Clusters of Orthologous Groups (COG) to EC numbers and a six-fold increase in mappings.
DTIC
Automatic Control; Genome; Management Systems; Pipelines; Prediction Analysis Techniques; Proteins

20080033583 Air Force Research Lab., Tyndall AFB, FL USA
Immobilization of Antimicrobial Activities in Inorganic Matrices (BRIEFING SLIDES)
Johnson, Glenn R; Luckarift, Heather R; Eby, Matthew D; Nadeau, Lloyd J; Nov 14, 2007; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08637-03-C-6006; Proj-ARMT
Report No.(s): AD-A480724; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Numerous biochemical mechanisms protect organisms against potential microbial infection. Materials that incorporate active antimicrobial biomolecules could provide a significant advance for self-sanitizing surfaces and decontamination processes. Current fundamental research in our laboratory focuses on defining the interface between polypeptides and inorganic support materials. Additional work aims for the isolation and identification of new antimicrobial molecules from recombinant libraries. The understanding and discoveries can be applied to development of a new generation of reactive materials. One approach for in vitro immobilization of biomolecules is modeled after the biosynthesis of marine diatom exoskeletons. The process involves rapid formation of porous nanoparticles, which will simultaneously entrap biomolecules

that are present in the reaction solution. We have found that the bacteriolytic enzyme, hen egg white lysozyme, will mediate silica formation from soluble precursors, yielding by its nature, a material with antimicrobial properties. Work is underway to elucidate the mechanism of lysozyme-mediated silica formation. Physical adsorption and other non-covalent interactions appear to be primary forces for lysozyme's interaction with silica, pH changes and other solvent conditions cause rapid desorption from the particle. The biocidal spectrum of the material can be broadened by addition of other molecules such as antimicrobial peptides or by utilizing an inorganic support with antimicrobial activity. For example, lysozyme will also catalyze reduction of silver anions to yield composites of silver nanoparticles and active lysozyme. The composite material can take advantage of the antimicrobial effect of the silver metal, as well as the biochemical activity of the template protein.
DTIC
Antibiotics; Antiinfectives and Antibacterials; Biochemistry; Chutes; Immobilization; Infectious Diseases; Microorganisms

20080033627 Army Medical Research and Materiel Command, Fort Detrick, MD USA
Evidence of Probabilistic Behaviour in Protein Interaction Networks
Ivanic, Joseph; Wallqvist, Anders; Reifman, Jaques; Jan 31, 2008; 9 pp.; In English
Report No.(s): AD-A480739; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Data from high-throughput experiments of protein-protein interactions are commonly used to probe the nature of biological organization and extract functional relationships between sets of proteins. What has not been appreciated is that the underlying mechanisms involved in assembling these networks may exhibit considerable probabilistic behaviour. We find that the probability of an interaction between two proteins is generally proportional to the numerical product of their individual interacting partners, or degrees. The degree-weighted behaviour is manifested throughout the protein-protein interaction networks studied here, except for the high-degree, or hub, interaction areas. However, we find that the probabilities of interaction between the hubs are still high. Further evidence is provided by path length analyses, which show that these hubs are separated by very few links. The results suggest that protein-protein interaction networks incorporate probabilistic elements that lead to scale-rich hierarchical architectures. These observations seem to be at odds with a biologically-guided organization. One interpretation of the findings is that we are witnessing the ability of proteins to indiscriminately bind rather than the protein-protein interactions that are actually utilized by the cell in biological processes. Therefore, the topological study of a degree-weighted network requires a more refined methodology to extract biological information about pathways, modules, or other inferred relationships among proteins.
DTIC
Networks; Pattern Recognition; Proteins

20080033760 Martin Army Community Hospital, Fort Benning, GA USA
Pediatric Trauma: Experience of a Combat Support Hospital in Iraq
McGuigan, Rebecca; Spinella, Philip C; Beekley, Alec; Sebesta, James; Perkins, Jeremy; Grathwohl, Kurt; Azarow, Kenneth; May 2006; 5 pp.; In English
Report No.(s): AD-A480555; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480555

The mission of the combat support hospital (CSH) is to evaluate and treat combatants injured during war operations. The 31st CSH in Balad and Baghdad, Iraq, during Operation Iraqi Freedom 2 also treated many injured civilians, including children. The purpose of this article is to report the experience of the 31st CSH treating pediatric trauma patients.
DTIC
Combat; Hospitals; Iraq; Support Systems

20080033765 Air Force Medical Center, Lackland AFB, TX USA
Children Treated at an Expeditionary Military Hospital in Iraq
Coppola, Christopher P; Leininger, Brian E; Rasmussen, Todd E; Smith, David L; Sep 2006; 6 pp.; In English
Report No.(s): AD-A480517; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480517

Objective: To describe the treatment of children at an expeditionary military hospital in wartime Iraq. Design: Descriptive, retrospective study. Setting: The 332nd Air Force Theater Hospital in Balad, Iraq, January 1, 2004, to May 31, 2005. Patients: All 85 children (of 1626 total patients) evaluated and treated at the hospital during the study period. Interventions: Indicated surgical procedures performed on children. Main Outcome Measures: Age, sex, diagnosis, injury, operations, and complications for children during the study period. Results: The 85 children (age range, 1 day to 17 years; mean, 8 years)

represented 5.2% of all patients. Thirty-four (61%) of the 56 children for whom sex was recorded were male. Injury was the diagnosis for 48 children (56%). Of these, the cause was fragmentation wound in 25 children (52%), penetrating trauma in 11 (23%), burn in 9 (19%), and blunt trauma in 3 (6%). The site injury was the lower extremity in 18 children (38%), head in 11 (23%), upper extremity in 8 (17%), abdomen in (17%), and chest in 3 (6%). Nontraumatic conditions had congenital, infectious, gastrointestinal, and neoplastic causes. During the study, 134 operations were performed on 63 children. There were 5 deaths. Conclusions: Expeditionary military hospitals will encounter both injured and noninjured children seeking medical care. To optimize the care of these children, will be necessary to provide the proper personnel, training, and equipment.
DTIC
Children; Hospitals; Iraq; Medical Services

20080033768 Naval Medical Research Inst., Pendleton, CA USA
Battlefield Casualties Treated at Camp Rhino, Afghanistan: Lessons Learned
Bilski, Tracy R; Baker, Bruce C; Grove, Jay R; Hinks, Robert P; Harrison, Michael J; Sabra, John P; Temerlin, Steven M; Rhee, Peter; Oct 2002; 10 pp.; In English
Report No.(s): AD-A480554; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480554

Operation Enduring Freedom is an effort to combat terrorism after an attack on the USA. The first largescale troop movement (> 1,300) was made by the U.S. Marines into the country of Afghanistan by establishing Camp Rhino.
DTIC
Afghanistan; Casualties; Lessons Learned; Medical Services

20080033769 Air Force Center for Sustainment of Trauma and Readiness Skills, Cincinnati, OH USA
En-Route Care in the Air: Snapshot of Mechanical Ventilation at 37,000 Feet
Barnes, Stephen L; Branson, Richard; Gallo, Louis A; Beck, George; Johannigman, Jay A; Feb 2008; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480473; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480473

Evacuation of seriously wounded service members requiring mechanical ventilation in aircraft where low light, noise, vibration, and barometric pressure changes create a unique clinical environment. Our goal was to evaluate ventilatory requirements, oxygenation, and oxygen use in flight and assess the feasibility of a computer interface. A personal computer was integrated with the pulse oximeter and ventilator data port used in aeromedical evacuation from Iraq to Germany. Ventilator settings, inspired oxygen (FiO2), tidal volume (VT), respiratory rate (RR), minute ventilation (VE), monitored values, heart rate (HR), and oxygen saturation (SpO2), were recorded continuously. Additional data was obtained through the U.S. Air Force (USAF) Transcom Regulation and Command/Control Evacuation System (TRAC2ES) and the U. S. Army Institute of Surgical Research Joint Theater Trauma Registry databases. During a 4 month time frame 117 hours of continuous recording was accomplished in 22 patients. All patients survived transport. There were 32 changes to FiO2, 18 changes to PEEP, 26 changes to RR, and 20 changes to VT during flight. Five patients underwent no recorded changes in flight. Three desaturation events (<90%) were recorded lasting 35, 115, and 280 seconds. Recorded ventilatory changes averaged less than 1 (0.82) per hour of recorded flight with FiO2 being the most common. Conclusions: A computer interface is feasible in the austere aeromedical environment. Implications to military operations and civilian homeland defense include understanding casualty oxygen requirements for resource planning in support of aeromedical evacuation. Portable oxygen generation systems may be able to provide adequate oxygen flow for transport, reducing the need for compressed gas. Future studies of oxygen conservation systems including closed loop control of FiO2 are warranted.
DTIC
Air Transportation; Evacuating (Transportation); Human-Computer Interface; Medical Services; Microcomputers; Ventilation

20080033792 274 Forward Surgical Team, Fort Bragg, NC USA
Combat Casualties in Afghanistan Cared for by a Single Forward Surgical Team during the Initial Phases of Operation Enduring Freedom
Peoples, George E; Gerlinger, Tad; Craig, Robert; Burlingame, Brian; Jun 2005; 8 pp.; In English
Report No.(s): AD-A480406; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480406

Background: The 274th Forward Surgical Team (FST) was the first FST deployed to Bagram, Afghanistan, to provide

surgical care for combat casualties during the initial phases of Operation Enduring Freedom. This is an analysis of the distribution, cause, and severity of wounds for combat casualties and the surgical procedures they required. Methods: A prospective database was maintained for combat casualties cared for by the 274th FST. The database included demographic data, vital status, mechanism of injury, distribution and severity of wounds, and surgical care provided. Results: The FST cared for 224 combat casualties, including 153 U.S. soldiers, 19 coalition soldiers, 32 Afghan militia forces soldiers, and 20 detainees. Fragments were the most common mechanism of injury (49%), and the extremity was the most common location of injury (58%), whereas gunshot wounds were the most common cause of death (57%). There were few significant head, chest, or abdominal wounds (13%). The FST treated 103 surgical cases (73 with combat wounds), including neurosurgical, thoracic, general, orthopedic, and vascular cases, with a total of 180 procedures.
DTIC
Afghanistan; Cardiovascular System; Casualties; Combat; Medical Services; Surgery

20080034451 California Univ., San Francisco, CA USA
Role of Merlin in the Growth and Transformation of Arachnoidal Cells
Lal, Anita; Jan 2008; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-01-0221
Report No.(s): AD-A480259; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480259

This proposal is concerned with the functional role of merlin in arachnoidal and meningioma cells. In year 1, we had developed meningioma-specific NF2 model systems. Now, we have finished characterizing the phenotypic effects caused by merlin loss in meningioma cell lines. We have shown that merlin loss enhances loss of contact inhibition of growth and increases anchorage independent growth. Loss of merlin also increases entry into the S-phase of the cell cycle and this effect is associated with an increase in transcript and protein levels of cyclin E1. We also find that merlin loss also decreases the apoptotic rates in meningioma cell lines. Finally, we have initiated an analysis to identify downstream targets of merlin by microarrays. In the last year of funding, we anticipate identifying and characterizing downstream effectors of merlin in meningiomas.
DTIC
Membranes; Growth; Proteins

20080034527 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Tracking the Daily Availability of Burn Beds for National Emergencies
Barillo, David J; Jordan, Marion H; Jocz, Richard J; Nye, Donna; Cancio, Leopoldo C; Holcomb, John B; Apr 2005; 10 pp.; In English
Report No.(s): AD-A480447; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480447

Medical planning for Operation Iraqi Freedom includes predictive models of expected number of burn casualties. In all but the best-case scenario, casualty estimates exceeded the capacity of the only Department of Defense burn center. Examination of existing federal- civilian disaster plans for military hospital augmentation revealed that bed availability data were neither timely nor accurate. Recognizing the need for accurate knowledge of burn bed availability, the Department of Defense requested assistance from the American Burn Association (ABA). Directors of burn centers in the USA were queried for interest in participation in a mass casualty plan to provide overflow burn bed capacity A list of 70 participating burn centers was devised based upon proximity to planned military embarkation points. A computer tracking program was developed. Daily automated e-mail messages requesting bed status were sent to burn center directors at 6 AM Central time with responses requested before 11 AM. The collated list of national overflow burn bed capacity was e-mailed each day to tile ABA Central Office and to federal and military agencies involved with burn patient triage and transportation. Once automated, this task required only 1-2 hours a day. Available burn-bed lists were generated daily between March 17 and May 2, 2003 and then every other day until May 9, 2003. A total of 2151 responses were received (mean, 43 burn centers per day). A system to track dally nationwide burn bed availability was successfully intended. Although intended for military conflict, this system is equally applicable to civilian mass casualty situations. We advocate adoption of this or a similar bed tracking system by the ABA for use during burn mass casualty incidents.
DTIC
Emergencies; Burns (Injuries)

20080034660 NATO Research and Technology Organization, Neuilly-sur-Seine, France
Biotechnologies for Assessment of Toxic Hazards in Operational Environments
June 2008; 154 pp.; In English; Original contains color and black and white illustrations
Report No.(s): RTO-TR-HFM-057; AC/323(HFM-057)TP/196; Copyright; Avail.: CASI: C01, CD-ROM: A08, Hardcopy

Protection against toxicological threats that impair health and performance of military members requires identification of risks and methods to assess exposure. This group focused on markers of exposure for assessment of neurotoxicological threats from non-threat agents. Two model systems were examined in detail, permethrin and JP8. These represent relevant chemical mixtures that are inhalation and dermal exposure hazards with neurotoxicological potential. The group reviewed and reported research on approaches to assessing health and performance risks from these two models, ranging from neurobehavioral testing to special in vitro exposure test systems and cellular biomarkers. Interactions with physical factors (e.g., heat, dust, work/exercise), psychological stress, and other chemical exposures were evaluated. Research gaps in health risk communication strategies to mitigate risk and achieve optimal compliance with protective measures were also discussed. Two international Environmental and Industrial Health Hazard (EIHH) workshops paralleled the efforts of this panel and expanded contributions to this work. Further work in these areas is being conducted with agreements to continue sharing of information on approaches to assess neurotoxicological risks. Recommendations were made for further development of efficient processes for early predeployment consideration of potential threats, assessment and monitoring of neurochemical hazards, and lifecycle health monitoring of exposed individuals.
Author
Toxic Hazards; Exposure; Biotechnology; Health; Skin (Anatomy); Stress (Psychology)

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*.

20080033188 Army Research Inst. of Environmental Medicine, Natick, MA USA
Effect of Heat Acclimation on Sweat Minerals
Chinevere, Troy D; Kenefick, Robert W; Cheuvront, Samuel N; Lukaski, Henry C; Sawka, Michael N; Dec 2007; 7 pp.; In English
Report No.(s): AD-A480325; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480325

Purpose: This study examined the impact of 10 days of exercise-heat acclimation on sweat mineral concentrations. Methods: Eight male subjects walked on a treadmill at 3.5 mph, 4% grade for 100 continuous minutes or until rectal temperature reached 39.5 C on 10 consecutive days in an environmental chamber set at 45 C, 20% relative humidity. Arm sweat samples were collected during the first 30 min of exercise-heat stress on days 1 and 10 using a polyethylene arm glove. Results: Final core temperature and HR values were significantly lower ($P < 0.05$) on day 10 versus day 1. Whole-body sweating rates increased by approximately 6% ($P = 0.12$). Sweat sodium concentration on day 10 (36.22 + or - 7.22 mM) was significantly lower than day 1 (54.49 + or - 16.18 mM) ($P < 0.05$). Sweat mineral concentrations of calcium (~29%), copper (~50%), and magnesium (~43%) were also significantly lower on day 10 versus day 1 of heat acclimation ($P < 0.05$). A trend for lower sweat iron (~75%; $P = 0.07$) and zinc (~23%; $P = 0.10$) concentrations were observed from day 1 to day 10. The estimated hourly sweat mineral losses (arm concentration x whole-body sweat rate) were reduced for calcium (~27%), copper (~46%), and magnesium (~42%) ($P < 0.05$), but not iron (75%) or zinc (~16%) ($P > 0.05$), from day 1 to day 10. Conclusion: Exercise-heat acclimation conserves arm sweat mineral concentrations and possibly whole-body sweat losses of calcium, copper, and magnesium, and may reduce sweat iron and zinc concentrations.
DTIC
Heat Acclimatization; Minerals; Perspiration; Sweat; Temperature Effects

20080033280 Navy Experimental Diving Unit, Panama City, FL USA

The Influence of Thermal Exposure on Diver Susceptibility to Decompression Sickness

Gerth, Wayne A; Ruterbusch, Victor L; Long, Edwin T; Nov 2007; 70 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-04-WR-2-0064

Report No.(s): AD-A480570; NEDU-TR-06-07; TA03-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480570

The incidences of decompression sickness (DCS) were compared in divers who completed air decompression dives while fully immersed in water at temperature controlled independently [either warm (36.1 C, 97 OF) or cold (26.7 C, 80 OF)] during bottom time (BT) and decompression phases. Divers wore only loosely fitting swim trunks, t-shirts, and neoprene boots and dive gloves, performed cycle ergometer exercise while at bottom, rested during decompression, and remained under controlled resting conditions at 78 +/- 5F (25.6 +/-2.8 C) during the immediate 4 hr postdive period when they were monitored for central venous gas emboli (VGE) with 2-D cardiac echo imaging. Four hundred man-dives were completed with 21 diagnosed cases of DCS in seven series of dives to 120 feet of seawater (fsw) with different combinations of thermal conditions and BT from 25 to 70 min, but with the same U.S. Navy Standard Air 120 fsw/70 min (depth/BT) decompression schedule (stops: 30 fsw/9 min, 20 fsw/23 min, 10 fsw/55 min). Observed effects of water temperature on DCS risk during BT (T(sub W,B)), water temperature during decompression (T(sub W.D)), and different BT were isolated with a fitted logistic model. The DCS odds ratio for a 10C increase in T(sub W,B) B was 23.8(95% CI = 3.8-131.5), while the odds ratio for a 10C increase in T(sub W,B) D was 0.01 (95% CI = 0.002-0.114). In another series of 84 man-dives to 150 fsw and BT = 60 min, divers were cold during compression and bottom phases and warm during subsequent decompression on a U.S. Navy Standard Air 150 fsw/60 min schedule (stops: 40 fsw/3 min, 30 fsw/19 min, 20 fsw/26 min, 10 fsw/62 min). With only a single case of DCS, the DCS incidence in this series was significantly lower (P<0.00 1) than obtained in a series of 150 fsw/60 min dives (5 DCS in 20 man-dives) conducted in an earlier study with divers cold throughout the dives and decompressed on a schedule nearly 2.5 times longer.

DTIC

Decompression Sickness; Diving (Underwater); Exposure; Thermodynamic Properties

20080033572 Universities Space Research Association, Houston, TX, USA

Hemodynamic Effects of Midodrine After Space Flight in Astronauts Without Orthostatic Hypotension

Platts, Steven H.; Ziegler, Michael G.; Waters, Wendy W.; Meck, Janice V.; [January 2006]; 17 pp.; In English

Contract(s)/Grant(s): NAS9-97005; M01RR00827; Copyright; Avail.: CASI: A03, Hardcopy

Orthostatic hypotension and presyncope are common and potentially serious risks for astronauts returning from space. Susceptible subjects fail to generate an adequate adrenergic response to upright posture. The -1 adrenergic agonist, midodrine, may be an effective countermeasure. We tested the hypothesis that midodrine would have no negative hemodynamic effect on healthy astronauts returning from space. Five male astronauts participated in preflight and postflight tilt testing on a control flight as well as on the test flights, where midodrine (10 mg, orally) was administered after landing, approximately 1 hour before testing. None of these astronauts exhibited orthostatic hypotension or presyncope before or after either flight. Midodrine did not cause any untoward reactions in these subjects before or after flight, in fact a modest beneficial effect was seen on postflight tachycardia (p=0.036). These data show that midodrine protected against post-spaceflight increases in heart rate, without having any adverse hemodynamic effects on non-presyncopal, male astronauts. Among these subjects, midodrine was a safe cardiovascular countermeasure.

Author

Hydrochlorides; Aerospace Medicine; Pharmacology; Orthostatic Tolerance; Hemodynamic Responses; Manned Space Flight; Return to Earth Space Flight; Flight Stress (Biology); Risk Management

20080033762 General Dynamics Advanced Information Systems, Dayton, OH USA

Development of the AFRL Aircrew Perfomance and Protection Data Bank

Cheng, Huaining; Buhrman, John R; Webb, James T; Pilmanis, Andrew A; Dec 2007; 40 pp.; In English

Contract(s)/Grant(s): FA8650-04-D-6472; Proj-7184

Report No.(s): AD-A480573; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480573

Through the cooperation of AFRL's Biomechanics Branch and Air Crew Performance and Protection Branch, a new web database application, the AFRL Air Crew Performance and Protection (Altitude) Data Bank, has been developed. The Altitude Data Bank consists of the altitude decompression sickness (DCS) research database, the DCS bibliographic database, and the

Altitude Decompression Sickness Risk Assessment Computer (ADRAC) model. It represents over 17 years of AFRL research and experiments in high altitude decompression sickness areas. This developmental work brings web-based multi-parameter search and multi-database access capabilities to the DCS research data. The ADRAC web toolkit is based on the combined Bubble Growth model and statistical model of hypobaric chamber simulations. It offers a quick and readily accessible online DCS risk assessment tool for flight mission planners, operators, pilots, and commanders.
DTIC
Data Bases; Decompression Sickness; Flight Crews; Protection

20080033766 Walter Reed Army Inst. of Research, Silver Spring, MD USA
The Effects of Prior Combat Experience on the Expression of Somatic and Affective Symptoms in Deploying Soldiers
Killgore, William D S; Stetz, Melba C; Castro, Carl A; Hoge, Charles W; Jan 2006; 8 pp.; In English
Report No.(s): AD-A480557; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480557

Deployment to a combat zone is undoubtedly an extremely stressful experience. It was hypothesized that, when faced with an impending wartime deployment, soldiers with prior combat experience would report minimal emotional problems accompanied by high rates of somatic complaints compared with combat-naive soldiers. Methods: Self-reports of posttraumatic stress disorder (PTSD) and affective and somatic complaints were collected from 2068 U.S. soldiers just prior to combat deployment during Operation Iraqi Freedom. Results: Although the percentage of soldiers scoring positive for PTSD was nearly identical for the experienced and inexperienced groups, scores on the Affective and Somatic scales differed as a function of prior combat history. Previous combat experience was associated with lower affective and greater somatic complaints relative to combat-naive soldiers. Conclusions: Consistent with theories of stress reaction, repression, and somatic amplification, combat-experienced soldiers reported limited affective complaints but greater somatic complaints relative to soldiers without combat experience.
DTIC
Combat; Deployment; Military Personnel; Signs and Symptoms

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

20080033075 Second Sight Medical Products, Inc., Sylmar, CA, USA; National Inst. of Health, Bethesda, MD USA
Retinal Prosthesis
Greenberg, R., Inventor; Talbot, N., Inventor; 13 Aug 04; 13 pp.; In English
Contract(s)/Grant(s): NIH-R24EY12893-01
Patent Info.: Filed Filed 13 Aug 04; US-Patent-Appl-SN-10-918 112
Report No.(s): PB2008-100949; No Copyright; Avail.: CASI: A03, Hardcopy

The invention is a retinal prosthesis with an improved configuration mounting necessary components within and surrounding the eye. The present invention better allows for the implantation of electronics within the delicate eye structure. The invention further limits the necessary width of a thin film conductor passing through the sclera by use of a multiplexer external to the sclera and a demultiplexer internal to the sclera.
NTIS
Mounting; Patent Applications; Retina

20080033143 Defence Research and Development Canada, Toronto, Ontario Canada
Smooth Rotation of 2-D and 3-D Representations of Terrain: An Investigation into the Utility of Visual Momentum
Hollands, Justin G; Pavlovic, Nada J; Enomoto, Yukari; Jiang, Haiying; Sep 2007; 16 pp.; In English
Report No.(s): AD-A480236; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480236

Objective: The potential advantage of visual momentum in the form of smooth rotation between two-dimensional (2-D) and three-dimensional (3-D) displays of geographic terrain was examined. Background: The relative effectiveness of 2-D and 3-D displays is task dependent, leading to the need for multiple frames of reference as users switch tasks. The use of smooth rotation to provide visual momentum has received little scrutiny in the task-switching context. A cognitive model of the

processes involved in switching viewpoints on a set of spatial elements is proposed. Methods: In three experiments, participants judged the properties of two points placed on terrain depicted as 2-D or 3-D displays. Participants indicated whether Point A was higher than Point B, or whether Point B could be seen from Point A. Participants performed the two tasks in pairs of trials, switching tasks and displays within the pair. In the continuous transition condition the display dynamically rotated in depth from one display format to the other. In the discrete condition there was an instantaneous viewpoint shift that varied across experiments (Experiment 1: immediate; Experiment 2: delay; Experiment 3: preview). Results: Performance after continuous transition was superior to that after discrete transition. Conclusion: The visual momentum provided by smooth rotation helped users switch tasks. Application: The use of dynamic transition is recommended when observers examine multiple views of terrain over time. The model may serve as a useful heuristic for designers. The results are pertinent to command and control, geological engineering, urban planning, and imagery analysis domains.
DTIC
Momentum; Rotation; Visual Perception

20080033262 Navy Experimental Diving Unit, Panama City, FL USA
Three-Hour Dives with Exercise While Breathing Oxygen Partial Pressure of 1.3 ATM
Shykoff, B; Oct 2007; 11 pp.; In English
Report No.(s): AD-A480508; NEDU-TR-07-12; TA-06-15; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480508

The U.S. Navy Diving Manual authorizes divers to breathe oxygen for up to 240 minutes per day at depths of 20 feet of seawater (fsw) or less but does not address the possible accumulation of effects over multiple days. When we conducted experimental four-hour dives with oxygen partial pressure (Po2) of approximately 1.4 atmospheres (atm)2,3 with divers at rest, we concluded that the limit of 240 minutes in 24 hours is acceptable for multiple days. However, when divers exercised for 120 minutes of their underwater time, mild pulmonary effects accumulated.4 The question addressed in this component of the NAVSEA-funded task, Pulmonary Oxygen Toxicity While Swimming: How Exercising Underwater or Using a Rebreather Underwater Breathing Apparatus Affects Pulmonary Function After 1.35 Atm Oxygen Exposures,5 was whether pulmonary effects accumulated over five days of three-hour dives when half of the dive time was spent exercising.
DTIC
Breathing Apparatus; Diving (Underwater); Oxygen; Partial Pressure; Physical Exercise

20080033273 Navy Experimental Diving Unit, Panama City, FL USA
Interspiro Divator MK II and DP2 Evaluation (Unmanned)
Briere, Michael; Feb 2007; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480549; NEDU-TR-07-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480549

The Interspiro DP2 and Divator MK II UBAs with the Divator positive-pressure and nonpositive-pressure full face masks (FFMs) were evaluated as possible candidate UBAs for inclusion on the Authorised for Navy Use (ANU) List. Resistive effort (RE) evaluations were conducted in 38 F fresh water and 29 F salt water. A free-flow evaluation - in which one FFM was breathed with a Reimers breathing simulator while a second FFM was allowed to free flow to determine whether it would degrade the RE of a second diver's FFM - was conducted for the DP2. With 1500 and 500 psig breathing gas supply pressures, the Divator MK II scuba met the Navy Experimental Diving Unit (NEDU) RE goal of 1.37 kPa at 62.5 L/min for Category 1 UBAs to a depth of 132 fsw with both the positive-pressure and nonpositive-pressure FFMs. With a 1500 psig breathing gas supply pressure, the DP2 met the NEDU goal of 1.76 kPa at 62.5 L/min for Category 2 UBAs to a depth of 198 fsw in 38 F water with the positive-pressure and nonpositive-pressure FFMs. At 29 F this goal was met to 198 fsw with the nonpositive-pressure FFM and to 165 fsw with the positive-pressure FFM.
DTIC
Breathing Apparatus; Evaluation; Masks; Oxygen Masks; System Effectiveness; Underwater Breathing Apparatus

20080033283 Michigan State Univ., East Lansing, MI USA
Timecourse of Recovery from Task Interruption: Data and a Model
Altmann, Erik M; Trafton, J G; Jan 2007; 7 pp.; In English
Contract(s)/Grant(s): N00014-06-1-0077; N00014-03-1-0063
Report No.(s): AD-A480577; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480577

Interruption of a complex cognitive task can entail, for the 'interruptee,' a sense of having to recover afterward. The

authors examined this recovery process by measuring the time-course of responses following an interruption. They sampled over 13,000 interruptions to obtain stable data. Results show that response times dropped in a smooth curvilinear pattern for the first 10 responses (15 sec or so) of postinterruption performance. They explain this pattern in terms of the cognitive system retrieving a displaced mental context from memory incrementally, with each retrieved element adding to the set of primes facilitating the next retrieval. The model explains a learning effect in the data in which the time-course of recovery changes over blocks, and is generally consistent with current representational theories of expertise.
DTIC
Cognition; Interruption; Responses

20080033307 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Geluidsexpositie bij gebruik van CEP door F-16 crewchiefs (Sound Exposure Level of F-16 Crew Chiefs Using Communications Earplugs)
Houben, M M; Verhave, J A; Geurtsen, F W; Mar 2008; 31 pp.; In Dutch; Original contains color illustrations
Report No.(s): AD-A480638; TNO-DV-2008-A054; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480638

For communication in noisy environments, communications earplugs (CEPs) are increasingly used. CEPs are earplugs that incorporate a miniature speaker through which communication can be presented to the user unattenuated while the earplugs do attenuate environmental sounds. To assess the sound exposure level of CEP users, not only environmental sounds should be taken into account, but also the sound exposure resulting from communication through the CEP. For this, a measurement method has been developed. It uses loudness matching to establish the relation between electric level to the CEP and perceived sound level. During activities, both the environmental noise and the electric signal to the CEP are recorded. The level of the environmental sounds, after attenuation by the hearing protection, is combined with the sound level produced by the CEP, which is determined from the electric level. This method is applied to F-16 crew chiefs at Air Base Volkel, a population that uses CEPs extensively in extremely noisy conditions. Our calculations show that communication through CEP significantly contributes to the sound exposure level of the crew chiefs. The estimated day dose, based on two launches and recoveries, is 79 dB(A), which is just below the maximum allowed level of 80 dB(A).
DTIC
Communication Equipment; Doors; Ear Protectors; Exposure; F-16 Aircraft

20080033407 Army Research Lab., Aberdeen Proving Ground, MD USA
The Effect of Audio and Tactile Cues on Soldier Decision Making and Navigation in Complex Simulation Scenarios
Savick, Douglas S; Elliott, Linda R; Zubal, Orest; Stachowiak, Christopher; Apr 2008; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480694; ARL-TR-4413; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Human factors studies of an array of military operation roles have shown significant overloading of the visual channel during the execution of many Soldier tasks, such as navigation and target detection (Mitchell, Samms, Glumm, Krausman, Brelsford, & Garrett, 2004). The objective of this study was to assess the effectiveness of tactile and three-dimensional (3-D) auditory cues to reduce overall workload and response time during high-visual workload target acquisition and robot navigation tasks. Soldiers performed target acquisition and navigation tasks in a computer-based simulation of Army target acquisition and navigation of robotic resources. Within this simulation (Operation Flashpoint), the participant functioned as the vehicle's commander/gunner. At pre-determined intervals, semi-autonomous robots called for help and directions. The call for help occurred three different ways: a) visual indication, b) 3-D audio alert, and c) tactile alert. Results indicate that the mean response time in the tactile condition was significantly lower than in the audio or visual conditions. There was no significant difference between audio and visual conditions. Ratings of the National Aeronautics and Space Administration Task Load Index workload were lowest for tactile and highest for the 3-D audio condition.
DTIC
Cues; Decision Making; Detection; Human Factors Engineering; Navigation; Simulation; Target Acquisition

20080033408 Clarify Concepts, Washington , DC USA
Understanding Dynamic and Static Displays: Using Images to Reason Dynamically
Bogacz, Sally; Trafton, J G; Jan 8, 2005; 9 pp.; In English
Contract(s)/Grant(s): N00014-00-WX-20844; N00014-00-WX-40002
Report No.(s): AD-A480695; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We examined expert meteorologists as they created a weather forecast while working in a naturalistic environment. We

examined the type of external representation they chose to examine (a static image, a sequence of static images, or a dynamic display) and the kind of information they extracted from those representations (static or dynamic). We found that even though weather is an extremely dynamic domain, expert meteorologists examined very few animations, examining primarily static images. However, meteorologists did extract large amounts of dynamic information from these static images, suggesting that they reasoned about the weather by mentally animating the static images rather than letting the software do it for them.
DTIC
Data Processing; Display Devices; Meteorology

20080033433 Queens Univ., Kingston, Ontario Canada
Development of a Dynamic Biomechanical Model for Load Carriage: Phase III Part C1: Pressure and Force Distribution Measurement for the Design of Waist Belts in Personal Load Carriage Systems
Hadcock, L J; Aug 2005; 117 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480768; DRDC-T-CR-2005-121; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In previous studies, two biomechanical models were developed that used pack and person geometry as well as pack mass to determine the reaction forces on the body. One problem has been determining the pack-person interface forces using Tekscan(TM) pressure sensors on rounded surfaces such as the shoulder and waist. The goal of this study was to determine design factors that affect force distribution of the backpack waist belt. A human-sized symmetrical lower torso (SLT) was created. A method of calculating the directional coordinates of applied forces was developed in order to understand the reactions between pack and person. Tekscan(TM) Sensors were used to measure the surface pressures between the torso and the waist belt. These were converted to normal force measures based on the mathematical coordinates of each sensel. Calibration factors, a factor of effective sensel area and a frictional coefficient for the in situ orientation of each sensor were calculated and used for the calculation of the directional forces. Then, using sites on the waist belt, known forces were applied and the resulting directional forces correlated moderately well with the known applied forces (19%). The pressure distributions of three waist belts were compared and the design features were examined to account for differences in distribution. The distributions were compared to results of the previous biomechanical models and determined to be too complex to be resolved with the simplified hoop stress theory. The study determined the importance of waist belt design, frictional force from belt tightening, and influence of load in understanding the force distribution of a waist belt. It is recommended that each pack and load condition be tested using this approach if one wishes to use the waist strap force gauge to determine compressive forces on the lumbar spine and on the hips.
DTIC
Anatomy; Biodynamics; Carriages; Dynamic Models; Force Distribution; Loads (Forces); Pressure Distribution

20080033436 Queens Univ., Kingston, Ontario Canada
Development of a Dynamic Biomechanical Model for Load Carriage: Phase III Part B: Characterization of Load Control During a Human Trials Circuit
Stevenson, J M; Good, J A; Devenney, I A; Morin, E L; Reid, S A; Bryant, J T; Aug 2005; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480771; DRDC-T-CR-2005-120; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work was undertaken in support of the research thrust 'Development of a Dynamic Biomechanical Load Carriage Model'. The report describes human response characteristics, both objective and subjective, to a mobility circuit. The goals of the study were to examine the relationships among aerobic demand, performance time and load as well as the relationships between posture, shoulder and lumbar reaction forces and load. Eleven subjects volunteered for three aspects of the study: a maximal aerobic capacity test and two test days for each load carriage system, Pack C and Pack D. During the testing, subjects were instrumented with a heart rate monitor, accelerometers on the person and in the pack, and strap force sensors on the lower shoulder strap and on the waist belt. The circuit was completed five times in Battle Order of 5.5 kg, followed by randomized rucksack loads of 15.7 kg, 25.5 kg and 34.3 kg, as well as a self-selected maximal load. Subjects were asked to assume a pace they could sustain all day, given the load they were asked to carry. The circuit consisted of a number of marching and mobility tasks and was timed for all components of the circuit. Statistics were done using two- and three-way repeated measures ANOVAs. There were significant differences in timed performance and load ($p=0.001$) and between aerobic demand and load ($p=0.008$) but not between packs. This relationship held true for both laps and tasks. This resulted in a decrease in performance time of 19% and an increase in aerobic demand of 21% for the heaviest load compared to Battle Order. There was a significant increase in upper body and head lean angles and shoulder and lumbar reaction forces often between packs and always between

loads. Posture changed by as much as 40% of the light weight's postural lean angles with shoulder and hip reaction forces being 120% to 150% greater than the light load with the lumbar forces exceeding recommended limits.
DTIC
Biodynamics; Circuits; Dynamic Models; Loads (Forces); Statistical Analysis

20080033463 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Integrated Personal Protective Equipment Standards Support Model
Coyne, Karen M; Apr 2008; 48 pp.; In English
Report No.(s): AD-A480842; ECBC-TR-617; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The National Institute of Standards and Technology's Office of Law Enforcement Standards (OLES) develops performance standards for equipment used by law enforcement personnel. The OLES and the U.S. Department of Homeland Security are developing a set of standards to protect first responders during incidents that may involve chemical, biological, radiological, or nuclear materials. The law enforcement community is interested in standards that are specific to their missions. A literature search was performed to identify the impacts of chemical protective suits, respirators, gloves, and boots on law enforcement tasks. A plan is described to develop a computer model using decision, sensitivity, and risk analyses to focus data collection and model development so that valuable information regarding performance of law enforcement tasks will be available to support the development of law enforcement-specific standards for personal protective equipment in a timely manner. The total cost of this 2-year project is estimated to be $500-600K.
DTIC
Law (Jurisprudence); Protectors; Respirators

20080033475 Environmental Security Technology Certification Program, Arlington, VA USA
The Use of Constructed Wetlands to Phytoremediate Explosives-Contaminated Groundwater at the Milan Army Ammunition Plant, Milan, Tennessee. Cost and Performance Report
Jul 1999; 47 pp.; In English
Report No.(s): AD-A480881; ESTCP-CU-9520; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The groundwaters beneath many Army ammunition plants in the USA are contaminated with explosives. To help address this problem, the USAEC and TVA initiated a field demonstration program to evaluate the technical feasibility of using constructed wetlands for remediating explosives-contaminated groundwater. As part of this program, a field demonstration of constructed wetlands technology was conducted at the Milan Army Ammunition Plant (MAAP) near Milan, Tennessee. The goal of the Milan demonstration was to reduce TNT concentrations in MAAP's groundwater to levels less than 2 ppb and total nitrobody concentrations to less than 50 ppb. During the project, two types of wetlands were demonstrated: a gravel-based system and a lagoon-based system. Both the gravel- and lagoon-based systems were designed to retain the groundwater for approximately 10 days at an influent flow rate of 5 gpm per system. The demonstration results indicated that while both the gravel- and lagoon-based systems could remove explosives, the gravel-based system was clearly superior. To develop the cost analysis, cost data were developed based on a conceptual design for a 10-acre, full-scale, gravel-based system designed to treat 200 gpm of contaminated groundwater from B-line at MAAP. The results indicate that the gravel-based system is an economical and efficient alternative to remediate explosives-contaminated groundwater. The lagoon-based system's economic performance was not evaluated due to poor technical performance.
DTIC
Ammunition; Contamination; Costs; Explosives; Ground Water; Pollution Control; Water Pollution; Wetlands

20080033500 Army Research Lab., Aberdeen Proving Ground, MD USA
Multiscale Modeling of Polymer Membranes for Soldiers Protective Clothing
Andzelm, Jan; Sloan, James; Napadensky, Eugene; Beyer, Rick; Snyder, James; McKnight, Steven; Chung, Peter W; Nov 2006; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480962; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The development of protective and breathable clothing is a very important goal set for the Future Force. Recently, a new polymer membrane made of an ionic triblock (A-B-A) copolymer was developed at the U.S. Army Research Laboratory (ARL) that provides an excellent selective barrier for soldier s protective clothing. We have used multiscale modeling to gain an understanding of the static and dynamic properties of this polymer membrane at detailed atomistic and mesoscale levels. These simulations lead to the prediction of the architecture and morphology of the membrane. We have also studied mesoscale

morphology of the copolymer constrained by a surface or the nanopore. Mechanical properties of copolymer were calculated using the self-consistent homogenization theory.
DTIC
Membranes; Military Personnel; Protective Clothing

20080034510 Navy Experimental Diving Unit, Panama City, FL USA
Kirby Morgan Dive Helmet 37 Evaluation (Unmanned)
Briere, Michael; Warkander, Dan E; Jan 2007; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480513; NEDU-TR-07-05; TA-06-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480513

Navy Experimental Diving Unit (NEDU) was tasked to test and evaluate commercially available diving equipment to determine its suitability for Navy use.1 Accordingly, NEDU performed a quick-look evaluation of the Kirby Morgan 37 helmet (kM 37) to determine whether this helmet was safe for manned evaluation in the NEDU test pool and Ocean Simulation Facility (0SF). Results of the NEDU quick-look evaluation (unmanned) have been detailed in a technical letter.2 Naval Sea Systems Command (NAVSEA) then tasked NEDU to further evaluate the KM 37 helmet for possible inclusion among equipment listed as Authorized for Navy Use (AN U).3 An NEDU test plan was created to prescribe the additional unmanned tests as part of this further evaluation, including a freezing water resistive effort (RE) evaluation, a freezing water dive profile, and carbon dioxide (002) retention (ventilation sufficiency) assessments. Evaluations were performed on five KM 37 helmets (serial numbers 4088KM, 4117KM, 4119KM, 4120KM, and 4121 KM) in NEDU's Experimental Diving Facility (EDF) Bravo hyperbaric chamber. The helmets were configured with the Tri-ValveTM double-exhaust valve system and quad-cover during all evaluations. The KM 37 helmet uses the SuperFlowTM 350 regulator. All evaluations were performed with the helmet in the vertical orientation, simulating a diver standing upright. A schematic showing the test setup follows the listing of references for this report.
DTIC
Helmets; Underwater Breathing Apparatus; Diving (Underwater)

20080034513 Alaska Univ., Anchorage, AK USA
Brown Bear (Ursus arctos) Habitat Use and Food Resources on Elmendorf Air Force Base, Alaska
Farley, Sean D; Griese, Herman; Sinnott, Rick; Coltrane, Jessica; Garner, Chris; Battle, Dave; Oct 2007; 66 pp.; In English
Contract(s)/Grant(s): W81XWH-04-2-0049
Report No.(s): AD-A480474; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480474

Brown bears (Ursus arctos) are frequently observed on Elmendorf Air Force Base and the contiguous US Army's Fort Richardson military lands in Alaska. Effective bear management in this human-influenced area requires data on bear habitat use and numbers. We conducted a brown bear habitat and diet study on the military lands and adjoining habitats from 2005-2007. Eleven bears (7F;4M) were captured 15 times and outfitted them with Global Positioning System (GPS) radio collars to determine habitat and movement.
DTIC
Diets; Food; Global Positioning System; Habitats

20080034594 Kentucky Univ., Lexington, KY USA
Use of Reflective Armbands to Improve Adolescent Pedestrian and Pedalcyclist Safety
Dunaway, N.; Green, E. R.; Pigman, J. G.; Barrett, M. L.; Jun. 2007; 104 pp.; In English
Report No.(s): PB2008-101454; KTC-07-15/PL11-06-01F; No Copyright; Avail.: CASI: A06, Hardcopy

The objective of this effort was to determine if elementary and middle school students could be educated to use reflective armbands to increase their visibility to motorists while walking or bicycling to school. The number of armbands and surveys distributed totaled slightly over 7,000. Responses were received from approximately 12 percent (873) of the pre-surveys and slightly over 3 percent (119) of the post-surveys. Respondents to the survey indicated nearly 15 percent of schoolchildren receiving reflective armbands were wearing the armband every day or most days. Of the parents responding, 21 percent indicated their children would continue to wear the armband on their travel to and from school. The armbands were generally well received by the students, with more enthusiasm by the younger students. The fact that the reflective armbands were

removable was problematic to their effectiveness. Considering the necessity to remove and reapply the armband each time it is to be used, the device may be better suited for adults.
NTIS
Human Beings; Reflectance; Safety; Safety Devices; Straps

20080034626 Idaho National Engineering Lab., Idaho Falls, ID, USA
Improving Emergency Response and Human-Robotic Performance. Joint Meeting and Conference of the Institute of Electrical and Electronics Engineers (IEEE) and Human Performance/Root Cause/Trending/Operating Experience/ and Self Assessment (HPRCT)
Gertman, D. I.; Bruemmer, D. J.; Hartley, R. S.; Aug. 2007; 8 pp.; In English
Report No.(s): DE2007-915535; INL/CON-07-12791; No Copyright; Avail.: Department of Energy Information Bridge

Preparedness for chemical, biological, and radiological/nuclear incidents at nuclear power plants (NPPs) includes the deployment of well trained emergency response teams. While teams are expected to do well, data from other domains suggests that the timeliness and accuracy associated with incident response can be improved through collaborative human-robotic interaction. Many incident response scenarios call for multiple, complex procedure-based activities performed by personnel wearing cumbersome personal protective equipment (PPE) and operating under high levels of stress and workload. While robotic assistance is postulated to reduce workload and exposure, limitations associated with communications and the robot's ability to act independently have served to limit reliability and reduce our potential to exploit human robotic interaction and efficacy of response. Recent work at the Idaho National Laboratory (INL) on expanding robot capability has the potential to improve human-system response during disaster management and recovery. Specifically, increasing the range of higher level robot behaviors such as autonomous navigation and mapping, evolving new abstractions for sensor and control data, and developing metaphors for operator control have the potential to improve state-of-the-art in incident response. This paper discusses these issues and reports on experiments underway intelligence residing on the robot to enhance emergency response.
NTIS
Conferences; Destruction; Emergencies; Engineers; Human Factors Engineering; Human Performance; Nuclear Power Plants; Robotics

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*.

20080032775 Idaho National Engineering Lab., Idaho Falls, ID, USA
Bayesian Modeling of Time Trends in Component Reliability Data Vai Markov Chain Monte Carlo Simulation. 2007 ESREL Safety and Reliability Conference
Kelly, D. L.; Jun. 2007; 7 pp.; In English
Report No.(s): DE2007-911890; INL/CON-06-11953; No Copyright; Avail.: National Technical Information Service (NTIS)

Markov chain Monte Carlo (MCMC) techniques represent an extremely flexible and powerful approach to Bayesian modeling. This work illustrates the application of such techniques to time-dependent reliability of components with repair. The WinBUGS package is used to illustrate, via examples, how Bayesian techniques can be used for parametric statistical modeling of time-dependent component reliability. Additionally, the crucial, but often overlooked subject of model validation is discussed, and summary statistics for judging the models ability to replicate the observed data are developed, based on the posterior predictive distribution for the parameters of interest.
NTIS
Bayes Theorem; Component Reliability; Conferences; Markov Chains; Monte Carlo Method; Reliability; Safety; Simulation; Trends

20080032827 Harris Corp., Melbourne, FL, USA
System and Method for Improving Signal to Noise Ratio in 3-D Point Data Scenes under Heavy Obscuration
Blask, S. G., Inventor; Faulkner, T., Inventor; Rahmes, M., Inventor; 15 Jul 04; 8 pp.; In English
Contract(s)/Grant(s): DAAD17-01-D-0004

Patent Info.: Filed Filed 15 Jul 04; US-Patent-Appl-SN-10-892 055
Report No.(s): PB2008-100077; No Copyright; Avail.: CASI: A02, Hardcopy

A method comprises loading LADAR point data into a three-dimensional voxel array as a plurality of components; determining connected components in the array; determining a size for each component and a hit count of occupied voxels; and determining whether each occupied voxel is to be written to an output file, wherein occupied voxels are written to the output file according to a set of criteria based on statistics for determining when a voxel represents a light pulse reflected by a physical object.

NTIS

Computer Aided Design; Laser Range Finders; Occultation; Optical Radar; Patent Applications; Signal to Noise Ratios; Targets

20080032857 Idaho National Engineering Lab., Idaho Falls, ID, USA

Technical Issues Map for the NHI System Interface and Support Systems Area: 2nd Quarter FY 07

Sherman, S. R.; Mar. 2007; 44 pp.; In English
Report No.(s): DE2007-911919; INL/EXT-07-12380; No Copyright; Avail.: National Technical Information Service (NTIS)

This document provides a mapping of technical issues associated with development of the Next Generation Nuclear Plant (NGNP) intermediate heat transport loop and nuclear hydrogen plant support systems to the work that has been accomplished or is currently underway in the 2nd quarter of FY07.

NTIS

Nuclear Power Plants; Support Systems

20080032860 Government Accountability Office, Washington, DC, USA

Information Security: Selected Departments Need to Address Challenges in Implementing Statutory Requirements

Aug. 2007; 47 pp.; In English
Report No.(s): PB2008-100142; GAO-07-528; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Information Security Management Act of 2002 (FISMA) strengthened security requirements by, among other things, requiring federal agencies to establish programs to provide cost-effective security for information and information systems. In overseeing FISMA implementation, the Office of Management and Budget (OMB) has established supporting processes and reporting requirements. However, 4 years into implementation of the act, agencies have not yet fully implemented key provisions. In this context, GAO determined what challenges or obstacles inhibit the implementation of the information security provisions of FISMA at the Departments of Defense, Homeland Security, Justice, and State. To do this, GAO reviewed and analyzed department policies, procedures, and reports related to department information security programs and interviewed agency officials. Defense, Homeland Security, Justice, and State face challenges in implementing key information security control activities required by FISMA and by OMB in its oversight role. These activities include creating and maintaining an inventory of major systems, implementing common security configurations, ensuring that staff receive information security training, testing and evaluating controls, taking remedial actions where deficiencies are found, and certifying and accrediting systems for operation. The four departments were challenged in several of these areas. For example, Defense is challenged in developing a complete FISMA inventory of systems because it has different definitions of what constitutes a 'system.' As another example, Homeland Security reported that the tool it uses to report security training counts each course taken, instead of tracking that an individual has taken a specialized course. As a result, the department lacks assurance that all users have received appropriate training. Until the departments address their challenges and fully implement effective departmentwide information security programs, increased risk exists that they will not be able to effectively protect the confidentiality, integrity, and availability of their information and information systems.

NTIS

Computer Information Security; Information Management; Information Systems; Security

20080032883 Defense Advanced Research Projects Agency, Arlington, VA, USA

Method and Apparatus for Recognizing 3-D Objects

ShanY. Shan, Y., Inventor; Matei, B. C. M., Inventor; 22 Jun 05; 8 pp.; In English
Contract(s)/Grant(s): F33615-02-C-1264
Patent Info.: Filed Filed 22 Jun 05; US-Patent-Appl-SN-11-159 969
Report No.(s): PB2008-100054; No Copyright; Avail.: CASI: A02, Hardcopy

A method and apparatus for recognizing an object, comprising providing a set of scene features from a scene, pruning a

set of model features, generating a set of hypotheses associated with the pruned set of model features for the set of scene features, pruning the set of hypotheses, and verifying the set of pruned hypotheses is provided.
NTIS
Patent Applications; Pattern Recognition; Three Dimensional Bodies

20080032921 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
Lagrangean Relaxation with Clusters for Some Optimization Problems Modeled by Conflict Graphs
Ribeiro, Glaydston Mattos; January 2008; 195 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format
Contract(s)/Grant(s): MRTN-CT-2003-504438
Report No.(s): INPE-15204-TDI/1304; Copyright; Avail.: CASI: C01, CD-ROM: A09, Hardcopy

Several combinatorial optimization problems can be modeled by a special graph denoted conflict graph. When these graphs are sparse well-adapted for a previous clustering phase, i.e, when they have clusters of vertices, the edges inter clusters can be relaxed in a lagrangean fashion, and the relaxed problem can be decomposed into sub problems and solved. This is the idea of the lagrangean relaxation with clusters (LagClus). The sub problems have similar structure of the original problem. Therefore the dual bounds are better than the traditional lagrangean relaxation over all edges of the conflict graph. This is the main advantage of the LagClus. We applied the LagClus over different problems present in the literature: Point-Feature Cartographic Label Placement Problem (PFCLP), Manufacturer's Pallet Loading Problem (MPLP), Woodpulp Stowage Problem (WSP) and Daily Photograph Scheduling Problem of an Earth Observation Satellite (DPSPEO). The decomposition of the conflict graph allows us to model the problem using the Dantzig-Wolfe decomposition, where the Restricted Master Problem (RMP) is defined by coupling constraints (all edges connecting the clusters) and the sub problem by the clusters obtained in the partitioning phase. Computational results show the equivalence between LagClus and this decomposition. This work also presents new mathematical formulations for three problems: PFCLP, WSP and DPSPEO. All these formulation are based on cutting theory. Computational tests, mainly for DPSPEO, show that when we insert interesting cuts generating new formulations, the optimal solutions can be found very quickly.
Author
Optimization; Lagrangian Function; Relaxation Method (Mathematics); Graphs (Charts); Mathematical Models

20080032937 Idaho National Engineering Lab., Idaho Falls, ID, USA
Technical Issues Map for the NHI System Interface and Support Systems Area: 1st Quarter FY07
Sherman, S. R.; Dec. 2006; 37 pp.; In English
Report No.(s): DE2007-911920; INL/EXT-06-12045; No Copyright; Avail.: National Technical Information Service (NTIS)

This document provides a mapping of technical issues associated with development of the Next Generation Nuclear Plant (NGNP) intermediate heat transport loop and nuclear hydrogen plant support systems to the work that has been accomplished or is currently underway. The technical issues are ranked according to priority and by assumed resolution dates. Due to funding limitations, not all high-priority technical issues are under study at the present time, and more resources will need to be dedicated to tackling such issues in the future. This technical issues map is useful for understanding the relative importance of various technical challenges and will be used as a planning tool for future work package planning.
NTIS
Nuclear Power Plants; Support Systems

20080032977 Geophysical Observatory, Helsinki, Finland
Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2
Martio, Olli, Editor; 2008; ISSN 1239-629X; 314 pp.; In English; See also 20080032978 - 20080032993; Original contains black and white illustrations; Copyright; Avail.: Other Sources

he following topics were covered: Universal Bounds for Eigenvalues of Schroedinger Operator on Riemannian Manifolds; The Regularity of Weak Solutions to Nonlinear Scalar Field Elliptic Equations Containing p- and q-Laplacians; Modulus of Continuity for Quasiregular Mappings with Finite Distortion Extension; Higher Integrability for Weak Solutions of Higher Order Degenerate Parabolic Systems; Equality Cases in the Symmetrization Inequalities for Brownian Transition Functions and Dirichlet Heat Kernels; New Examples of Weakly Compact Approximation in Banach Spaces; An L(sup p) Two Well Liouville Theorem; Duality Based A Posteriori Error Estimates for Higher Order Variational Inequalities with Power Growth Functionals; Fine Topology of Variable Exponent Energy Superminimizers; Variable Besov and Triebel-Lizorkin Spaces; Regularity and Free Boundary Regularity for the p Laplacian in Lipschitz and C1 Domains; Omega Result for the

Error Term in the Mean Square Formula for Dirichlet L-Functions; Valence and Oscillation of Functions in the Unit Disk; Planar Beurling Transform and Grunsky Inequalities; A Caccioppoli Estimate and Fine Continuity for Superminimizers on Metric Spaces; and Removable Sets for Holder Continuous p-Harmonic Functions on Metric Measure Spaces.
Derived from text
Error Analysis; Mean Square Values; Riemann Manifold; Functionals; Harmonic Functions; Measure and Integration; Nonlinear Equations; Banach Space; Dirichlet Problem

20080032978 Academia Sinica, Wuhan, China
The Regularity of Weak Solutions to Nonlinear Scalar Field Elliptic Equations Containing p- and q-Laplacians
He, Chengjun; Li, Gongbao; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 337-371; In English; See also 20080032977
Contract(s)/Grant(s): NSFC NO:10571069; NSFC NO: 10631030; Copyright; Avail.: Other Sources

In this paper, we consider the regularity of weak solutions of the elliptic partial differential equation. We prove that these solutions are locally in C(1,infinity) and decay exponentially at infinity. Furthermore, we prove the regularity for the solutions. As an application, we can show that the solution we got has the same regularity.
Author
Elliptic Differential Equations; Regularity; Partial Differential Equations; Laplace Equation; Nonlinear Equations

20080032979 Brasilia Univ., Brasilia, Brazil
Universal Bounds for Eigenvalues of Schroedinger Operator on Riemannian Manifolds
Wang, Qiaoling; Xia, Changyu; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 319-336; In English; See also 20080032977; Copyright; Avail.: Other Sources

In this paper we consider eigenvalues of Schroedinger operator with a weight on compact Riemannian manifolds with boundary (possibly empty) and prove a general inequality for them. By using this inequality, we study eigenvalues of Schrodinger operator with a weight on compact domains in a unit sphere, a complex projective space and a minimal submanifold in a Euclidean space. We also study the same problem on closed minimal submanifolds in a sphere, compact homogeneous space and closed complex hypersurfaces in a complex projective space. We give explicit bound for the (k + 1)-th eigenvalue of the Schrodinger operator on such objects in terms of its first k eigenvalues. Our results generalize many previous estimates on eigenvalues of the Laplacian.
Author
Eigenvalues; Schroedinger Equation; Riemann Manifold; Spheres; Domains; Estimates; Manifolds (Mathematics)

20080032980 Jyvaskyla Univ., Finland
Modulus of Continuity for Quasiregular Mappings with Finite Distortion Extension
Zapandinskaya, Aleksandra; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 373-385; In English; See also 20080032977; Copyright; Avail.: Other Sources

We establish a sharp modulus of continuity for those planar quasiregular mappings defined in a domain with a cone condition that admit an extension to a mapping of locally exponentially integrable distortion. These mappings are known to he continuous and some modulus of continuity results were established. Our results deal with the mappings that are additionally assumed to be quasiregular in some domain Omega. Recall that a mapping is quasiregular, is locally integrable and in the distortion inequality the function is bounded. If in addition we assume the function to be a homeomorphism, we say that the function is K-quasiconformal.
Author
Continuity (Mathematics); Domains; Distortion; Inequalities

20080032981 Scuola Normale Superiore, Pisa, Italy
An L(sup p) Two Well Liouville Theorem
Lorent, Andrew; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 439-473; In English; See also 20080032977; Copyright; Avail.: Other Sources

We provide a different approach to and prove a (partial) generalisation of a recent theorem on the structure of low energy solutions of the compatible two well problem in two dimensions [LorOS], [CoScOG].
Author
Matrices (Mathematics); Proving; Theorems; Gradients; Inequalities; Liouville Theorem

20080032982 Universitaet des Saarlandes, Saarbrucken, Germany

Duality Based A Posteriori Error Estimates for Higher Order Variational Inequalities with Power Growth Functionals

Bildhauer, Michael; Fuchs, Martin; Repin, Sergey; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 475-490; In English; See also 20080032977; Copyright; Avail.: Other Sources

We consider variational inequalities of higher order with pgrowth potentials over a domain in the plane by the way including the obstacle problem for a plate with power hardening law. Using duality methods we prove a posteriori error estimates of functional type for the difference of the exact solution and any admissible comparision function.

Author

Error Analysis; Inequalities; Optimization; Functionals; Exponents; Boundaries

20080032983 Helsinki Univ. of Technology, Helsinki, Finland

Fine Topology of Variable Exponent Energy Superminimizers

Harjulehto, Petteri; Latvala, Visa; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 491-510; In English; See also 20080032977

Contract(s)/Grant(s): INTAS Proj. 06-1000017-8792; Copyright; Avail.: Other Sources

We study the p(.)-fine continuity in the variable exponent Sobolev spaces under the standard assumptions that p: Omega approaches R is log-Hoelder continuous and 1 < p- lessthan or equal to p+ < infinity. As a by-product we obtain improvements in the variational exponent capacity theory and in the non-linear potential theory based on p(.)-Laplacian.

Author

Exponents; Nonlinearity; Estimates; Euclidean Geometry; Potential Theory; Topology

20080032984 Hong Kong Univ., Hong Kong

Omega Result for the Error Term in the Mean Square Formula for Dirichlet L-Functions

Lau, Yuk-Kam; Tsang, Kai-Man; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 549-560; In English; See also 20080032977; Copyright; Avail.: Other Sources

Let q be a positive integer and let E(q, x) denote the error term in the asymptotic formula for the mean value. We obtain in this paper an Omega-result for E(q, x), which is an extension of the corresponding Omega-result for the Riemann zeta-function.

Author

Mean Square Values; Dirichlet Problem; Circles (Geometry); Measure and Integration

20080032985 Erlangen-Nuernberg Univ., Erlangen, Germany

Higher Integrability for Weak Solutions of Higher Order Degenerate Parabolic Systems

Boegelein, Verena; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 387-412; In English; See also 20080032977; Copyright; Avail.: Other Sources

We consider a class of higher order nonlinear degenerate parabolic systems, whose easiest model is the parabolic p-Laplacean system and show higher integrability for weak solutions. Initially, higher integrability results were achieved for elliptic systems. The main point in the proof is to apply in turn a Caccioppoli inequality for the weak solution and the Sobolev-Poincari: inequality to conclude a reverse-Hoelder inequality. Then, the gain of the exponent is achieved with the help of Gehring's lemma. But, unfortunately in the case of parabolic systems neither the Sobolev-Poincari: inequality nor the Poincari: inequality can be applied (even in the case p = 2), since weak solutions are only assumed to be LP-functions with respect to the time-variable t. Nevertheless, it turns out that the weighted means of a weak solution are absolutely continuous with respect to t, which allows us to show a sort of Poincari: inequality valid for weak solutions. This method was introduced by Giaquinta and Struwe, proving higher integrability of weak solutions in the case p = 2. But this method could not directly be transferred to the case p not equal to 2, where we have to deal with the additional difficulty that the parabolic system behaves 'non-homogeneous', in the sense that solutions of the parabolic p-Laplacean system are not invariant under multiplication by constants. On the other hand, reverse-Holder inequalities which are essential to apply Gehring's lemma, are indeed invariant under multiplication by constants. The key to come up with this lack of homogeneity is to choose a system of cylinders whose side lengths depend on the size of the solution itself. This idea goes back to DiBenedetto, proving 'intrinsic' Harnack estimates and regularity of solutions of the p-Laplacean equation, respectively system. This method turned out to be fruitful also when considering systems of more general structure and it was used by Kinnunen and Lewis to show higher integrability for second order parabolic systems

Author

Nonlinear Systems; Estimates; Degeneration; Inequalities; Exponents; Homogeneity; Regularity

20080032986 Helsinki Univ. of Technology, Finland

A Caccioppoli Estimate and Fine Continuity for Superminimizers on Metric Spaces

Korte, Riikka; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 597-604; In English; See also 20080032977; Copyright; Avail.: Other Sources

We prove a Caccioppoli estimate for p-superminimizers on metric spaces. As an application, we provide a new proof for the fine continuity of p-superminimizers. We study superminimizers of the p-Dirichlet integral on metric measure spaces. In the Euclidean case, minimizing this p-energy functional is equivalent to solving the p-harmonic equation. In general metric spaces, it is not clear how to define the p-harmonic equation, but the variational approach is available. Our main result is a Caccioppoli type estimate for p-superminimizers, Theorem 3.4. It answers to a question that was motivated by Kinnunen and Latvala. They were able to prove a weaker estimate that is sufficient to show that the infinity set of any p-superharmonic function is of zero capacity. It is well known that the sharp estimate holds in the Euclidean case, see for example, and it is also one of the main ingredients in proving that the Wiener condition is sufficient for regularity at the boundary. The difficulties in the proof of Theorem 3.4 arise from the fact that the equation is not available and we can use only the minimizing property. We have developed a method to overcome this difficulty, and it enables us to extend the classical pro~f also to this situation. Our method can be used in the metric space setting to obtain simpler proofs also for other estimates that are classically proved exploiting the equation. These include for example some Caccioppoli type estimates, see Lemma 3.1 and Lemma 4.1, as well as an integrability estimate, see Theorem 7.45. As an application of Theorem 3.4, we present a new proof for the fact that p-superharmonic functions are p-finely continuous.

Author

Estimates; Continuity (Mathematics); Regularity; Dirichlet Problem; Euclidean Geometry; Function Space; Metric Space

20080032987 Kentucky Univ., Lexington, KY, USA

Regularity and Free Boundary Regularity for the p Laplacian in Lipschitz and C1 Domains

Lewis, John L.; Nystrom, Kaj; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 523-548; In English; See also 20080032977; Copyright; Avail.: Other Sources

In this paper we study regularity and free boundary regularity, below the continuous threshold, for the p Laplace equation in Lipschitz and C1 domains.

Author

Free Boundaries; Boundary Value Problems; Laplace Transformation; Regularity; Domains; Inequalities; Harmonic Functions; Laplace Equation

20080032988 Royal Inst. of Tech., Stockholm, Sweden

Planar Beurling Transform and Grunsky Inequalities

Hedenmalm, Hakan; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 585-596; In English; See also 20080032977; Copyright; Avail.: Other Sources

In recent work with Baranov, it was explained how to view the classical Grunsky inequalities in terms of an operator identity, involving a transferred Beurling operator induced by the conformal mapping. The main property used is the fact that the Beurling operator is unitary on L(sup)2(C). As the Beurling operator is also bounded on L(sup p)(C) for 1 < p < +(infinity) (with so far unknown norm), an analogous operator identity was found which produces a generalization of the Grunsky inequalities to the L(sup p) setting. Here, we consider weighted Hilbert spaces, and find that the Beurling operator perturbed by adding a Cauch-ytype operator acts unitarily . After transferring to the unit disk D with the conformal mapping, we find a generalization of the Grunsky inequalities); this generalization seems to be essentially known, but the formulation is new. As a special case, the generalization of the Grunsky inequalities contains the Prawitz theorem used in a recent paper with Shimorin. We also mention an application to quasiconformal maps.

Author

Conformal Mapping; Identities; Inequalities; Theorems

20080032989 Jyvaskyla Univ., Finland

Removable Sets for Holder Continuous p-Harmonic Functions on Metric Measure Spaces

Makalainen, Tero; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 605-624; In English; See also 20080032977; Copyright; Avail.: Other Sources

We show that sets of weighted (-p + alpha(p - 1))-Hausdorff measure zero are removable for alpha-Hoelder continuous Cheeger p-harmonic functions. The result is optimal for small alpha. Moreover, we obtain the optimal Hoelder continuity of

p-supersolutions in terms of the associated Riesz measures. Recently, there has been progress in the analysis on general metric measure spaces. The assumptions on the metric measure space are that it is equipped with a doubling measure and it supports a Poincare inequality, see section 2. Under these assumptions, many important tools of the first-order calculus are available. We can conduct deep analysis of such a space in a wide range of topics. We can study, for example, Sobolev-type spaces, nonlinear potential theory and p-harmonic functions in metric space setting, see [BMS], [BBS1], [Ch], [HaK], [KM2], [Sh1] and [Sh2]. In this note, we study p-harmonic functions on complete metric spaces. We assume that the space is equipped with a doubling measure, see (5), and supporting a weak (1,p)-Poincare inequality, see (8). To control the integrability of the derivative in metric space setting, we need a substitute for Sobolev space, which in this note is Newtonian space due to Shanmugalingam in [Sh1], denoted by N1,p, see Definition 2.3. For the definition of p-harmonicity, we need a deep theorem due to Cheeger in [Ch]. Cheeger showed that under the assumptions above the metric space has a differentiable structure, with a fixed collection of coordinate functions, with which Lipschitz functions can be differentiated almost everywhere.
Author
Continuity (Mathematics); Harmonic Functions; Measure and Integration; Metric Space; Sobolev Space; Inequalities; Potential Theory; Function Space

20080032990 Aristotle Univ. of Thessaloniki, Greece
Equality Cases in the Symmetrization Inequalities for Brownian Transition Functions and Dirichlet Heat Kernels
Betsakos, Dimitrios; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 413-427; In English; See also 20080032977; Copyright; Avail.: Other Sources

We prove equality statements for the symmetrization inequalities for Brownian transition functions and Dirichlet heat kernels. The proofs involve the equality statements for the related polarization inequalities which we also prove. These results lead to symmetrization inequalities for Green functions, condenser capacities, and exit times of Brownian motion. The probability measure is absolutely continuous with respect to the n-dimensional Lebesgue measure (denoted in the sequel by m,). The corresponding density (Radon-Nikodym derivative) will be denoted by pt)(x, y). This density can be chosen to be a function continuous in t, x, y; it is the heat kernel for D. For more details on transition functions and heat kernels. In the present article, we study the behavior of transition functions and heat kernels under symmetrization. For the sake of concreteness we will state and prove symmetrization results only for 1-dimensional Steiner symmetrization.
Author
Kernel Functions; Brownian Movements; Dirichlet Problem; Lebesgue Theorem; Probability Theory; Inequalities

20080032991 Helsinki Univ. of Technology, Helsinki, Finland
New Examples of Weakly Compact Approximation in Banach Spaces
Saksman, Eero; Tylli, Hans-Olav; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 429-438; In English; See also 20080032977
Contract(s)/Grant(s): Proj. 113286; Proj. 118765; Proj. 53893; Proj. 210970; Copyright; Avail.: Other Sources

The Banach space E has the weakly compact approximation property (W.A.P.) if there is C < infinity so that the identity map I(sub E) can be uniformly approximated on any weakly compact subset by weakly compact operators. We show that the spaces of nuclear operators the W.A.P. for 1 < q < p < infinity, but that the Hardy space does not have the W.A.P.
Author
Approximation; Banach Space; Identities; Sums

20080032992 Hunan Normal Univ., Changsha, China
Variable Besov and Triebel-Lizorkin Spaces
Xu, Jingshi; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 511-522; In English; See also 20080032977
Contract(s)/Grant(s): HPNSFC 06JJ5012; SRF 06B059; NNSFC 10671062; Copyright; Avail.: Other Sources

In this paper, variable Besov and Triebel-Lizorkin spaces are introduced. Then equivalent norms of these new spaces are given.
Author
Function Space; Banach Space; Partial Differential Equations; Fourier Transformation; Calculus of Variations; Norms

20080032993 Pontificia Univ. Catolica de Chile, Santiago, Chile

Valence and Oscillation of Functions in the Unit Disk

Chuaqui, Martin; Stowe, Dennis; Annals of the Finnish Academy of Sciences: Mathematics, Volume 33, No. 2; 2008, pp. 561-584; In English; See also 20080032977

Contract(s)/Grant(s): Fondecyt 1071019; Copyright; Avail.: Other Sources

We investigate the number of times that nontrivial solutions of equations u' + p(z)u = 0 in the unit disk can vanish - or equivalently, the number of times that solutions of S(f) = 2p(z) can attain their values-given a restriction. We establish a bound for that number when b satisfies a Nehari-type condition, identify perturbations of the condition that allow the number to be infinite, and compare those results with their analogs for real equations.

Author

Perturbation; Valence; Oscillations; Quotients; Amount

20080033009 Shandong Univ. of Technology, Shandong, China

A General Algorithm for the Numerical Evaluation of Nearly Singular Boundary Integrals in the Equivalent Non-Singular BIES with Indirect Unknowns

Zhang, Yaoming; Sun, Cuilian; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 437-447; In English; See also 20080032994; Copyright; Avail.: Other Sources

The accurate evaluation of nearly singular boundary integrals is an important issue in boundary element analysis, and the importance of this problem is next to the singular boundary integrals. Although many ways of evaluating nearly singular integrals have been developed in recent years, and obtained varying degree of success, questions still remain. In this paper, a new efficient transformation is proposed, based on a new idea of transformation with variables. The proposed transformation can remove the near singularity efficiently by smoothing out the rapid variations of the integrand of nearly singular integrals, and improve the accuracy of numerical results of nearly singular integrals greatly without increasing the computational effort. Numerical examples of potential problems are given, with results, showing the high efficiency and the stability of the suggested approach, even when the internal point is very close to the boundary.

Author

Boundary Layers; Algorithms; Accuracy; Integrals; Transformations (Mathematics)

20080033086 Schwegman Lundberg Woessner and Kluth, PA, Minneapolis, MN, USA

Monitoring Activity Using Video Information

Masoud, O. T., Inventor; Papanikolopoulos, N., Inventor; Bird, N. D., Inventor; 22 Jul 05; 32 pp.; In English

Contract(s)/Grant(s): CMS-0127893; IIS-0219863

Patent Info.: Filed Filed 22 Jul 05; US-Patent-Appl-SN-11-188 288

Report No.(s): PB2008-100645; No Copyright; Avail.: CASI: A03, Hardcopy

Apparatus and methods for monitoring activity use video information to track activity of a target at a given location. In an embodiment, the target is segmented into portions and a value of a biometric attribute is associated with the target and compared against values of a biometric attributes of corresponding portions of other images to identify the target and determine a length of time that the target is at the given location.

NTIS

Patent Applications; Video Data

20080033087 Los Alamos National Lab., NM USA

Key Path Generation and Exchange of Cryptographic Keys Using Path Length Noise

Nickel, G. H., Inventor; 23 Jun 04; 7 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-36

Patent Info.: Filed Filed 23 Jun 04; US-Patent-Appl-SN-10-874 483

Report No.(s): PB2008-100644; No Copyright; Avail.: CASI: A02, Hardcopy

Apparatus for sending cryptographic key information through a turbulent medium features a radiation generator in a first enclosure for emitting radiation at a predetermined wavelength through first launching means for launching the radiation into turbulent media. A second launching means in a second enclosure is located a distance from the first enclosure for receiving

the radiation launched from the first launching means after the radiation has traversed the turbulent media, and focusing the radiation onto detection means for determining a unique cryptographic key.
NTIS
Cryptography; Patent Applications; Computer Information Security

20080033088 Shumaker and Sieffert, P.A., Saint Paul, MN, USA; Architecture Technology Corp., Minneapolis, MN, USA
Attack Correlation Using Marked Information
Adelstein, F. N., Inventor; Bar, H., Inventor; Alla, P., Inventor; Proskourine, N., Inventor; 22 Mar 05; 31 pp.; In English
Contract(s)/Grant(s): DAAH01-03-C-R118
Patent Info.: Filed Filed 22 Mar 05; US-Patent-Appl-SN-11-087 388
Report No.(s): PB2008-100643; No Copyright; Avail.: CASI: A03, Hardcopy

Techniques are described for providing security to a protected network. Techniques are described for thwarting attempted network attacks using marked information. The attack correlation system provides marked information to computing devices that probe for sensitive information, and monitors subsequent communications for use of the marked information. In one example, the attack correlation system reroutes communications containing the marked information to a dedicated vulnerable device that logs the communications to monitor the attackers' methods. The attack correlation system may also include functionality to exchange information regarding attempted attacks with other attack correlation systems to gain broader knowledge of attacks throughout one or more networks.
NTIS
Computer Information Security; Computer Networks; Information Systems

20080033104 Brookhaven National Lab., Upton, NY USA
Real-Time Self-Networking Radiation Detection Apparatus
Kaplan, E., Inventor; Lemley, J., Inventor; Tsang, T. Y., Inventor; Milian, L. W., Inventor; 16 Aug 04; 11 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Patent Info.: Filed Filed 16 Aug 04; US-Patent-Appl-SN-10-918 795
Report No.(s): PB2008-100823; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is for a radiation detector apparatus for detecting radiation sources present in cargo shipments. The invention includes the features of integrating a bubble detector sensitive to neutrons and a GPS system into a miniaturized package that can wirelessly signal the presence of radioactive material in shipping containers. The bubble density would be read out if such indicated a harmful source.
NTIS
Cargo; Radiation Detectors; Real Time Operation

20080033121 NASA Langley Research Center, Hampton, VA, USA
Figures of Merit for Control Verification
Crespo, Luis G.; Kenny, Sean P.; Goesu. Daniel P.; August 18, 2008; 20 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 457280; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033121

This paper proposes a methodology for evaluating a controller's ability to satisfy a set of closed-loop specifications when the plant has an arbitrary functional dependency on uncertain parameters. Control verification metrics applicable to deterministic and probabilistic uncertainty models are proposed. These metrics, which result from sizing the largest uncertainty set of a given class for which the specifications are satisfied, enable systematic assessment of competing control alternatives regardless of the methods used to derive them. A particularly attractive feature of the tools derived is that their efficiency and accuracy do not depend on the robustness of the controller. This is in sharp contrast to Monte Carlo based methods where the number of simulations required to accurately approximate the failure probability grows exponentially with its closeness to zero. This framework allows for the integration of complex, high-fidelity simulations of the integrated system and only requires standard optimization algorithms for its implementation.
Author
Dynamical Systems; Control Theory; Mathematical Models; Figure of Merit

20080033413 Intelliserv, Inc., Houston, TX, USA
System for Loading Executable Code into Volatile Memory in a Downhole Tool
Hall, D. R., Inventor; Bartholomew, D. B., Inventor; Johnson, M. L., Inventor; 27 Jul 04; 14 pp.; In English
Contract(s)/Grant(s): DE-FC26-01NT41229
Patent Info.: Filed Filed 27 Jul 04; US-Patent-Appl-SN-10-710 638
Report No.(s): PB2008-100679; No Copyright; Avail.: CASI: A03, Hardcopy

A system for loading an executable code into volatile memory in a downhole tool string component comprises a surface control unit comprising executable code. An integrated downhole network comprises data transmission elements in communication with the surface control unit and the volatile memory. The executable code, stored in the surface control unit, is not permanently stored in the downhole tool string component. In a preferred embodiment of the present invention, the downhole tool string component comprises boot memory. In another embodiment, the executable code is an operating system executable code. Preferably, the volatile memory comprises random access memory (RAM). A method for loading executable code to volatile memory in a downhole tool string component comprises sending the code from the surface control unit to a processor in the downhole tool string component over the network. A central processing unit writes the executable code in the volatile memory.

NTIS
Computers; Patent Applications; Strings; Data Transmission; Central Processing Units; Random Access Memory

20080033824 Greer, Burns and Crain, Chicago, IL, USA; Illinois Univ. at Urbana-Champaign, Urbana, IL, USA
Methods and Systems for Image Modification
Fang, H., Inventor; Hart, J. C., Inventor; 26 Jul 04; 12 pp.; In English
Contract(s)/Grant(s): ACI-0121288UFAS; 1-5-29322
Patent Info.: Filed Filed 26 Jul 04; US-Patent-Appl-SN-10-899 268
Report No.(s): PB2008-100632; No Copyright; Avail.: CASI: A03, Hardcopy

A method of the invention includes the steps of selecting at least a portion of an image on which to superimpose a texture and segmenting that portion of the image into a plurality of clusters. Each of the clusters is then parameterized with texture coordinates, and texture is assigned to each of the clusters using the texture coordinates to result in a texture patch. The texture patches are then blended together. This exemplary method of the invention has the result of the texture patches appearing to adopt the surface undulations of the underlying surface.

NTIS
Image Processing; Patent Applications

20080033832 Mack-Blackwell Transportation Center, Fayetteville, AR, USA
Improved Traffic Signal Efficiency in Rural Areas Through the Use of Variable Meximum Green Time
Click, S. M.; Rajagopalan, A.; Aug. 2007; 91 pp.; In English
Report No.(s): PB2008-101286; MBTC-2093; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this research was to investigate the potential to improve traffic signal operating efficiency through the use of VMGT as low cost local adaptive control. The primary measures of intersection efficiency investigated were average delay and intersection throughput. The primary investigative method involved software-in-the-loop simulation, which allows for computerized traffic simulations to be connected in real time with field traffic signal controller software, thus allowing multiple strategies to be tested with identical traffic conditions and without the difficulties of in-field traffic disruption.

NTIS
Rural Areas; Traffic; Adaptive Control; Controllers; Real Time Operation

20080033833 Knobbe Martens Olson and Bear LLP, Irvine, CA, USA; Micron Technology, Inc., Bowie, MD, USA
Antiferromagnetically Stabilized Pseudo Spin Valve for Memory Applications (PAT-APPL-11-146 431)
Katti, R. R., Inventor; Drewes, J. A., Inventor; Vogt, T. J., Inventor; 7 Jun 05; 17 pp.; In English
Contract(s)/Grant(s): MDA972-98-C-0021
Patent Info.: Filed Filed 7 Jun 05; US-Patent-Appl-SN-11-146 431
Report No.(s): PB2008-100637; No Copyright; Avail.: CASI: A03, Hardcopy

The invention relates to improving the switching reliability of a magnetic memory cell in a magnetic random access memory (MRAM). Embodiments of the invention add an antiferromagnet to a magnetic memory cell. An antiferromagnetic layer can be formed adjacent to a soft layer in the MRAM on a side of the soft layer that is opposite to a hard layer of the

MRAM. One embodiment further includes an additional interlayer of non-antiferromagnetic material between the antiferromagnetic layer and the soft layer.
NTIS
Antiferromagnetism; Computer Storage Devices; Patent Applications; Random Access; Valves

20080033839 Botts (Baker), LLP, Dallas, TX, USA
Imposing and Recovering Correlithm Objects in Conjunction with Table Lookup
Lawrence, P. N., Inventor; Matzke, D. J., Inventor; Jackson, I. R., Inventor; 17 Mar 04; 8 pp.; In English
Contract(s)/Grant(s): F30602-03-C-0051
Patent Info.: Filed Filed 17 Mar 04; US-Patent-Appl-SN-10-803 573
Report No.(s): PB2008-100628; No Copyright; Avail.: CASI: A02, Hardcopy

Encoding bits includes receiving a bit set to encode. An encoding lookup table associates correlithm objects of a space with bit sets. The space refers to an N-dimensional space, a correlithm object refers to a point of the space. The correlithm object corresponding to the received bit set is identified. The received bit set is encoded as the identified correlithm object. The identified correlithm object is imposed to encode the received bit set and subsequently decoded with table lookup using the reverse process.
NTIS
Coding; Patent Applications; Mathematics

20080033894 Department of Energy, Oak Ridge, TN, USA
State of Data Management in the DOE Research amd Development Complex. Report of the Meeting 'DOE Data Centers: Preparing for the Future' held July 14-15, 2004 in Oak Ridge, Tennessee
Jul. 2004; 17 pp.; In English
Report No.(s): PB2008-101064; No Copyright; Avail.: CASI: A03, Hardcopy

DOE invests billions of dollars in R&D projects that generate and use data as a critical resource integral to science. Examples abound. Through its large-scale experimental facilities, DOE provides its researchers with an ever-growing array of world-class instruments that produce vast amounts of data in probing the fundamental workings of science. Science communities have developed many new ways to exploit data collections. Today, state-of-the-art computer simulations and modeling have become as important to the advancement of science as theory and experimentation always have been. Recently, Ray Orbach, Director of the Office of Science, highlighted the growing emphasis on computational science as a fundamental shift in research. Simulation-based science is dependent on the availability, accuracy, and usability of the data previously generated by scientists and funded by DOE and its predecessor agencies. Increasingly, valuable source data are being stored in digital databases. The charter for the National Science Boards (NSB) Task Force on Long-Lived Data Collections (LLDC) states, the number of digital databases is increasing rapidly, and database sizes are in many cases growing exponentially. Digital databases are now an essential and increasingly large component of the cyber-infrastructure that underpins research and education. Early in 2004 the NSB created the LLDC Task Force to study data management practices across the federal science agencies and determine how they should shape future NSF funding policies. Some R&D agencies already have data management policies, while other R&D agencies are now exploring the needs relating to data preservation and use.
NTIS
Data Bases; Data Management

20080034538 Lawrence Livermore National Lab., Livermore, CA USA
Intelligent Classification and Visualization of Network Scans
Chen, L.; Muelder, C.; Ma, K.; Bartoletti, A.; Mar. 09, 2007; 12 pp.; In English
Report No.(s): DE2007-914602; UCRL-CONF-228878; No Copyright; Avail.: National Technical Information Service (NTIS)

Network scans are a common first step in a network intrusion attempt. In order to gain information about a potential network intrusion, it is beneficial to analyze these network scans. Statistical methods such as wavelet scalogram analysis have been used along with visualization techniques in previous methods. However, applying these statistical methods to reduce the data causes a substantial amount of data loss. This paper presents a study of using associative memory learning techniques to directly compare network scans in order to create a classification which can be used by itself or in conjunction with existing

visualization techniques to better characterize the sources of these scans. This produces an integrated system of visual and intelligent analysis which is applicable to real world data.
NTIS
Classifications; Intrusion; Scanners

20080034560 Lawrence Livermore National Lab., Livermore, CA USA
Practical Differential Profiling
Schulz, M.; De Supinski, B. R.; Feb. 06, 2007; 12 pp.; In English
Report No.(s): DE2007-914615; UCRL-CONF-227812; No Copyright; Avail.: Department of Energy Information Bridge

Comparing performance profiles from two runs is an essential performance analysis step that users routinely perform. In this work we present eGprof, a tool that facilitates these comparisons through differential profiling inside gprof. We chose this approach, rather than designing a new tool, since gprof is one of the few performance analysis tools accepted and used by a large community of users. eGprof allows users to subtract two performance profiles directly. It also includes callgraph visualization to highlight the differences in graphical form. Along with the design of this tool, we present several case studies that show how eGprof can be used to find and to study the differences of two application executions quickly and hence can aid the user in this most common step in performance analysis. We do this without requiring major changes on the side of the user, the most important factor in guaranteeing the adoption of our tool by code teams.
NTIS
Reliability Analysis; Profiles

20080034562 Pacific Northwest National Lab., Richland, WA, USA
Component-Based Framework for Subsurface Simulations
Palmer, B. J.; Fang, Y.; Hammond, G.; Gurumoorthi, V.; January 2007; 5 pp.; In English
Report No.(s): DE2007-913603; No Copyright; Avail.: National Technical Information Service (NTIS)

Simulations in the subsurface environment represent a broad range of phenomena covering an equally broad range of scales. Developing modelling capabilities that can integrate models representing different phenomena acting at different scales present formidable challenges both from the algorithmic and computer science perspective. This paper will describe the development of an integrated framework that will be used to combine different models into a single simulation. Initial work has focused on creating two frameworks, one for performing smooth particle hydrodynamics (SPH) simulations of fluid systems, the other for performing grid-based continuum simulations of reactive subsurface flow. The SPH framework is based on a parallel code developed for doing pore scale simulations, the continuum gridbased framework is based on the STOMP (Subsurface Transport Over Multiple Phases) code developed at PNNL. Future work will focus on combining the frameworks together to perform multiscale, multiphysics simulations of reactive subsurface flow.
NTIS
Computerized Simulation; Reactivity; Simulation

20080034604 Sandia National Labs., Albuquerque, NM USA
Optimizing the ASC WAN: Evaluating Network Performance Tools for Comparing Transport Protocols
Lydick, C. L.; Jul. 2007; 33 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-912922; SAND2007-4526; No Copyright; Avail.: National Technical Information Service (NTIS)

The Advanced Simulation & Computing Wide Area Network (ASC WAN), which is a high delay-bandwidth network connection between US Department of Energy National Laboratories, is constantly being examined and evaluated for efficiency. One of the current transport-layer protocols which is used, TCP, was developed for traffic demands which are different from that on the ASC WAN. The Stream Control Transport Protocol (SCTP), on the other hand, has shown characteristics which make it more appealing to networks such as these. Most important, before considering a replacement for TCP on any network, a testing tool that performs well against certain criteria needs to be found. In order to try to find such a tool, two popular networking tools (Netperf v.2.4.3 & v.2.4.6 (OpenSS7 STREAMS), and Iperf v.2.0.6) were tested. These tools implement both TCP and SCTP and were evaluated using four metrics: (1) How effectively can the tool reach a throughput near the bandwidth. (2) How much of the CPU does the tool utilize during operation. (3) Is the tool freely and widely available. And, (4) Is the tool actively developed. Following the analysis of those tools, this paper goes further into explaining some recommendations and ideas for future work.
NTIS
Bandwidth; Computer Networks; Computerized Simulation; Simulation; Wide Area Networks

20080034605 Idaho National Engineering Lab., Idaho Falls, ID, USA
Technical Issues Map for the NHI System Interface and Support Systems Area: 3rd Quarter FY 07
Sherman, S. R.; Jun. 2007; 27 pp.; In English
Report No.(s): DE2007-912904; INL/EXT-07-12794; No Copyright; Avail.: National Technical Information Service (NTIS)

This document provides a mapping of technical issues associated with development of the Next Generation Nuclear Plant (NGNP) intermediate heat transport loop and nuclear hydrogen plant support systems to the work that has been accomplished or is currently underway. The technical issues are ranked according to priority and by assumed resolution dates. Due to funding limitations, not all high-priority technical issues are under study at the present time, and more resources will need to be dedicated to tackling such issues in the future. This technical issues map is useful for understanding the relative importance of various technical challenges and will be used as a planning tool by the NHI technical leadership for future work package planning. The technical map in its present form will be discontinued in FY08 and will be folded into a larger NHI System Interface and Support Systems project management plan and scope baseline statement in FY08.
NTIS
Nuclear Power Plants; Support Systems

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*.

20080033444 Naval Postgraduate School, Monterey, CA USA
SP Summary (with Authority Mode)
Levin, Timothy E; Sep 18, 2007; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): CNS-0430566; CNS-0430598
Report No.(s): AD-A480788; NPS-CS-08-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report provides a summary of the interface and semantics for the processor extensions defined by the SP Processor (where SP is the name of the design, which informally stands for 'secret protected').
DTIC
Computer Information Security; Computer Storage Devices; Cryptography; Data Storage; Microprocessors

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.

20080032742 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
BSSData - An Optimized System Prototype for BSS Data Processing and Analysis
RicardoFazanaroMartinon, Andre; January 2008; 119 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-14831-TDI/1271; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

This work proposes an optimized system for data processing and analysis in Solar Radioastronomy, being specifically designed for the BSS - Brazilian Solar Spectroscope, at INPE. This system is an extension of the formerly developed BSSData software. In the current work it was implemented the BSSLibrary, an optimized library that includes routines for data processing. This library is being continuously developed and the set of image filtering routines has been completed. Optimization made use of vector instructions in assembly language, typical in current IA32 processors. This library was implemented as a Dynamic Link Library (DLL), in order to form a self contained module, not dependent from other modules, such as the user interface. Tests show that a good performance is attained through vectorization. The proposed work includes the software configuration of the data processing and analysis system and discusses some alternatives for data visualization. Author
Computer Programs; Optimization; Data Processing; Data Acquisition; Solar Spectrometers

20080033000 National Dong Hwa Univ., Hualien, Taiwan, Province of China

An Information Flow Control Model for Software Processes that Manages Developer Associations

Chou, Shih-Chien; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 503-507; In English; See also 20080032994; Copyright; Avail.: Other Sources

A software process (software development process) should be followed to develop software. As agreed, process-centered software engineering environments (PSEEs) facilitate controlling complicated software processes. Quite a few issues regarding PSEE such as process evolution support have been addressed. Nevertheless, PSEE researchers have generally ignored the important issues of ensuring secure product access during process execution. This can be achieved through information flow control. This paper proposes an information flow control model to ensure secure product access. The model also manages developer associations and adapts to developer association change.

Author

Software Engineering; Computer Programming; Access Control; Environmental Control; Information Flow; Programming Environments

20080033142 Navy Center for Applied Research in Artificial Intelligence, Washington, DC USA

An Investigation of How Humans and Machines Deal with Increases in Reactivity

Trafton, J G; Schultz, Alan C; Bugajska, Magdalena D; Gittens, Shaun; Mintz, Farilee; Jan 2001; 10 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480230; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480230

Many aspects of CGF tasks have highly reactive aspects to them ‘e.g., observing and responding to multiple simultaneous information sources while piloting an airplane’. Also, reactivity can be a critical aspect of performance when there are many individual agents being controlled. This reactivity, however, must be combined with ‘higher-level’ cognitive activities like planning and strategy assessment. Finally, reactivity and planning activities must coexist in a single system that interacts realistically with the environment. This preliminary work presents an initial examination of reactivity in SAMUEL agents and humans.

DTIC

Computerized Simulation; Reactivity

20080033212 Washington Univ., Seattle, WA USA

An Analysis of Software Interface Issues for SMT Processors

Redstone, Joshua A; Jan 2002; 143 pp.; In English

Contract(s)/Grant(s): F30602-97-2-0226

Report No.(s): AD-A480391; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480391

Simultaneous Multithreading (SMT) has progressed from concept to commercial technology. This thesis explores three software interface issues on SMT. These issues are: operating system performance on SMT, the impact of spinning on SMT, and register file limitations to scaling SMT. We investigate these issues with a new, detailed simulation infrastructure capable of modeling all operating system activity. First, we present an analysis of operating system execution on SMT. We compare Apache’s user- and kernel-mode behavior to a multi-programmed SPECInt workload. Our results demonstrate the micro-architectural impact of an OS-intensive workload on an SMT processor. The synergy between the SMT processor and Web and OS software produces a greater throughput gain over superscalar execution than seen on any previously examined workloads. Second, we study the cost of synchronization on SMT. Spinning can exact a large performance cost on SMT, because all threads share execution resources. We quantify the impact of spinning on SMT and the performance benefit of replacing spinning with SMT-lock-based code. We observe that spinning’s degradation of performance ranges widely between more than 3x on multi-programmed workloads to a negligible amount on the Apache workload. Finally, we explore architectural register sharing on SMT. A significant impediment to the construction of SMTs larger than two or four contexts is register file size. We introduce and evaluate mini-threads, a simple extension to SMT that increases thread-level parallelism without the commensurate increase in register hardware. A mini-threaded SMT CPU adds additional per-thread state to each hardware context; an application executing in a context can create mini-threads that will utilize its own per-thread state, but share the context’s architectural register set. Our results quantify the factors affecting performance in detail and demonstrate that mini-threads can improve performance significantly.

DTIC

Architecture (Computers); Computer Programs

20080033229 Virginia Univ., Charlottesville, VA USA

Delta Coherence Protocols

Williams, Craig; Reynolds, Jr , Paul F; de Supinski, Bronis R; Jan 2000; 8 pp.; In English

Contract(s)/Grant(s): CCR-9503143; DABT63-95-C-0081

Report No.(s): AD-A480418; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480418

Caching data can reduce access latency and improve data availability, but it also raises the problem of how to maintain consistency among copies of writable data. The problem appears in different guises in different contexts: it appears as the cache coherence problem in multiprocessors, as the problem of maintaining a distributed shared memory in distributed computations, and as the replica control problem in distributed databases. This article describes the home update protocol, a member of the class of coherence protocols called delta coherence protocols that uses isotach guarantees to solve the coherence problem in a new and highly concurrent way. (Due to space constraints, and to avoid obscuring the basic concept of the protocols, we describe the protocol at a high level and do not address practical implementation issues.) Our goal is to show how isotach guarantees are useful in solving the coherence problem and in reasoning about coherence protocols. The coherence problem is difficult, because it requires coordinating events across nodes. The traditional approach to the problem is to reduce the coordination required by limiting concurrency or weakening the correctness criteria. Hardware based coherence protocols are traditionally divided into two classes: snoopy protocols, which require a shared bus, and directory protocols, intended for point-to-point networks. A shared bus serializes memory requests. This serialization readily yields an agreed total order among requests, but it limits concurrency and scalability. Directory protocols are more scalable, but existing directory protocols that enforce sequential consistency (SC) require that nodes execute requests one at a time and invalidate or lock copies while executing write requests. Delta protocols use isotach guarantees to coordinate accesses, an approach that lets delta protocols enforce SC without limiting concurrency. However, delta protocols require isotach guarantees.

DTIC

Distributed Processing; Multiprocessing (Computers); Protocol (Computers)

20080033253 Massachusetts Inst. of Tech., Cambridge, MA USA

Graphical Geometric and Learning/Optimization-Based Methods in Statistical Signal and Image Processing Object Recognition and Data Fusion

Willsky, Alan S; Mar 1, 2008; 28 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0351

Report No.(s): AD-A480487; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480487

This report summarizes our accomplishments under this grant. Our research covers several interrelated areas: (a) the use of graphical, hierarchical, and multiresolution representations for the development of statistical modeling methodologies for complex phenomena and for the construction of scalable algorithms for the fusion of multiple heterogeneous sources of information; (b) the development of first principles methods for constructing statistical models for shapes and for the use of these models in developing robust and statistically optimal methods of shape estimation and recognition; and (c) the development of new statistical learning and optimization algorithms for feature extraction, signal and image restoration, and sensor fusion. Our research blends methods from several fields-statistics and probability, signal and image processing, mathematical physics, scientific computing, statistical learning theory, and differential geometry-to produce new approaches to emerging and challenging problems in signal and image processing, and each aspect of our program contains both fundamental research in mathematical sciences and important applications of direct relevance to Air Force missions. In particular, our research is relevant to automatic target recognition based on synthetic aperture radar and laser radar imagery; wide-area surveillance and information preparation of the battlefield; global awareness and higher-level fusion for situational assessment; and fusion of multiple heterogeneous sensors. In all of these areas we have contacts and interactions with AFRL staff and with industry involved in Air Force programs.

DTIC

Graphical User Interface; Image Processing; Multisensor Fusion; Optical Radar; Pattern Recognition; Signal Processing; Statistical Analysis

20080033264 Naval Research Lab., Washington, DC USA

A Framework for Answering Queries Using Multiple Representation and Inference Techniques

Cassimatis, Nicholas L; Sep 2003; 14 pp.; In English

Report No.(s): AD-A480512; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480512

The Polylog framework is designed to provide a language for efficiently automating complex queries of information represented in multiple formats. A Polylog program contains a set of modules called specialists that store and make inferences about data in a particular representation. The FocusLoop algorithm answers queries by combining the knowledge and computation of all the specialists. Logic program duals for Polylog programs are introduced to prove that FocusLoop is sound and complete. A logic program dual makes the same inferences as the Polylog program it corresponds to. By using one program to formally characterize behavior and another to implement it, the traditional tradeoffs between provably correct automated question answering, representational flexibility and efficient execution are greatly reduced. Specialists using representations such as neural networks, ontologies, logical clauses and constraint graphs have already been implemented. They demonstrate that complex queries over multiple data sources can be automated without sacrificing efficiency for soundness and completeness. Finally, it is shown that FocusLoop generalizes logical deduction using operations such as resolution, forward inference and subgoaling and that these are common themes in many computational frameworks. In Polylog, each operation is implemented using multiple algorithms, enabling the weaknesses and impasses of one inference or representation technique to be compensated for by the strengths and resources the others.

DTIC

Algorithms; Computer Programs; Computers; Inference; Logic Design

20080033312 Naval Research Lab., Bay Saint Louis, MS USA

Global Ocean Nowcasts and Forecasts with the Navy Coastal Model (NCOM)

Barron, C N; Rhodes, R C; Smedstad, L F; Rowley, C D; Martin, P J; Kara, A B; Jan 2003; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480644; XB-NRL/MR/7332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480644

The global ocean is a seamless body where open-ocean systems shape and are shaped by nearshore conditions, surface processes drive and respond to interior circulation, and localized events often can be predicted and understood only within a larger context. To support Navy operations and other research and operational activities within such an environment, we have developed and are transitioning to the Naval Oceanographic Office (NAVO) a fully global implementation of the Navy Coastal Ocean Model (NCOM). We have endeavored to produce a friendly environment for nesting higher resolution models wherever the need should arise. Some global NCOM data products of particular interest include surface currents and temperature, mixed-layer depth, current and thermohaline profiles, and shelf circulation. Global NCOM extends present global Navy operational model capabilities into the Arctic and to nearshore regions, with a minimum depth of 5 m. Operational roles of global NCOM include providing standalone data where global resolution is sufficient and timely overviews of local circulation as detailed localized products are prepared. Perhaps its most important purpose is to provide boundary conditions used by regional or relocatable models, giving required information regarding the surrounding environment to localized models more specialized for a particular task or domain. In general, nested models will have more detailed forcing, topography, additional data for assimilation, or higher resolution necessary for improved local detail. The global model includes inflow from almost 1000 rivers to improve the fidelity of coastal salinity. Global NCOM is designed to be suitable for inclusion in a coupled ocean-atmosphere modeling system, and it is also designated as the host for an embedded ice model, PIPS3, which is in development for transition.

DTIC

Coasts; Forecasting; Navy; Nowcasting; Ocean Models; Oceans

20080033314 Humansystems, Inc., Guelph, Ontario Canada

TBCS/Chameleon Utility Trial Report

Matthews, Michael L; Brooks, Jeremy E; Angel, Harold A; May 2005; 81 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480648; DRDC-T-CR-2006-215; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480648

This study evaluated the utility and ease of use of features of the Tactical Battlefield Command Systems (TBCS)/ Chameleon using participants representing command elements of a combat team. Seven participants role-played an advance to contact scenario developed by Joint Command Staff Training Centre (JCSTC) in 13 segments. Following each segment,

participants provided user feedback on 25 key features and tools of the software. The overall results indicated that the features and tools in TBCS/Chameleon are seen to be generally useful by the combat team across a range of activities. Many specific features currently in the software, as well as future features, were seen to have particularly high utility and have the potential to improve situation awareness, reduce workload, improve communication effectiveness and support decision-making. However, there are a number of areas in which the utility of features can be improved. Specific recommendations are made to support these improvements across a range of features including: map use, communication tools, production of orders and access to information. These recommendations concentrate on utility issues with a secondary focus on increasing the ease of use of some features. The user review process should continue at each major build of the TBCS/Chameleon. As the development moves from a concept based development to a fieldable system the user reviews should move from utility based to usability based. Tabletop user reviews of concepts will also assist with design decisions between major builds.
DTIC
Combat; Feedback; Information Systems; Software Development Tools; Thermal Control Coatings

20080033315 Naval Research Lab., Bay Saint Louis, MS USA
Incorporation of Random Wave Effects into a Quasi-3D Nearshore Circulation Model (Preprint)
Kaihatu, James M; Shi, Fengyan; Kirby, James T; Svendsen, Ib A; Jul 2002; 14 pp.; In English
Report No.(s): AD-A480649; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480649

A coupled wave-hydrodynamic modeling system, comprised of a random wave model driving a quasi-3D nearshore hydrodynamic model, is described. Random wave formulations for several inputs to the hydrodynamic model are developed. An alternate wave dissipation mechanism is incorporated into the random wave model, and two wave roller descriptions are implemented to calculate volume flux and other roller-dependent input properties. Comparison to laboratory and field data indicate that an evolving roller description, in conjunction with the 3D dispersive mixing inherent in the hydrodynamic model, yield the best results. A method to nest the model system inside larger-scale wave models is described, and an application to an area of complex bathymetry shown.
DTIC
Ocean Models; Ocean Surface; Three Dimensional Models; Water Waves

20080033316 Naval Research Lab., Bay Saint Louis, MS USA
MASDA - MODAS Adaptive Sampling Decision Aid
Collins, Mona J; DelBalzo, Donald R; Barron, Charlie N; Oct 2002; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480650; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480650

The Modular Ocean Data Assimilation System (MODAS) produces oceanographic nowcasts based on a) climatology, b) remotely-sensed sea surface temperature and height, and c) in-situ measurements. Recent analyses have shown that the locations of in-situ measurements can have a profound influence on the accuracy of the MODAS synthetic profiles. Small-scale variability combined with sparse sampling and inappropriate covariance scales can lead to a spreading of unrepresentative anomalies. The MODAS Adaptive Sampling Decision Aid (MASDA) is being developed to guide the selection of Airborne Expendable Bathy Thermograph (AXBT) measurement locations to improve the accuracy of MODAS analyses while minimizing the number of required measurements. MASDA uses the computed MODAS temperature uncertainty to predict the optimum sampling locations. The iterative in-flight MASDA approach is to recommend sequential measurement locations based on sequentially computed temperature uncertainty. The pre-flight combinatorial MASDA approach is to recommend the best combination of N measurement locations based on the computed temperature uncertainty. These environmentally driven sampling strategies are expected to increase accuracy of MODAS analyses relative to MODAS analyses based on alternate sampling strategies with the same number of observations. AXBT measurements from several ocean areas are being used to develop and test MASDA algorithms. Preliminary results showing improvement in MODAS accuracy using the MASDA method for selecting observations compared to more subjective selection methods are presented.
DTIC
Accuracy; Bathythermographs; Decision Support Systems; Sampling

20080033323 Delaware Univ., Newark, DE USA

Development and Verification of a Comprehensive Community Model for Physical Processes in the Nearshore Ocean

Kirby, James T; Allen, John S; Drake, Thomas G; Elgar, Steve; Guza, Robert T; Hanes, Daniel M; Herbers, Thomas H; Kaihatu, James M; Mellor, George; Ozkan-Haller, H T; Jan 2002; 11 pp.; In English

Contract(s)/Grant(s): N00014-99-1-1051

Report No.(s): AD-A480662; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480662

Our goal is to develop a comprehensive, verified community model that predicts nearshore hydrodynamics, sediment transport, and seabed morphology changes given offshore wave conditions and initial bathymetry. The basic scientific objective is to synthesize understanding of physical processes in the nearshore ocean by developing a model for waves and resulting radiation stresses and mass fluxes over evolving coastal bathymetry and currents wave-induced circulation sediment transport and morphological evolution. An additional objective is to test model components and the full community model with field. Our approach is to develop a tightly-coupled system of individual model components, or modules. We are utilizing a framework where wave processes are distinguished from wave-averaged processes by means of a suitable time average. The resulting set of modules and their functions are: 1. wave module - calculation of second- and third-moment wave properties, including frequency-directional spectra, radiation stresses, and wave skewness and asymmetry 2. circulation module - calculation of wave-driven circulation and turbulence levels 3. seabed module - calculation of local sediment fluxes and seabed changes resulting from flux divergences, and characterization of bed geometry.

DTIC

Ocean Models; Oceans; Regions

20080033424 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

A Software Pipeline for Protein Structure Prediction

Lee, Michael S; Yeh, In-Chul; Zavajevski, Nela; Wilson, Paul; Reifman, Jaques; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480740; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have developed a software suite to predict protein structures from sequence through the integration of multiple non-commercial programs. The Army and DoD medical and scientific communities will be able to use this software to annotate structures of sequenced pathogenic and host genomes. Such structural predictions can be used in therapeutic and vaccine design as well as many areas of basic biological research. In this work, initial assessments of the software are made. Most importantly, these tests include evaluation of the quality of predicted structural models as a function of sequence similarity to known protein structures.

DTIC

Computer Programming; Pipelines; Proteins; Software Engineering

20080033445 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Modeling and Analysis of Resolve and Morale for the ′Long War'

Artelli, Michael J; Dec 2007; 273 pp.; In English

Report No.(s): AD-A480793; AFIT/DS/ENS/07-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In The Art of War, Sun Tzu begins by stating: 'War is a matter of vital importance to the State; the province of life or death; the road to survival or ruin. It is mandatory that it be thoroughly studied.' Sun Tzu follow's this opening by stating five fundamental factors a commander must master to be successful in combat. The first of these factors is moral influence which Sun Tzu defines as 'that which causes the people to be in harmony with their leaders, so they will accompany them in life and death without fear of mortal peril.' In the face of the instant communication provided by satellites, 24 hour news media coverage, and other technological advances, this factor is even more relevant today. This research provides an analytic framework, based on the principles of fourth generation operations, capturing the effects of will and resolve of the combatant and population. The strategic level model investigates the long term impacts of asymmetric conflict. These results are primarily measured in the socio-political arena rather than the military battlefield. The model developed in this dissertation remains a model of conflict and combat. However, some of the impacts from the political, economic, and informational instruments of power are represented in the model through the dynamic adaptation of public resolve and combat spirit. To paraphrase Sun Tzu, war is vitally important and must be studied. Therefore, this dissertation puts forth a means to model key aspects of conflict in the ′long war'.

DTIC

Combat; Models; Morale; Simulation; Terrorism; Warfare

20080033565 Biotechnology HPC Software Applications Inst., Fort Detrick, MD USA

A Tool for Creating and Parallelizing Bioinformatics Pipelines

Yu, Chenggang; Wilson, Paul A; Jun 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480822; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Bioinformatics pipelines enable life scientists to effectively analyze biological data through automated multi-step processes constructed by individual programs and databases. The huge amount of data and time consuming computations require effectively parallelized pipelines to provide results within a reasonable time. Considerable programming effort is needed for both integrating individual programs into a pipeline and parallelizing them. The object of our Bioinformatics Pipeline Generation and Parallelization Toolkit (BioGent) is to reduce researchers programming burden. A user only needs to create a pipeline definition file that describes the data processing sequence and input/output files. Program termed schedpipe in BioGent toolkit takes the definition file and executes the designed procedure.

DTIC

Biomedical Data; Information Systems; Parallel Processing (Computers); Pipelines

20080034627 Idaho National Engineering Lab., Idaho Falls, ID, USA

Method for Selecting Software for Dynamic Event Analysis I: Problem Selection. Structural Mechanics in Reactor Technology (SMiRT 19)

Lacy, J. M.; Novascone, S. R.; Richins, W. D.; Larson, T. K.; Aug. 2007; 9 pp.; In English

Report No.(s): DE2007-915532; INL/CON-07-12650; No Copyright; Avail.: National Technical Information Service (NTIS)

New nuclear power reactor designs will require resistance to a variety of possible malevolent attacks, as well as traditional dynamic accident scenarios. The design/analysis team may be faced with a broad range of phenomena including air and ground blasts, high-velocity penetrators or shaped charges, and vehicle or aircraft impacts. With a host of software tools available to address these high-energy events, the analysis team must evaluate and select the software most appropriate for their particular set of problems. The accuracy of the selected software should then be validated with respect to the phenomena governing the interaction of the threat and structure. In this paper, we present a method for systematically comparing current high-energy physics codes for specific applications in new reactor design. Several codes are available for the study of blast, impact, and other shock phenomena. Historically, these packages were developed to study specific phenomena such as explosives performance, penetrator/target interaction, or accidental impacts. As developers generalize the capabilities of their software, legacy biases and assumptions can remain that could affect the applicability of the code to other processes and phenomena. R&D institutions generally adopt one or two software packages and use them almost exclusively, performing benchmarks on a single-problem basis.

NTIS

Computer Programs; Nuclear Power Plants; Power Reactors; Reactor Technology; Structural Analysis

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20080032754 Instituto de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

A Methodology for Attack Detection in the Network Traffic Based on Neural Networks

deSaSilva, Lilia; January 2008; 256 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15175-TDI/1292; Copyright; Avail.: CASI: C01, CD-ROM: A12, Hardcopy

In order to be cautious against unexpected and undesired situations and to prevent the proliferation of attacks continuously launched to different targets in the network, protection mechanisms like firewalls, antivirus, authentication system, cryptography and intrusion detection systems are installed in network environments all over the world. Intrusion detection systems compose an essential part of the infrastructure of in-layer security and its objective is to analyze audit trails data of hosts or network traffic data in order to search suspected events or attacks against network or systems. Several techniques to recognize intrusion events have been proposed, from public domain tools to commercial solutions. However, a methodology of easy applications to aid analysts in network attack detection tasks is necessary. Thus, a neural network-based methodology to aid analysts in detecting attacks on the network traffic is proposed in this thesis. This methodology provides strategies,

methods, techniques, and tools to model and treat data, to generate normal and anomalous traffic used for training and testing of detection models and methods for attack detection on the network traffic based on neural networks. Also, it provides information about signature and normal traffic databases updating, as well as information about computer network traffic behavior analysis. Studies of cases had disclosed the possibility of efficient use of the proposal methodology to detect attacks in computer network HTTP traffic, with emphasis in the application of neural networks to analyze network packet data.
Author
Computer Networks; Neural Nets; Data Transmission; Intrusion Detection (Computers); Computer Security

20080032837 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A-Train Data Search and Visualization to Facilitate Multi-Instrument Cloud Studies
Kempler, Steven; Smith, Peter; Savtchenko, Andrey; Leptoukh, Greg; Stephens, Graeme; Winkler, Dave; December 10, 2007; 1 pp.; In English; American Geophysical Union Fall Meeting, 15-19 Dec. 2007, California, USA; Original contains poor quality, truncated or crooked pages; Copyright; Avail.: CASI: A01, Hardcopy

Now that the A-Train suite of datasets have become more mature, new and innovative science utilizing the various products has become more reliable and challenging. To perform multi-satellite research with A-Train data originating from heterogenous missions, scientists must access, subset visualize and analyze user specified datasets in ways unique to the dataset. Then hte datasets need to be co-registered and maybe merged. The A-Train Data Depot (ATDD) has been developed to save each scientist the effort and expense of developing these functions individually.
Author
Data Processing; Data Systems; Multisensor Applications; Remote Sensing

20080033165 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Software Assurance Best Practices for Air Force Weapon and Information Technology Systems - Are We Bleeding
Maxon, Ryan A; Mar 2008; 147 pp.; In English
Report No.(s): AD-A480286; AFIT/GIR/ENV/08-M13; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480286

In the corporate world, 'bits mean money,' and as the Department of Defense (DoD) becomes more and more reliant on net-centric warfare, bits mean national security. Software security threats are very real, as demonstrated by the constant barrage of Internet viruses, worms, Trojans, and hackers seeking to exploit the latest vulnerability. Most organizations focus their resources on reactive defenses such as firewalls, antivirus software, and encryption, however as demonstrated by the numerous attacks that are successful, those post facto measures are not enough to stop the bleeding. The DoD defines software assurance (SwA) as the 'level of confidence that software functions as intended and is free of vulnerabilities, either intentionally or unintentionally designed or inserted as part of the software.' SwA focuses on baking in security versus bolting it on afterwards. The Department of Homeland Security and DoD each have had SwA programs for a few years; however the Air Force (AF) just recently formed the Application Software Assurance Center of Excellence at Maxwell AFB-Gunter Annex, AL. This research seeks to identify common issues that present challenges to the development of secure software and best practices that the AF could adopt as it proactively begins to heal the SwA problem.
DTIC
Information Systems; Procedures; Security; Weapon Systems

20080033340 Naval Research Lab., Washington, DC USA
Reliable Multicast and Integrated Parity Retransmission with Channel Estimation Considerations
Gossink, Don E; Macker, Joseph P; Nov 1998; 7 pp.; In English
Report No.(s): AD-A480686; XB-NRL/ITD/5500; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480686

This paper explores extensions to parity-based retransmission schemes applied to protocols for reliable multicast delivery. It considers a hybrid protocol scheme to potentially reduce the number of required data repair cycles through channel loss prediction. It is conjectured that such a scheme has potential benefit for particular network architectures, such as direct broadcast satellite, in improving protocol throughput delay and efficiency.
DTIC
Parity; Protocol (Computers)

20080033564 Department of Defense, Washington, DC USA
The Power of Information: Transforming the National Defense Team to an Internet World
Grimes, James; Oct 2006; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480826; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The National Defense Strategy clearly states how we will operate in the future - we will be Net-Centric. Our job is to deliver the critical enabling capability to conduct Net-Centric Operations. Our pioneering effort will radically change the way the entire Defense Enterprise does business. Defense transformation hinges on the recognition that information is our greatest source of power. We can leverage information to allow decision makers at all levels to make better decisions faster and act sooner. This booklet, the first in a series, takes us back to the basics: Why must we change? How are we changing? What does it mean to me? Rather than an in-depth technical discussion, this booklet focuses on a far more complex topic - What is Net-Centricity? Perhaps by reminding ourselves of the fundamentals, we can stay better focused as we work out the details. DTIC

Command and Control; Defense Program; Information Management; Internets

20080034661 NATO Research and Technology Organization, Neuilly-sur-Seine, France
Verification, Validation, and Accreditation (VV and A) of Federations
April 2008; 104 pp.; In English; Original contains black and white illustrations
Report No.(s): RTO-TR-MSG-019; AC/323(MSG-019)TP/13; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

This document defines the recommended processes and procedures that should be followed to implement Verification, Validation, and Accreditation (VV&A) for federations being developed using the High Level Architecture (HLA) Federation Development and Execution Process (FEDEP). The VV&A overlay described in this document is a tailorable process that overlays the FEDEP and is intended to apply across a wide range of functional applications. This overlay identifies and describes the recommended VV&A processes that should be followed to assure the acceptability and utility of federations for particular intended uses. The overlay also identifies and describes the information feeding and resulting from those processes as well as the relationships between the FEDEP and the VV&A processes and their respective information products. In addition, this overlay defines those terms uniquely needed to characterize the FEDEP VV&A overlay.
Author

Architecture (Computers); Program Verification (Computers); Models; Systems Integration

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20080032767 NASA Marshall Space Flight Center, Huntsville, AL, USA
NASA and Army Collaboration on Unmanned Systems Presentation to (SE)3
Fernandez, Ken; May 12, 2008; 8 pp.; In English; Southeastern Software and Systems Engineering Conference, 12-14 May 2008, Huntsville, AL, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032767

This viewgraph presentation reviews the collaboration in developing robotic and autonomous systems by NASA and the Department of Defense (DoD). Several examples of the collaboration are reviewed.
Author

Autonomy; Robotics; Automatic Control; Coordination

20080033146 Naval Research Lab., Washington, DC USA
Huh, What Was I Doing? How People Use Environmental Cues after an Interruption
Trafton, J G; Altmann, Erik M; Brock, Derek P; Sep 2005; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480254; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480254

The authors examine the effects of environmental cues on being interrupted while performing a task. They conducted an experiment in which participants, after an interruption, received either a blatant environmental cue of their previous action (a red arrow), a subtle environmental cue of their previous action (a cursor that was placed in the same location as their previous action), or no environmental cue at all. The authors found that participants in the blatant condition resumed their task faster

than participants in the other two conditions. Furthermore, a subtle environmental cue was no better than no cue at all. The results support their model of memory for goals.
DTIC
Cognition; Cues; Human-Computer Interface; Interruption; Mathematical Models; Problem Solving

20080033151 Naval Research Lab., Washington, DC USA
Spatial Representation and Reasoning for Human-Robot Collaboration
Kennedy, William G; Bugajska, Magdalena D; Marge, Matthew; Adams, William; Fransen, Benjamin R; Perzanowski, Dennis; Schultz, Alan c; Trafton, J G; Jul 2007; 7 pp.; In English
Report No.(s): AD-A480260; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480260

How should a robot represent and reason about spatial information when it needs to collaborate effectively with a human? The form of spatial representation that is useful for robot navigation may not be useful in higher-level reasoning or working with humans as a team member. To explore this question, we have extended previous work on how children and robots learn to play hide and seek to a human-robot team covertly approaching a moving target. We used the cognitive modeling system, ACT-R, with an added spatial module to support the robot's spatial reasoning. The robot interacted with a team member through voice, gestures, and movement during the team's covert approach of a moving target. This paper describes the new robotic system and its integration of metric, symbolic, and cognitive layers of spatial representation and reasoning for its individual and team behavior.
DTIC
Navigation; Robots

20080033187 Naval Research Lab., Washington, DC USA
Memory for Goals: An Activation-Based Model
Altmann, Erik M; Trafton, J G; Jan 2002; 47 pp.; In English
Contract(s)/Grant(s): F49620-97-1-0353
Report No.(s): AD-A480324; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480324

Goal-directed cognition is often discussed in terms of specialized memory structures like the 'goal stack.' The 'goal-activation' model presented here analyzes goal-directed cognition in terms of the general memory constructs of activation and associative priming. The model embodies three predictive constraints: (1) the interference level, which arises from residual memory for old goals; (2) the strengthening constraint, which makes predictions about time to encode a new goal; and (3) the priming constraint, which makes predictions about the role of cues in retrieving pending goals. These constraints are formulated algebraically and tested through simulation of latency and error data from the Tower of Hanoi, a means-ends puzzle that depends heavily on suspension and resumption of goals. Implications of the model for understanding intention superiority, post-completion error, and effects of task interruption are discussed.
DTIC
Artificial Intelligence; Cognition; Information Retrieval; Problem Solving

20080033193 Naval Research Lab., Washington, DC USA
Children and Robots Learning to Play Hide and Seek
Trafton, J G; Schultz, Alan C; Perznowski, Dennis; Bugajska, Magdalena D; Adams, William; Cassimatis, Nicholas L; Brock, Derek P; Jan 2006; 9 pp.; In English
Contract(s)/Grant(s): MIPR-N0001402WX20374
Report No.(s): AD-A480331; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480331

How do children learn how to play hide and seek? At ages 3-4, children do not typically have perspective taking ability, so their hiding ability should be extremely limited. The authors show through a case study that a 3-1/2-year-old child can, in fact, play a credible game of hide and seek, even though she does not seem to have perspective taking ability. They propose that children are able to learn how to play hide and seek by learning the features and relations of objects (e.g., containment, under) and use that information to play a credible game of hide and seek. They model this hypothesis within the ACT-R cognitive architecture and put the model on a robot, which is able to mimic the child's hiding behavior. They also take the

'hiding' model and use it as the basis for a 'seeking' model. They suggest that using the same representations and procedures that a person uses allows better interaction between the human and robotic system.
DTIC
Artificial Intelligence; Children; Cognition; Learning; Machine Learning; Mathematical Models; Robots

20080033194 Michigan State Univ., East Lansing, MI USA
Task Interruption: Resumption Lag and the Role of Cues
Altmann, Erik M; Trafton, J G; Aug 2004; 7 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0063; MIPR-N0001400WX21058
Report No.(s): AD-A480333; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480333

The consequences of interrupting someone in the middle of a complex task are of considerable practical and theoretical interest. The authors examine one behavioral measure of the disruption caused by task interruption, namely the 'resumption lag,' or the time needed to 'collect one's thoughts' and restart a task after an interruption is over. The resumption lag (in this task environment) was double the interval between uninterrupted actions (3.8 seconds vs. 1.9 seconds), indicating a substantial disruptive effect. To probe the nature of the disruption, they examined the role of external cues associated with the interrupted task and found that cues available immediately before an interruption facilitate performance immediately afterwards, thus reducing the resumption lag. This 'cue-availability' effect suggests that people deploy preparatory perceptual and memory processes, apparently spontaneously, to mitigate the disruptive effects of task interruption.
DTIC
Cognition; Cues; Human-Computer Interface; Interruption

20080033244 Carnegie-Mellon Univ., Pittsburgh, PA USA
Coordinated Deployment of Multiple, Heterogeneous Robots
Simmons, Reid; Apfelbaum, David; Fox, Dieter; Goldman, Robert P; Haigh, Karen Z; Musliner, David J; Pelican, Michael; Thrun, Sebastian; Jan 2000; 8 pp.; In English
Contract(s)/Grant(s): DAAE07-98-C-L032
Report No.(s): AD-A480451; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480451

To be truly useful, mobile robots need to be fairly autonomous and easy to control. This is especially true in situations where multiple robots are used, due to the increase in sensory information and the fact that the robots can interfere with one another. This paper describes a system that integrates autonomous navigation, a task executive, task planning, and an intuitive graphical user interface to control multiple, heterogeneous robots. We have demonstrated a prototype system that plans and coordinates the deployment of teams of robots. Testing has shown the effectiveness and robustness of the system, and of the coordination strategies in particular.
DTIC
Deployment; Heterogeneity; Planning; Robots

20080033266 Naval Research Lab., Washington, DC USA
Enabling Effective Human-Robot Interaction Using Perspective-Taking in Robots
Trafton, J G; Cassimatis, Nicholas L; Bugajska, Magdalena D; Brock, Derek P; Mintz, Farilee E; Schultz, Alan C; Jul 2005; 12 pp.; In English
Contract(s)/Grant(s): MIPR-N0001404WX30001
Report No.(s): AD-A480516; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480516

We propose that an important aspect of human-robot interaction is perspective-taking. We show how perspective-taking occurs in a naturalistic environment (astronauts working on a collaborative project) and present a cognitive architecture for performing perspective-taking called Polyscheme. Finally, we show a fully integrated system that instantiates our theoretical framework within a working robot system. Our system successfully solves a series of perspective-taking problems and uses the same frames of references that astronauts do to facilitate collaborative problem solving with a person.
DTIC
Computer Programming; Java (Programming Language); Problem Solving; Robots

20080033268 Pennsylvania Univ., Philadelphia, PA USA

A Taxonomy and Comparison of Haptic Actions for Disassembly Tasks

Bloomfield, Aaron; Deng, Yu; Wampler, Jeff; Rondot, Pascale; Harth, Dina; McManus, Mary; Badler, Norman; Mar 2003; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-99-D-6001-0008

Report No.(s): AD-A480520; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480520

The usefulness of modern day haptics equipment for virtual simulations of actual maintenance actions is examined. In an effort to categorize which areas haptic simulations may be useful, we have developed a taxonomy for haptic actions. This classification has two major dimensions: the general type of action performed and the type of force or torque required. Building upon this taxonomy, we selected three representative tasks from the taxonomy to evaluate in a virtual reality simulation. We conducted a series of human subject experiments to compare user performance and preference on a disassembly task with and without haptic feedback using CyberGlove, Phantom, and SpaceMouse interfaces. Analysis of the simulation runs shows Phantom users learned to accomplish the simulated actions significantly more quickly than did users of the CyberGlove or the SpaceMouse. Moreover a lack of differences in the post-experiment questionnaire suggests that haptics research should include a measure of actual performance speed or accuracy rather than relying solely on subjective reports of a device's ease of use.

DTIC

Assembling; Maintenance; Taxonomy; Touch; Virtual Reality

20080033269 Naval Research Lab., Washington, DC USA

Perspective-taking with Robots: Experiments and models

Trafton, J G; Schultz, Alan C; Bugajska, Magdalena; Mintz, Farilee; Aug 2005; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): MIPR-N0001402WX20374

Report No.(s): AD-A480522; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480522

We suggest that to enable effective human-robot interaction, robots should be able to interact in a way that is natural to and preferred by humans. Using human-compatible representations and reasoning mechanisms should help in developing skills which support effective human-robot interaction. In this paper, we present two studies that examine a critical human-robot-interaction component: perspective-taking. We find that when a person asks a robot to perform a task with some ambiguity to the robot, the person prefers the robot to either ask for clarification or take the person's perspective and act appropriately.

DTIC

Robots; Statistical Analysis

20080033308 Naval Research Lab., Washington, DC USA

Communicating and Collaborating With Robotic Agents (Preprint)

Trafton, J G; Schultz, Alan C; Cassimatis, Nicholas L; Hiatt, Laura M; Perzanowski, Dennis; Brock, Derek P; Bugajska, Magdalena D; Adams, William; Jan 2006; 41 pp.; In English

Contract(s)/Grant(s): N0001402WX20374

Report No.(s): AD-A480639; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480639

For the last few years, our lab has been attempting to build robots that are similar to humans in a variety of ways. Our goal has been to build systems that think and act like a person rather than look like a person since the state of the art is not sufficient for a robot to look (even superficially) like a human person. We believe that there are at least two reasons to build robots that think and act like a human. First, how an artificial system acts has a profound effect on how people act toward the system. Second, how an artificial system thinks has a profound effect on how people interact with the system.

DTIC

Communicating; Human-Computer Interface; Robotics; Social Factors

20080033401 Naval Undersea Warfare Center, Newport, RI USA
Virtual Reality Training System for a Submarine Command Center
Maxwell, Douglas B, Inventor; Apr 25, 2008; 14 pp.; In English
Report No.(s): AD-D020364; No Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/100.2/ADD020364

The invention as disclosed is a system that uses a combined real and virtual display interaction methodology to generate the visual appearance of submarine combat control rooms and allow interaction with mixed real and virtual control panels for the purposes of training in the operation of submarine combat control systems.
DTIC
Education; Submarines; Training Devices; Virtual Reality

20080033438 Center for Higher Learning, Stennis Space Center, MS USA
Refinements to an Optimized Model-Driven Bathymetry Deduction Algorithm
Narayanan, Chandrasekher; Kaihatu, James M; Sep 2001; 10 pp.; In English
Report No.(s): AD-A480773; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this study we describe a numerical algorithm which deduces characteristics of the bottom bathymetry given free surface elevation records dense in space but sparse in time. The method makes use of the Levenberg-Marquardt numerical optimization scheme in conjunction with a time-domain nonlinear model. Iteration occurs until the mismatch between the free surfaces of the data and model are minimized; the bathymetry is adjusted in order to achieve this minimum. The sensitivity measure is a by-product of the calculation, and determines the invertibility of the system. Due to robustness concerns, we limit ourselves to deduction of bathymetric profile parameters. Tests of the system using monochromatic, irregular and groupy waves show favorable results; the latter is particularly notable give the difficulty standard inversion methods have had with groupy waves. A two-stage system is also outlined, in which a simple parameterization for a nearshore bar is developed and utilized. The first stage determines the mean profile, while the second stage determines the bar characteristics using the first stage results as the initial iterate. To extend the method's capabilities further, the use of phase speed records is discussed.
DTIC
Algorithms; Bathymeters; Detection; Remote Sensing; Signal Processing

20080033477 Strategic Environmental Research and Development Program, Arlington, VA USA
EM61-3D Discrimination of UXO Using Empirical, Analytic, and Numerical Models
Weichman, Pieter; Becker, Alex; Dec 24, 2002; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2035SER; Proj-U-1215
Report No.(s): AD-A480886; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary goal of this project was to compare three quantitative approaches to modeling EM induction for UXO discrimination: a phenomenological dipole model, a semianalytic theory, and a finite-element numerical method. The secondary goal was to quantify the value of multiple spatial components and time channels. A general, time-dependent triaxial dipole model was developed. The semianalytic theory was not completed; implementation of the numerical method was impractical given allocated resources. The relative merits of additional temporal and spatial information were assessed. Performance was measured by the fraction of false positives for ordnance-like objects at 91% true positives. The best false-positive rate for the full multicomponent, multichannel data was just 5%. However, this excellent performance is largely due to the fact that the ordnance-like objects are larger than the scrap-like objects in this data set. Better generalization may be obtained with discriminants based solely on shape which yielded 32% false positives. This work demonstrated in an internally consistent way the high performance in UXO discrimination that can be achieved with multicomponent, multichannel electromagnetic sensors, as well as the value of relatively simple modeling and discrimination procedures.
DTIC
Explosives Detection; Magnetic Induction; Mathematical Models

20080033479 Illinois Univ., Urbana, IL USA
Extracting Subimages of an Unknown Category from a Set of Images
Todorovic, Sinisa; Ahuja, Narendra; Jan 2006; 9 pp.; In English
Contract(s)/Grant(s): N00014-06-1-0101
Report No.(s): AD-A480892; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Suppose a set of images contains frequent occurrences of objects from an unknown category. This paper is aimed at

simultaneously solving the following related problems '1' unsupervised identification of photometric, geometric, and topological 'mutual containment' properties of multi-scale regions defining objects in the category; '2' learning a region-based structural model of the category in terms of these properties from a set of training images; and '3' segmentation and recognition of objects from the category in new images. To this end, each image is represented by a tree that captures a multiscale image segmentation. The trees are matched to find the maximally matching subtrees across the set, the existence of which is itself viewed as evidence that a category is indeed present. The matched sub-trees are fused into a canonical tree, which represents the learned model of the category. Recognition of objects in a new image and image segmentation delineating all object parts are achieved simultaneously by finding matches of the model with subtrees of the new image. Experimental comparison with state-of-the-art methods shows that the proposed approach has similar recognition and superior localization performance while it uses fewer training examples.
DTIC
Image Processing; Photometry

20080033493 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA
PLATO: Portable Language-Independent Adaptive Translation from OCR
Natarajan, Prem; Mar 2008; 5 pp.; In English
Contract(s)/Grant(s): HR001-08-C-0004; ARPA ORDER-X103
Report No.(s): AD-A480938; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This is the second R&D quarterly progress report (QPR) of the BBN-led team under DARPA's MADCAT program. The goal for the pre-processing and image enhancement task is to eliminate noise artifacts from documents. In this reporting period, we performed preliminary experiments to assess the usefulness of shape-DNA enhancement on machine-print and handwritten images. The shape-DNA approach uses a database of low- and high-resolution shapes and a probabilistic shape-mapping model. The database and mapping are both automatically learned from training data to estimate high-resolution details from low-resolution shapes.
DTIC
Adaptation; Image Processing; Translating

20080033494 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA
AGILE: Autonomous Global Integrated Language Exploitation
Makhoul, John; Apr 2008; 36 pp.; In English
Contract(s)/Grant(s): HR0011-06-C-0022; ARPA ORDER-V002
Report No.(s): AD-A480940; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The objective of GALE is nothing short of solving the human language technology (HLT) problem of transcribing foreign spoken and written languages into English and distilling the transcription into accurate information for use by our military. Below, we summarize the work performed by the BBN-led AGILE Team in Year 2. A more detailed description of the work performed can be found in the DARPA/IPTO Quarterly Status Reports for this project.
DTIC
Autonomy; Exploitation; Languages; Machine Translation

20080033594 George Mason Univ., Fairfax, VA USA
Human Control of Multiple Unmanned Vehicles: Effects of Interface Type on Execution and Task Switching Times
Squire, Peter; Trafton, Greg; Parasuraman, Raja; Mar 2006; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480602; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480602
The number and type of unmanned vehicles sought in military operations continues to grow. A critical consideration in designing these systems is identifying interface types or interaction schemes that enhance an operator's ability to supervise multiple unmanned vehicles. Past research has explored how interface types impact overall performance measures (e.g. mission execution time), but has not extensively examined other human performance factors that might influence human-robot interaction. Within a dynamic military environment, it is particularly important to assess how interfaces impact an operator's ability to quickly adapt and alter the unmanned vehicle's tasking. To assess an operator's ability to confront this changing environment, we explored the impact of interface type on task switching. Research has shown performance costs (i.e. increased time response) when individuals switch between different tasks. Results from this study suggest that this task switching effect is also seen when participants controlling multiple unmanned vehicles switch between different strategies.

Results also indicate that when utilizing a flexible delegation interface, participants did not incur as large a switch cost effect as they did when using an interface that allowed only the use of fixed automated control of the unmanned vehicles.
DTIC
Man Machine Systems; Manual Control; Robots; Switching

20080033611 Integrated Wave Technologies, Inc., Fremont, CA USA
Choosing Frames of Reference: Perspective-Taking in a 2D and 3D Navigational Task
Mintz, Farilee E; Trafton, J G; Marsh, Elaine; Perzanowski, Dennis; Sep 2004; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MIPR-N0001402WX20374
Report No.(s): AD-A480653; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480653

This study investigates how frames of reference are chosen in a dynamic navigational task. Participants issued verbal instructions to an animated robot and were provided with one of three views for navigating the animated robot around a virtual world. The different views included a flat two-dimensional (2D) North-up map, a three-dimensional (3D) robot's eye view of the world, and a 3D view from behind the robot (3D-Camera) in which depth cues were manipulated. Our results show people adopt an egocentric frame of reference when depth cues are salient and an exocentric reference frame when depth cues are absent. The results suggest the absence or presence of depth cues is a critical component in choosing a reference frame. We discuss the extension of Bryant and Tversky's (1999) theoretical framework to a dynamic environment, such as navigation.
DTIC
Cues; Depth; Navigation; Robots

20080033695 NASA Langley Research Center, Hampton, VA, USA
Piloted Evaluation of the H-Mode, a Variable Autonomy Control System, in Motion-Based Simulation
Goodrich, Kenneth H.; Schutte, Paul C.; Williams, Ralph A.; August 18, 2008; 15 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 457280; Copyright; Avail.: CASI: A03, Hardcopy

As aircraft become able to autonomously respond to a range of situations with performance surpassing human operators, we are compelled to look for new methods that help understand their use and guide the design of new, more effective forms of automation and interaction. The 'H-mode' is one such method and is based on the metaphor of a well-trained horse. The concept allows the pilot to manage a broad range of control automation functionality, from augmented manual control to FMS-like coupling and automation initiated actions, using a common interface system and easily learned set of interaction skills. The interface leverages familiar manual control interfaces (e.g., the control stick) and flight displays through the addition of contextually dependent haptic-multimodal elements. The concept is relevant to manned and remotely piloted vehicles. This paper provides an overview of the H-mode concept followed by a presentation of the results from a recent evaluation conducted in a motion-based simulator. The evaluation focused on assessing the overall usability and flying qualities of the concept with an emphasis on the effects of turbulence and cockpit motion. Because the H-mode results in interactions between traditional flying qualities and management of higher-level flight path automation, these effects are of particular interest. The results indicate that the concept may provide a useful complement or replacement to conventional interfaces, and retains the usefulness in the presence of turbulence and motion.
Author
Manual Control; Motion Simulation; Remotely Piloted Vehicles; Trajectory Control; Control Sticks; Flight Characteristics; Human Performance; Autonomy

20080033728 Naval Research Lab., Washington, DC USA
The Attentional Costs of Interrupting Task Performance at Various Stages
Monk, Christopher A; Boehm-Davis, Deborah A; Trafton, J G; Oct 2002; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MIPR-N0001400WX21058
Report No.(s): AD-A480334; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480334

The visual occlusion technique has received considerable attention in recent years as a method for measuring the interruptible aspects of in-vehicle information system (IVIS) task performance. Because the visual occlusion technique lacks

a loading task during 'occluded' periods, an alternate method was adopted to provide increased sensitivity to the attentional costs of interruptions on IVIS-style task performance. Participants alternated between performing a VCR programming task and a simple tracking task. Results indicate that it does matter at which point the VCR task is interrupted in terms of time to resume the VCR task. Specifically, the resumption time, or lag, was lowest right before beginning a new task stage such as entering the show end-time, or when performing a repetitive scrolling task. The results suggest that it might be appropriate to include measures of resumption lag when testing the interruptability of IVIS-style tasks.
DTIC
Cognition; Computer Programming; Costs; Human Performance; Human-Computer Interface; Interruption; Occlusion; Tasks

20080033763 Naval Research Lab., Washington, DC USA
Extracting Explicit and Implict Information from Complex Visualizations
Trafton, J G; Marshall, Sandra; Mintz, Farilee; Trickett, Susan B; Jan 2002; 16 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0331; MIPR-N0001400WX20844
Report No.(s): AD-A480548; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480548

How do experienced users extract information from a complex visualization? The authors examine this question by performing an experiment. They presented experienced weather forecasters with visualizations that did not show the needed information explicitly and examined their eye movements. They replicated Carpenter and Shah (1998) when the information was explicitly available on the visualization. However, when the information was not explicitly available, they found that forecasters used spatial reasoning in the form of spatial transformations to extract the needed information. They also found a strong image component for constructing meteorological information.
DTIC
Cognition; Extraction; Eye Movements; Meteorological Parameters

20080033767 Naval Research Lab., Washington, DC USA; George Mason Univ., Fairfax, VA, USA
From Specific Information Extraction to Inferences: A Hierarchical Framework of Graph Comprehension
Ratwani, Raj M; Trafton, J G; Boehm-Davis, Deborah A; Sep 2004; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480551; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480551

This study examined how graph readers extract specific information, integrate information, and make inferences from choropleth graphs. The authors present a hierarchical framework of graph comprehension that suggests how graph readers extract different types of information. The framework suggests that the cognitive operations required to extract different types of information build in a hierarchical fashion as the complexity of the type of extraction increases. Empirical data gathered in their laboratory is reviewed in support of the hierarchical framework, and implications of the work are discussed.
DTIC
Cognition; Extraction; Eye Movements; Hierarchies

20080034452 Navy Center for Applied Research in Artificial Intelligence, Washington, DC USA
Collaborating with Humanoid Robots in Space
Sofge, Donald; Bugajska, Magdalena; Trafton, J G; Perzanowski, Dennis; Thomas, Scott; Skubic, Marjorie; Blisard, Samuel; Cassimatis, Nicholas; Brock, Derek; Adams, William; Schultz, Alan; Dec 2005; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480221; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480221

Humanoid robots such as Robonaut offer many opportunities for advancing the use of robots in complex environments such as space, and for development of more effective interfaces for humans to interact with them. Once a sufficiently high level of interaction between robots and humans is achieved, the operation of and interaction with these robots will become less of an additional burden for the humans, and more of a collaboration to achieve the objectives of the task-at-hand. In this paper we describe our plans to endow Robonaut with cognitive capabilities which will support collaboration between human astronauts and Robonaut. We build upon our experience in normal l%%%%1%%% understanding, ge sflire recognition, spatial reasoning and cognitive modeling in achieving future goals.
DTIC
Robots; Astronauts

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20080033145 Naval Research Lab., Bay Saint Louis, MS USA
Finite Element-Based Coastal Ocean Modeling: Today and Tomorrow
Blain, C A; Massey, T C; Arnone, R A; Gould, R W; Jan 2006; 4 pp.; In English
Report No.(s): AD-A480239; XB-NRL/FR/7320; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480239

The continued necessity of military special forces operations in riverine and coastal environments along with increasing civilian concerns related to sediment transport, search and rescue, pollutant dispersal, and coastal restoration, have resulted in the need for detailed knowledge of currents and water levels in coastal, estuarine, and riverine environments. This demand for information at highly resolved spatial and temporal scales and the availability of massively parallel computer resources has brought to the forefront the capabilities of finite element (FE)-based coastal ocean circulation models. The use by these models of unstructured triangular meshes permits a large degree of flexibility in representing the complexities of coastal environments associated with convoluted shorelines, and steep gradients in currents or bathymetry. Ultimately this flexibility results in model predictions over periods of hours or less at spatial scales that range from meters to kilometers. Unstructured meshes containing upwards of 281,800 computational points and 540,000 triangular elements are constructed to represent riverine and coastal currents off the shores of southeast Louisiana and Mississippi (Fig. 1). Spatial resolution is 50 m in rivers and decreases to 100 to 200 m offshore. The need for remote boundary forcing is accommodated by including the Gulf of Mexico and extending the mesh into the north Atlanta ocean. The applied forcing includes tides, wind stress at the water surface and river discharge from the Atchafalaya and Mississippi Rivers.
DTIC
Coasts; Finite Element Method; Ocean Models; Oceans

20080033150 Naval Postgraduate School, Monterey, CA USA
Sixth-Order Difference Scheme for Sigma Coordinate Ocean Models
Chu, Peter C; Fan, Chenwu; Mar 1997; 9 pp.; In English
Report No.(s): AD-A480258; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480258

How to reduce the horizontal pressure gradient error is a key issue of using sigma-coordinate ocean models, especially of using primitive equation models for coastal regions. The error is caused by the splitting of the horizontal pressure gradient term into two parts and the subsequent incomplete cancellation of the truncation errors of those parts. Due to the fact that the higher the order of the difference scheme, the less the truncation error and the more complicated the computation, a sixth-order difference scheme for the sigma-coordinate ocean models is proposed in order to reduce error without increasing complexity of the computation. After the analytical error estimation, the Semi-spectral Primitive Equation Model is used to demonstrate the benefit of using this scheme. The stability and accuracy are compared with those of the second-order and fourth-order schemes in a series of calculations of unforced flow in the vicinity of an isolated seamount. The sixth-order scheme is shown to have error reductions by factors of 5 compared to the fourth-order difference scheme and by factors of 50 compared to the second-order difference scheme over a wide range of parameter space as well as a great parametric domain of numerical stability.
DTIC
Coasts; Difference Equations; Ocean Models; Pressure Gradients

20080033177 Naval Research Lab., Bay Saint Louis, MS USA
Comparing Ocean Prediction System Skill Using Ocean Color
Hurlburt, H E; Shriver, J F; Smedstad, O M; Wallcraft, A J; Arnone, R A; Barron, C N; Chassignet, E P; Flynn, P M; Ko, D -S; Rhodes, R C; Smedstad, L F; Jan 2005; 7 pp.; In English
Report No.(s): AD-A480310; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480310

This article illustrates the value of SeaWiFS ocean color imagery in assessing the ability of five different ocean prediction systems to map the 'ocean weather.' Nowcast results are presented from three global systems in the northwestern Arabia Sea and from all systems in the Gulf of Mexico. Ocean weather includes warm and cold eddies, the oceanic analog of atmospheric

high and lows, and the meandering pathways of ocean currents and fronts. Ocean color imagery is a unique independent data set that is very effective in differentiating the relative skill of the different systems and in helping to diagnose specific strengths and weaknesses of the systems. Ocean color from the SeaWiFS satellite (operated by Orbital Sciences Corp.) was collected and processed at NRL using an extension of NASA algorithms. Improved coupled ocean-atmosphere algorithms for coastal waters were used to uncouple the spectral color signature into the near-surface chlorophyll concentrations. These images provide unique tracers of both circulation and biological activity. Daily chlorophyll images were generated by a 7-day latest pixel composite to remove clouds and retain ocean features. The chlorophyll features are clearly associated with the location of ocean circulation features, whereas their absolute concentrations associated with the biological response. Features marked by both chlorophyll-rich and chlorophyll-poor water proved useful in comparing the ocean prediction systems. In addition, the study clearly illustrates that biological responses of the surface waters are strongly linked to physical events and processes.
DTIC
Color; Display Devices; Imagery; Ocean Currents; Oceans; Prediction Analysis Techniques; Signatures; Spectra; Water Color

20080033204 Naval Postgraduate School, Monterey, CA USA
Two Kinds of Predictability in the Lorenz System
Chu, Peter C; May 15, 1999; 7 pp.; In English
Report No.(s): AD-A480365; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480365

The Lorenz system is used to discuss two kinds of predictability: the model sensitivity to inaccurate initial conditions (first kind) and to inaccurate boundary conditions (second kind). The first kind of predictability has been investigated for a long time, but not the second kind. It was found that the Lorenz system has a capability to detect both kinds of predictability since the boundary condition is represented by a model parameter, r. Two sensitivity runs are designed by perturbing the initial condition and the model parameter r by the same small relative error 10(exp -4), which is equivalent to 10% of the instrumentational accuracy for surface temperature measurement. Comparison of model output between the control run and the sensitivity runs shows that the model error growth and the growing period are comparable between the two kinds of predictability. This indicates the importance of preparing accurate boundary conditions in numerical prediction.
DTIC
Numerical Analysis; Prediction Analysis Techniques; Predictions; Random Numbers

20080033233 Montana State Univ., Bozeman, MT USA
Sensitivity Analysis and Computation for Partial Differential Equations
Davis, Lisa G; Mar 14, 2008; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-07-1-0405
Report No.(s): AD-A480422; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480422

The development of practical numerical methods for simulation of partial differential equations leads to problems of convergence, accuracy and efficiency. Verification of a computational algorithm consists in part of establishing a convergence theory for the discretized equations. It is well known that the long time behavior of a system may not be captured even by 'convergent' approximating methods and additional requirements must be placed on the scheme to ensure the discretized equations capture the correct asymptotic behavior. Even on finite intervals, there are always uncertainties in the problem data that can be a source of difficulty for accurate simulation of nonlinear problems. These uncertainties lead to uncertainty in the computed results and should be considered as part of the verification step. This research gives preliminary results showing how sensitivity analysis can be used to provide a practical precursor to dynamic transitions and quantify numerical uncertainty in simulations of nonlinear parabolic partial differential equations.
DTIC
Computation; Partial Differential Equations; Sensitivity; Sensitivity Analysis

20080033234 Florida Agricultural and Mechanical Univ., Tallahassee, FL USA
Numerical Solutions for Optimal Control Problems Under SPDE Constraints
Cao, Yanzhao; Feb 7, 2008; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-06-1-0234
Report No.(s): AD-A480423; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480423

The focus of this project is about numerical solutions of optimal control problems using the analysis of variance

(ANOVA) analysis. The impact of random parameter dependent boundary conditions on the solutions of a class of nonlinear partial differential equations (PDEs) is considered. Because the boundary conditions are random field, the PDE becomes stochastic PDE. The concepts of effective dimensions are used to determine the accuracy of the ANOVA expansions. Demonstrations are given to show that whenever truncated ANOVA expansions of functionals provide accurate approximations, optimizers found through a simple surrogate optimization strategy are also relatively accurate.
DTIC
Numerical Analysis; Optimal Control; Partial Differential Equations; Problem Solving; Stochastic Processes

20080033293 Naval Postgraduate School, Monterey, CA USA
The S-Transform for Obtaining Localized Spectra
Chu, Peter C; Jan 1989; 12 pp.; In English
Report No.(s): AD-A480610; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480610

We used the recently developed S-transform, an extention to the ideas of the Gabor transform and wavelet transform, to analyze the Tropical Ocean Global Atmosphere (TOGA) sea level data set and to obtain the localized spectra, varying with time. Our S-spectra show some features that cannot be obtained from the Fourier transform, such as phase lock, temporal variability of spectra, and out-of-phase behavior of the semiannual, annual, and biannual signals between the western Pacific (Naura) station and the eastern Pacific (La Liberiad) station. The annual signal is usually phase-locked with the semiannual signal, but not with the biannual signal. The annual signal is quite stationary in the western Pacific station and non-stationary in the eastern Pacific station. During 1980-84, the quasi-biannual (QB) signal was very strong at the western Pacific station and quite weak at the eastern Pacific station. However, during 1974-76 and 1986-90, the QB signal was weak at the western Pacific station and strong at the eastern Pacific station. This may imply different physical processes involved in the western and eastern Pacific during the El Nino and Southern Oscillation (ENSO) periods.
DTIC
Pacific Ocean; Spectra; Wavelet Analysis

20080033302 Delaware Univ., Newark, DE USA
The Detection of Hostile Objects
Colton, David; Monk, Peter; Cakoni, Fioralba; Apr 15, 2008; 14 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0127
Report No.(s): AD-A480624; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480624

This grant is concerned with the problem of the detection of decoys and objects buried in the earth from measured electromagnetic scattering data at fixed frequency in the resonance region. The proposed research includes the problem of determining the shapes and material properties of the unknown scattering objects, in particular the surface conductivity and index of refraction. Central to this investigation has been the study of a new class of elliptic problems called the interior transmission problems as well as the use of the ultra-weak method to solve direct scattering problems in order to generate data for the inverse problem. The main accomplishments are the development of 1) an algorithm for determining the shape and surface conductivity of a partially coated dielectric, 2) the reciprocity gap functional method for imaging of subsurface caves and tunnels and 3) a formula for determining a lower bound for the index of refraction, all from a knowledge of the scattered field.
DTIC
Detection; Electromagnetic Scattering; Inverse Scattering

20080033453 Air Force Research Lab., Edwards AFB, CA USA
Numerical Prediction of UV Radiation from Two-Phase Plumes at High Altitudes (Preprint)
Gimelshein, Natalia E; Lyons, Robert B; Reuster, James G; Gimelshein, Sergey F; Aug 27, 2007; 23 pp.; In English
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A480813; AFRL-PR-ED-JA-2007-409; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A multi-step continuum-kinetic approach is used to model a steady state plume flow from a Star 27 motor at an altitude of 188 km. Two-way coupled Navier-Stokes equations and the DSMC method are used to predict the interaction between plume and atmospheric gases and micron-sized alumina particles from the thruster. A Monte Carlo radiation code that accounts

for photon scattering on particles is used to calculate UV radiation based on the obtained flowfield solutions. Comparison of computed spectral and integral radiant intensity with available flight data is performed. Photon scattering by submicron particles in the 200 nm to 400 nm range was found to be a dominant process in the far field UV emission.
DTIC
Exhaust Gases; High Altitude; Mathematical Models; Plumes; Prediction Analysis Techniques; Rocket Exhaust; Signatures; Trajectories; Ultraviolet Radiation

20080033454 Air Force Research Lab., Edwards AFB, CA USA
Transient Modeling of High Altitude Rocket Stage Separation (Preprint)
Eramya, Allen; Gimelshein, Sergey; Cline, Jason; Braunstein, Matthew; Jul 31, 2007; 22 pp.; In English
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A480814; AFRL-PR-ED-JA-2007-399; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The direct simulation Monte Carlo method is used to model a transient stage separation of a generic sounding rocket at 100 km. Lower stage movement is included, and the flow and surface properties are simulated over the first second after thruster ignition. Both liquid and solid propellant thrusters are examined with a thrust of 25 kN and 34 kN, respectively. Four different simulation scenarios are considered that allow analysis of the impact of the stage motion, explicitly including unsteady flow effects. Unsteady flow effects are small enough that quasi-steady state modeling appears to be adequate for this general staging scenario. The influence of DSMC statistical fluctuations on the stage trajectory is insignificant compared to the total contribution of the plume force. We also examine the radiation environment, including the plume-atmosphere shock and plume-lower stage impingement.
DTIC
High Altitude; Propulsion; Sounding Rockets; Stage Separation

20080033481 Mirage Systems, Sunnyvale, CA USA
SAR/GPR Matched Filter Processing for UXO Discrimination
Dec 21, 2001; 32 pp.; In English
Contract(s)/Grant(s): DACA72-00-P-0056
Report No.(s): AD-A480904; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In order to achieve focused SAR images it is necessary to have accurate knowledge of the radar antenna position during its motion over the synthetic aperture. This position information is used to ensure proper focusing of the SAR image by phase compensating the data collected over the entire SAR path. This process is known as motion compensation and requires precise measurement of the position of the phase center of the GPR antenna. The positioning measurement system utilized on this project used electronic repeaters that act as reference targets within the SAR field of view. The repeater-based measurement technique works as follows. Each repeater receives the radar signal, alters it by imposing a pseudo-Doppler modulation onto the signal, and then transmits this modulated signal back to the radar. The repeater signals are, thus, embedded in the normal radar data stream; no special radar modifications are required to receive the repeater signals. A different Doppler frequency is used for each individual repeater allowing each repeater to be uniquely identified. After Doppler processing, the responses from the repeaters stand out above the background clutter with high signal quality (i.e., high signal to clutter ratio) because the repeater signals have been Doppler shifted away from the zero-Doppler background clutter. Due to the high quality of the repeater signals, with post processing of the data, the range between each repeater and the SAR antenna is precisely determined. A tri-lateration algorithm is then used on three repeater ranges to accurately locate the SAR antenna's 3D position. Only the precise relative locations of the repeaters with respect to each other are needed in order to form a sharply focused SAR image; absolute geo-location of the repeaters also allows the focused SAR image to be accurately geo-referenced as well.
DTIC
Ammunition; Image Motion Compensation; Matched Filters; Synthetic Aperture Radar

20080033562 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Statistical Removal of Shadow for Applications to Gait Recognition
Hockersmith, Brian; Mar 2008; 73 pp.; In English
Report No.(s): AD-A480715; AFIT/GAM/ENC/08-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this thesis is to mathematically remove the shadow of an individual on video. The removal of the shadow will aid in the rendering of higher quality binary silhouettes than previously allowed. These silhouettes will allow researchers

studying gait recognition to work with silhouettes unhindered by unrelated data. The thesis begins with the analysis of videos of solid colored backgrounds. A formulation of the effect of shadow on specified colors will aid in the derivation of a hypothesis test to remove an individual's shadow. Video of an individual walking normally, perpendicular to the camera will be utilized to test the algorithm. First, the algorithm replaces shaded pixels, pixel values determined to be shadows, with corresponding pixels of an average background. A hypothesis test will be employed to determine if a pixel value is a shaded pixel. The rejection region for the hypothesis test will be determined from the pixel values of the frames containing a subject. Once the shaded pixels are replaced, the resulting frames will then be run through a background subtraction algorithm and filtered, resulting in a series of binary silhouettes. Researchers can then utilize the series of binary silhouettes to accomplish a gait recognition algorithm.
DTIC
Algorithms; Gait

20080033569 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Computation of Observation Sensitivity and Observation Impact in Incremental Variational Data Assimilation
Tremolet, Yannick; [2008]; 37 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

We discuss the computation of observation sensitivities and observation impact for incremental variational data assimilation, accounting for the inner and outer loops. Fully accounting for the outer loops requires a second order adjoint of the data assimilation system which makes it impractical for an operational data assimilation system. However, some approximations can be made that allow useful results to be obtained with multiple outer loop iterations, in particular for observation impact studies. Two algorithms are presented to compute the adjoint of the inner loop minimisation and their merits are discussed. Validation results are given for both of these algorithms. We show that one algorithm, based on the adjoint of an approximation of the inverse of the Hessian of the cost function, can also be used to investigate some convergence aspects of the incremental variational data assimilation inner loop. Because it is computationally inexpensive, the proposed algorithm could be used to monitor an operational system routinely. We give some numerical results illustrating the impact of observations in successive outer loop iterations.
Author
Weather Forecasting; Data Acquisition; Data Integration; Algorithms; Numerical Analysis; Sensitivity

20080033584 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Joint Image and Pupil Plane Reconstruction Algorithm based on Bayesian Techniques
Phillips, James D; Dec 2007; 112 pp.; In English
Report No.(s): AD-A480716; AFIT/DEE/ENG/08-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The focus of this research was to develop an joint pupil and focal plane image recovery algorithm for use with coherent LADAR systems. The benefits of such a system would include increased resolution with little or no increase in system weight and volume as well as allowing for operation in the absence of natural light since the target of interest would be actively illuminated. Since a pupil plane collection aperture can be conformal, such a system would also potentially allow for the formation of large synthetic apertures. The system is demonstrated to be robust and in all but extreme cases yield better results than algorithms using a single data set (such as deconvolution). It was shown that the joint algorithm had a resolution increase of 70% over deconvolution alone and a 40% increase over traditional pupil plane algorithms. It is also demonstrated that the new algorithm does not suffer as severely from stagnation problems typical with pupil plane algorithms.
DTIC
Algorithms; Bayes Theorem; Image Reconstruction; Pupils; Synthetic Aperture Radar

20080033973 NASA Dryden Flight Research Center, Edwards, CA, USA
Non-Linear System Identification for Aeroelastic Systems with Application to Experimental Data
Kukreja, Sunil L.; August 18, 2008; 13 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033973

Representation and identification of a non-linear aeroelastic pitch-plunge system as a model of the NARMAX class is considered. A non-linear difference equation describing this aircraft model is derived theoretically and shown to be of the NARMAX form. Identification methods for NARMAX models are applied to aeroelastic dynamics and its properties

demonstrated via continuous-time simulations of experimental conditions. Simulation results show that (i) the outputs of the NARMAX model match closely those generated using continuous-time methods and (ii) NARMAX identification methods applied to aeroelastic dynamics provide accurate discrete-time parameter estimates. Application of NARMAX identification to experimental pitch-plunge dynamics data gives a high percent fit for cross-validated data.
Author
Aeroelasticity; Parameter Identification; System Identification; Difference Equations

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STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20080033112 NASA Glenn Research Center, Cleveland, OH, USA
Structural Materials and Fuels for Space Power Plants
Bowman, Cheryl; Busby, Jeremy; Porter, Douglas; June 08, 2008; 24 pp.; In English; ANS Annual Meeting- Nuclear Science and Technology: Now Arriving on Main Street, 8-12 Jun. 2008, California, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A fission reactor combined with Stirling convertor power generation is one promising candidate in on-going Fission Surface Power (FSP) studies for future lunar and Martian bases. There are many challenges for designing and qualifying space-rated nuclear power plants. In order to have an affordable and sustainable program, NASA and DOE designers want to build upon the extensive foundation in nuclear fuels and structural materials. This talk will outline the current Fission Surface Power program and outline baseline design options for a lunar power plant with an emphasis on materials challenges. NASA first organized an Affordable Fission Surface Power System Study Team to establish a reference design that could be scrutinized for technical and fiscal feasibility. Previous papers and presentations have discussed this study process in detail. Considerations for the reference design included that no significant nuclear technology, fuels, or material development were required for near term use. The desire was to build upon terrestrial-derived reactor technology including conventional fuels and materials. Here we will present an overview of the reference design, Figure 1, and examine the materials choices. The system definition included analysis and recommendations for power level and life, plant configuration, shielding approach, reactor type, and power conversion type. It is important to note that this is just one concept undergoing refinement. The design team, however, understands that materials selection and improvement must be an integral part of the system development.
Author
Fission; Nuclear Fuels; Reactor Technology; Systems Analysis; Systems Engineering; Stirling Cycle

20080033169 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Developing an Excel Decision Support System Using In-Transit Visibility to Decrease DoD Transportation Delays
Stone, Brian B; Mar 2008; 139 pp.; In English
Report No.(s): AD-A480294; AFIT/GOR/ENS/08-20; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA480294

The USA Air Force's Air Mobility Command (AMC) is responsible for efficiently transporting military personnel and cargo throughout the world. Organizations throughout the transportation system search for ways to decrease cargo transportation time as part of their ongoing mission to provide timely airlift services to the DoD. Decreasing the average time pallets wait for a transportation aircraft, called the port hold time (PHT), is a difficult problem which is currently receiving attention. The DoD has invested in radio frequency identification (RFID) technology to provide in-transit visibility (ITV) of all cargo moving through the transportation system. In many ways ITV has made cargo transportation much more efficient but its capability to measure and characterize cargo flow through the system has not been fully exploited. The purpose of this research is to create a Microsoft Excel application which utilizes RFID data to quantify and analyze cargo velocity in the Iraqi theater. The transportation system is analyzed at the pallet level to reveal which specific air bases and transportation methods cause lengthy cargo delays. Pallet PHT data is processed and reported using Statistical Process Control (SPC) methods including control and Pareto charts.
DTIC
Air Transportation; Computer Techniques; Decision Support Systems; Military Operations; Transportation; Visibility

20080033333 Naval Postgraduate School, Monterey, CA USA

3D Rigid Body Impact Burial Prediction Model (IMPACT35)

Chu, Peter C; Fan, Chenwu; Jan 2005; 11 pp.; In English

Contract(s)/Grant(s): N00014-03-WR-20178

Report No.(s): AD-A480678; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480678

Falling of rigid body through air, water, and sediment is investigated experimentally and theoretically. Two experiments were conducted to drop rigid cylinders with the density ratio around 1.8 into shallow water (around 13 m deep) in the Monterey Bay (Exp-1) and into the Naval Postgraduate School s swimming pool (Exp-2). During the experiments, we carefully observe cylinder track and burial depth while simultaneously taking gravity cores (in Exp-1). After analyzing the gravity cores, we obtain the bottom sediment density and shear strength profiles. The theoretical work includes the development of 3D rigid body impact burial prediction model (IMPACT35) which contains three components: triple coordinate transform, hydrodynamics of falling rigid object in a single medium (air, water, or sediment) and in multiple media (air-water and water-sediment interfaces). The model predicts the rigid body s trajectory in the water column and burial depth and orientation in the sediment. The experimental data (burial depth, sediment density and shear strength) are used to evaluate the newly developed numerical model. The 3D model shows great improvement to the currently used US Navy s 2D model (i.e., IMPACT28).

DTIC

Impact Prediction; Mathematical Models; Rigid Structures

20080033405 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Forecasting Instability Indicators in the Horn of Africa

Tannehill, Bryan R; Mar 2008; 274 pp.; In English

Report No.(s): AD-A480691; AFIT/GOR/ENS/08-21; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The forecasting of state failure and the associated indicators has been a topic of great interest to a number of different agencies. USAid, CENTCOM, the World Bank, the Center for Army Analyses, and others have all examined the subject based on their own specific objectives. Whether the goal is denying terrorists space in which to operate, deciding how to pre-position materials in anticipation of unrest, stabilizing foreign markets and trade, or preventing or mitigating humanitarian disasters, man made or otherwise, this topic has been of interest for over a decade. The Horn of Africa has been one of the least stable regions in the world over the past three decades, and a continual source of humanitarian crises as well as terrorist activity. Some of the initial modeling of instability was done in response to crises in the Horn of Africa, but research is ongoing. Current models forecasting instability suffer from lack of lead time, subjective predictions, and lack of specificity. The models demonstrated in this study provide 4 year forecasts of battle deaths per capita, refugees per capita, genocide, and undernourishment for Djibouti, Ethiopia, Eritrea, Kenya, Somalia, Sudan, and Yemen. This thesis used principal component analysis, canonical correlation, ordinary least squares regression, logistic regression, and discriminant analysis to develop models of each instability indicator using 54 variables covering 32 years of observations. The key variables within each model are identified, and the accuracy of each model is compared with current models.

DTIC

Africa; Forecasting; Mathematical Models; Principal Components Analysis; Regression Analysis; Stability

20080033442 Maryland Univ., College Park, MD USA

Stochastic Opponent Modeling Agents: A Case Study with Hezbollah

Mannes, Aaron; Michael, Mary; Pate, Amy; Sliva, Amy; Subrahmanian, V S; Wilkenfeld, Jonathan; Apr 2008; 9 pp.; In English

Contract(s)/Grant(s): DAAD19-03-1-0202; NSF-0540216

Report No.(s): AD-A480779; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Stochastic Opponent Modeling Agents 'SOMA' have been proposed as a paradigm for reasoning about cultural groups, terror groups, and other socioeconomic-political-military organizations worldwide. In this paper, we describe a case study that shows how SOMA was used to model the behavior of the terrorist organization, Hezbollah. Our team, consisting of a mix of computer scientists, policy experts, and political scientists, were able to understand new facts about Hezbollah of which even

seasoned Hezbollah experts may not have been aware. This paper briefly overviews SOMA rules, explains how more than 14,000 SOMA rules for Hezbollah were automatically derived, and then describes a few key findings about Hezbollah, enabled by this framework.
DTIC
Stochastic Processes; Terrorism

20080033469 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Stochastic Processes and their Applications Conference, (32nd), held in Champaign, Illinois, August 6, 7, 8, 9, 10, 2007
Sowers, Richard B; Aug 2007; 47 pp.; In English
Contract(s)/Grant(s): N00014-07-1-0436
Report No.(s): AD-A480858; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The 32nd conference on Stochastic Processes and their Applications (SPA'07) was held at the University of Illinois at Urbana-Champaign during the week of August 6-10. The SPA meetings are yearly international events held under the auspices of Committee for Conferences on Stochastic Processes of the Bernoulli Society for Mathematical Statistics and Probability and are co-sponsored by the Institute for Mathematical Statistics (IMS). The conference was organized by Robert Bauer, Tom Kurtz, Sean Meyn, Renming Song, and Richard Sowers. There were 15 invited speakers, about 20 special sessions, and 150 contributed talks. The invited speakers spoke on a range of topics such as abstract stochastic processes, population models, stochastic partial differential equations, and stochastic networks. The sessions (special and contributed) were also dedicated to a variety of subjects; e.g., stochastic Loewner equations, Levy and stable processes, abstract stochastic equations, probability and the Navier-Stokes equation, random media, finance and simulation.
DTIC
Conferences; Stochastic Processes

20080033656 Sandia National Labs., Albuquerque, NM USA
Bayesian Approach to UXO Site Characterization with Incorporation of Geophysical Information
McKenna, Sean A; Saito, Hirotaka; Dec 19, 2003; 75 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000; Proj-UX-1200
Report No.(s): AD-A480955; No Copyright; Avail.: Defense Technical Information Center (DTIC)

UXO site characterization approaches are developed to assist decision makers in determining where additional characterization efforts need to be expended and where additional characterization is not effective. These decisions are based on limited transect data and require that without 100 percent site characterization there is a finite probability of leaving some UXO behind. One theoretical limitation of geostatistical approaches to estimation is the assumption that sample data exist in an unbounded domain. Contiguous transect data because of their close proximity to each other violate this assumption and can produce unwanted results in the estimates. The extent of these unwanted results are checked for a variety of transect sample designs on three simulated sites and the results show that the effects of the finite domain associated with transect data are negligible and traditional geostatistical estimation techniques can be applied.
DTIC
Ammunition; Bayes Theorem; Characterization; Geophysics

20080034588 Sandia National Labs., Albuquerque, NM USA
Extension of Latin Hypercube Samples with Correlated Variables
Sallaberry, C. J.; Helton, J. C.; Hora, S. C.; Nov. 2006; 48 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-902218; SAND2006-6135; No Copyright; Avail.: National Technical Information Service (NTIS)

A procedure for extending the size of a Latin hypercube sample (LHS) with rank correlated variables is described and illustrated. The extension procedure starts with an LHS of size m and associated rank correlation matrix C and constructs a new LHS of size 2m that contains the elements of the original LHS and has a rank correlation matrix that is close to the original rank correlation matrix C. The procedure is intended for use in conjunction with uncertainty and sensitivity analysis of computationally demanding models in which it is important to make efficient use of a necessarily limited number of model evaluations.
NTIS
Hypercube Multiprocessors; Mathematical Models; Random Sampling

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20080033024 NASA Marshall Space Flight Center, Huntsville, AL, USA
Process Improvement for Next Generation Space Flight Vehicles: MSFC Lessons Learned
Housch, Helen; May 13, 2008; 16 pp.; In English; Southeastern Software and Systems Engineering Conference, 13-15 May 2008, Huntsville, AL, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation reviews the lessons learned from process improvement for Next Generation Space Flight Vehicles. The contents include: 1) Organizational profile; 2) Process Improvement History; 3) Appraisal Preparation; 4) The Appraisal Experience; 5) Useful Tools; and 6) Is CMMI working?
Derived from text
Lessons Learned; Project Management; Launch Vehicles; Software Engineering

20080033080 Schwartz and Weinrieb, Arlington, VA, USA; Lockheed Martin Corp., Denver, CO, USA
Tool Comprising Systems Engineering Environment for Meeting Task Requirements
Karas, L., Inventor; 16 Aug 04; 22 pp.; In English
Contract(s)/Grant(s): USN-N61331-00-D-0041
Patent Info.: Filed Filed 16 Aug 04; US-Patent-Appl-SN-10-918 424
Report No.(s): PB2008-100963; No Copyright; Avail.: CASI: A03, Hardcopy

A new and improved tool, in the form of an Operational Description Template (ODT), and an integrated system comprising a plurality of such Operational Description Templates (ODTs), which effectively embodies three sub-systems, comprising a functional sub-system, a physical sub-system, and an operational sub-system, whereby task objectives or mission statements can in fact be satisfied. In addition, the integrated system, comprising the plurality of Operational Description Templates (ODTs), establishes a common framework for effectively integrating the various component specifications such that a composite system can be defined and manufactured so as to in fact be capable of performing the various behavioral or operational task objectives or mission statements.
NTIS
Patent Applications; Systems Engineering; Templates; Systems Integration

20080033122 NASA Langley Research Center, Hampton, VA, USA
A Verification-Driven Approach to Control Analysis and Tuning
Crespo, Luis G.; Kenny, Sean P.; Giesy, Daniel P.; August 18, 2008; 17 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 457280; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033122

This paper proposes a methodology for the analysis and tuning of controllers using control verification metrics. These metrics, which are introduced in a companion paper, measure the size of the largest uncertainty set of a given class for which the closed-loop specifications are satisfied. This framework integrates deterministic and probabilistic uncertainty models into a setting that enables the deformation of sets in the parameter space, the control design space, and in the union of these two spaces. In regard to control analysis, we propose strategies that enable bounding regions of the design space where the specifications are satisfied by all the closed-loop systems associated with a prescribed uncertainty set. When this is unfeasible, we bound regions where the probability of satisfying the requirements exceeds a prescribed value. In regard to control tuning, we propose strategies for the improvement of the robust characteristics of a baseline controller. Some of these strategies use multi-point approximations to the control verification metrics in order to alleviate the numerical burden of solving a min-max problem. Since this methodology targets non-linear systems having an arbitrary, possibly implicit, functional dependency on the uncertain parameters and for which high-fidelity simulations are available, they are applicable to realistic engineering problems..
Author
Approach Control; Feedback Control; Nonlinearity; Probability Theory; Boundaries

20080033309 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Risk-Based Comparison of Classification Systems

Wagenman, Seth B; Mar 2008; 74 pp.; In English

Report No.(s): AD-A480641; AFIT/GAM/ENC/08-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480641

Performance measures for families of classification system families that rely upon the analysis of receiver operating characteristics (ROCs), such as area under the ROC curve (AUC), often fail to fully address the issue of risk, especially for classification systems involving more than two classes. For the general case, we denote matrices of class prevalences, costs, and class-conditional probabilities, and assume costs are subjectively fixed, acceptable estimates for expected values of class-conditional probabilities exist, and mutual independence between a variable in one such matrix and those of any other matrix. The ROC Risk Functional (RRF), valid for any finite number of classes, has an associated parameter argument, that which specifies a member of a family of classification systems, and which system minimizes Bayes risk over the family. We typify joint distributions for class prevalences over standard simplices by means of uniform and beta distributions, and create a family of classification systems using actual data, testing independence assumptions under two such class prevalence distributions. We minimize risk under two different sets of costs.

DTIC

Bayes Theorem; Classifications; Risk

20080033327 Naval Postgraduate School, Monterey, CA USA

A Three-Point Combined Compact Difference Scheme

Chu, Peter C; Fan, Chenwu; Jan 1998; 31 pp.; In English

Report No.(s): AD-A480666; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480666

A new three-point combined compact difference (CCD) scheme is developed for numerical models. The major features of the CCD scheme are: three point, implicit, sixth order accuracy, and inclusion of boundary values. Due to its combination of the first and second derivatives, the CCD scheme becomes more compact and more accurate than normal compact difference schemes. The efficient twin-tridiagonal (for calculating derivatives) and triple-tridiagonal (for solving partial difference equation with the CCD scheme) methods are also presented. Beside, the CCD scheme has sixth-order accuracy at periodic boundaries and fifth-order accuracy at non periodic boundaries. The possibility of extending to a three-point eighth-order scheme is also included.

DTIC

Difference Equations; Mathematical Models; Numerical Analysis

20080033331 Naval Postgraduate School, Monterey, CA USA

Three-Dimensional Hydrodynamic Model for Prediction of Falling Cylinder Through Water Column

Chu, Peter C; Fan, Chenwu; Evans, Ashley; Gilles, Anthony F; Fleischer, Peter; Jan 2005; 12 pp.; In English

Contract(s)/Grant(s): N00014-01-WR-20218; N62306-00-PO-00005

Report No.(s): AD-A480670; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480670

A three dimensional hydrodynamic model based on triple coordinate systems is developed to predict translation and orientation of falling rigid cylinder through the water column: earth-fixed coordinate (E-coordinate), cylinder 5 main-axis following coordinate (M-coordinate), and hydrodynamic force following coordinate (F- coordinate). Use of the triple coordinate systems and the transforms among them leads to the simplification of the dynamical system. The body and buoyancy forces and their moments are easily calculated using the E-coordinate system. The hydrodynamic forces (such as the drag and lift forces) and their moments are easily computed using the F- coordinate. The cylinder's moments of gyration are simply represented using the M-coordinate. A recursive model is developed on the base of the triple coordinate transform to predict the cylinder's translation and orientation. To evaluate the recursive model, a cylinder-drop experiment was conducted at the Naval Postgraduate School swimming pool in June 2001. Comparison between the modeled and observed results shows a great potential of using the triple coordinate transform.

DTIC

Cylindrical Bodies; Hydrodynamics; Mathematical Models; Three Dimensional Models; Water

20080033404 Boston Univ., Boston, MA USA

Spatial Hearing, Attention and Informational Masking in Speech Identification

Kidd, Jr , Gerald; Durlach, Nathaniel; Brungart, Douglas; Feb 28, 2008; 7 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0337

Report No.(s): AD-A480690; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The specific aims of this research grant included examining how and how well listeners could treat the two ears as independent channels, the role of a priori knowledge in multisource listening, and the evaluation of the Listener Max-Min observer models in multiple talker environments (Durlach et al., J. Acoust. Soc. Am., 2003). The general approach was empirical using humans subjects as observers in masked speech identification experiments when multiple sources of sound were present and, usually, were spatially distributed. As a general statement, we feel that considerable progress was made toward each of these aims. A list of publications and presentations at scientific meetings is appended. The work that was accomplished with AFOSR support has considerable scientific significance and possible relevance for practical applications. Furthermore, it has stimulated new lines of research in auditory attention and masked conditions where higher-level cognitive processes are key.

DTIC

Hearing; Masking; Spatial Distribution; Speech Recognition

20080033431 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Robust Sensitivity Analysis of Courses of Action Using an Additive Value Model

Marks, Hunter A; Mar 2008; 108 pp.; In English

Report No.(s): AD-A480761; AFIT/GOR/ENS/08-14; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) requires the ability to quantifiably measure progress in arenas that are complex and difficult to measure, such as the stability of a region. Therefore, the DoD works diligently to predict the effect of operations and sponsors research to improve prediction and analysis. They desire a repeatable, systematic methodology to aid in the selection of courses of action (COA) that efficiently meet stated objectives and quantitatively measure the degree of accomplishment of these objectives. The author proposes a value-focused thinking (VFT) decision analysis (DA) approach to this problem. This methodology not only aids in selection of possible COAs, but provides a framework to compare the effectiveness of implemented actions via key indicators. Due to the complex nature of COA selection and assessment, weights within the DA model are often fluid. Sensitivity analysis provides the justification of COA selection in such an environment. This thesis focuses on conducting further analysis of the ranked alternatives through a robust sensitivity analysis technique. Sensitivity analysis begins with the examination of the top ranked alternative by varying one weight at a time, one-way sensitivity. The author then proposes a more robust examination of multiple weight sensitivity using five unique measures and optimization via linear and non-linear programming. The measures reveal the alternatives sensitive to small simultaneous variations of multiple weights within the model, n-way sensitivity. Small measure values indicate sensitive alternatives, and indicate to a field commander where to more closely examine the consequences of a selected COA.

DTIC

Additives; Sensitivity; Sensitivity Analysis

20080033434 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase V: Development of the Biomechanical Model by Means of the Portable Measurement System

Morin, E L; Stevenson, J M; Reid, S A; Bryant, J T; May 2005; 98 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480769; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Soldier operational performance is impacted by a number of factors including physiological workload, the biomechanical effects of equipment used in the field, demographics and soldier readiness. The specific objectives of the work reported here are to identify components of a load carriage limit (LCL) equation specifically related to the physiological workload and biomechanical effects, and to further the development of a dynamic biomechanical model (DBM) for load carriage. The ultimate goal of this research program is to develop and fully validate an LCL equation, which includes all relevant factors and which can be used to predict the operational effectiveness of soldiers in the field. Data were collected in a previous contract on 10 physically fit male subjects. In the DBM development, a skin layer with appropriate properties was created for the torso model and the modeling of all relevant pack components that form the person-to-pack interface has been completed. Stress analyses, in the equilibrium state, for the skin layer, and the shoulder strap and waist belt contact regions were done. A library of material properties for biological (skin on the back, skin toughened, skin over bone) and pack materials, both individually and in combination, has been compiled. Completion of the DBM will entail validating the motion and stress response of the

DBM against existing test data, improving the user interface, and adding an output format that will provide the biomechanical factor for input into the LCL equation.
DTIC
Anatomy; Biodynamics; Dynamic Models; Loads (Forces); Mathematical Models; Models; Physiological Effects

20080033441 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Improving Mixed Variable Optimization of Computational and Model Parameters Using Multiple Surrogate Functions
Bethea, David; Mar 2008; 155 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480778; AFIT/GOR/ENC/08-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research focuses on reducing computational time in parameter optimization by using multiple surrogates and subprocess CPU times without compromising the quality of the results. This is motivated by applications that have objective functions with expensive computational times at high fidelity solutions. Applying, matching, and tuning optimization techniques at an algorithm level can reduce the time spent on unprofitable omputations for parameter optimization. The objective is to recover known parameters of a flow property reference image by comparing to a template image that comes from a computational fluid dynamics simulation, followed by a numerical image registration and comparison process. Mixed variable pattern search and mesh adaptive direct search methods were applied using surrogate functions in the search step to produce solutions within a tolerance level of experimental observations. The surrogate functions are based on previous function values and computational times of those values. The use of multiple surrogates at each search step provides parameter selections that lead to improved solutions of an objective function evaluation with less computational time. Previously computed values for the objective function and computation time were used to compute a time cut-off parameter that allows termination during an objective function evaluation if the computational time exceeded a threshold or a divergent template image was created. This approach was tested using DACE and radial basis function surrogates within the NOMADm MATLABr software. The numerical results are presented.
DTIC
Computer Programming; Optimization

20080033464 Brown Univ., Providence, RI USA
Physical Simulation for Probabilistic Motion Tracking
Vondrak, Marek; Sigal, Leonid; Jenkins, Odest C; Jan 2008; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-07-1-0141
Report No.(s): AD-A480848; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Human motion tracking is an important problem in computer vision. Most prior approaches have concentrated on efficient inference algorithms and prior motion models; however, few can explicitly account for physical plausibility of recovered motion. The primary purpose of this work is to enforce physical plausibility in the tracking of a single articulated human subject. Towards this end, we propose a fullbody 3D physical simulation-based prior that explicitly incorporates motion control and dynamics into the Bayesian filtering framework. We consider the human's motion to be generated by a 'control loop'. In this control loop, Newtonian physics approximates the rigid-body motion dynamics of the human and the environment through the application and integration of forces. Collisions generate interaction forces to prevent physically impossible hypotheses. This allows us to properly model human motion dynamics, ground contact and environment interactions. For efficient inference in the resulting high-dimensional state space, we introduce exemplar-based control strategy to reduce the effective search space. As a result we are able to recover the physically-plausible kinematic and dynamic state of the body from monocular and multi-view imagery. We show, both quantitatively and qualitatively, that our approach performs favorably with respect to standard Bayesian filtering methods.
DTIC
Bayes Theorem; Computer Vision; Simulation

20080033581 Army Medical Research and Materiel Command, Fort Detrick, MD USA
DOVIS: An Implementation for High-Throughput Virtual Screening Using Auto-Dock
Zhang, Shuxing; Kumar, Kamal; Jiang, Xiaohui; Wallqvist, Anders; Reifman, Jaques; Feb 27, 2008; 5 pp.; In English
Report No.(s): AD-A480738; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Molecular-docking-based virtual screening is an important tool in drug discovery that is used to significantly reduce the number of possible chemical compounds to be investigated. In addition to the selection of a sound docking strategy with appropriate scoring functions, another technical challenge is to in silico screen millions of compounds in a reasonable time.

To meet this challenge, it is necessary to use high performance computing (HPC) platforms and techniques. However, the development of an integrated HPC system that makes efficient use of its elements is not trivial. We have developed an application termed DOVIS that uses AutoDock (version 3) as the docking engine and runs in parallel on a Linux cluster. DOVIS can efficiently dock large numbers (millions) of small molecules (ligands) to a receptor, screening 500 to 1,000 compounds per processor per day. Furthermore, in DOVIS, the docking session is fully integrated and automated in that the inputs are specified via a graphical user interface, the calculations are fully integrated with a Linux cluster queuing system for parallel processing, and the results can be visualized and queried. DOVIS removes most of the complexities and organizational problems associated with large-scale high-throughput virtual screening, and provides a convenient and efficient solution for AutoDock users to use this software in a Linux cluster platform.
DTIC
Chemical Composition; Computer Programming; Drydocks; Ligands; Parallel Processing (Computers); Queueing Theory; Ship Terminals; Software Engineering; Wharves

20080034528 Naval Academy, Annapolis, MD USA
Preparing Semantic Agents for an Unsuspecting and Unreliable World
McDowell, Luke K; Nov 2005; 4 pp.; In English
Contract(s)/Grant(s): N00014-05-W-R20153
Report No.(s): AD-A480430; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480430

Semantic web-enabled agents offer tremendous promise for enabling automated coordination and negotiation amongst diverse participants. Ideally, a user should be able to quickly instruct his personal agent to achieve some goal, e.g., to schedule a meeting so that at least one representative of each division of the company would attend. This agent would then negotiate with the agents of all the invited participants, receiving prompt and definitive replies, and quickly reach consensus on an acceptable time. The original user would be involved again only when the goal was achieved. In reality, many problems are likely to arise: 1. Goal Specification: The user may know precisely what he wishes to have done, but instructing a general-purpose software agent to achieve this goal can be very complex. 2. Agent Proliferation: In a typical organization today, very few participants will know what a software agent is, much less have one that could act on their behalf. 3. Participant Reliability: Even if the user's agent is able to directly interact with the participants, many of them are likely to not respond, due to confusion about how to do so or general busyness. Moreover, those that do properly respond may later need to change their response, a situation that the user's agent may not be prepared to handle. 4. Evolving Goals: Finally, even the originating user may be uncertain about his precise goals. For instance, he may decide to invite new participants later, or to modify the goals after seeing the initial responses. Such changes pose technical challenges for the agent and may render its earlier actions irrelevant or even counter-productive. Collectively, these issues pose serious problems to the wide-scale deployment of useful, flexible semantic agents. In previous work, we examined the first issue by considering how ordinary people could specify flexible, explainable semantic agents (McDowell, Etzioni, & Halevy 2004).
DTIC
Semantics; Coordination; Deployment; Schedules

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20080033261 Naval Postgraduate School, Monterey, CA USA
Temporal and Spatial Variabilities of Japan Sea Surface Temperature and Atmospheric Forcings
Chu, Peter C; Chen, Yuchun; Lu, Shihua; Jan 1998; 13 pp.; In English
Report No.(s): AD-A480507; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480507

In this study, we used the National Centers for Environmental Prediction monthly sea surface temperature (SST) and surface air temperature (SAT) data during 1982-1994 and the National Center for Atmospheric Research surface wind stress curl data during 1982-1989 to investigate the Japan Sea SST temporal and spatial variabilities and their relations to atmospheric forcing. First, we found an asymmetry in the correlation coefficients between SST and wind stress curl, which implies that the SST variability at the scales of the order of one month is largely due to atmospheric forcing. Second, we performed three analyses on the data fields: annual mean, composite analysis to obtain the monthly anomaly relative to the

annual mean, and empirical orthogonal function (EOF) analysis on the residue data relative to the summation of the annual mean and the monthly anomaly. The first EOF mode of SST accounts for 59.9% of the variance and represents the Subpolar Front. The temporal variation of the first EOF mode implies that the deep Japan Sea could be cooler in cold seasons (November April) of 1984-1987. Third, we computed cross-correlation coefficients among various principal components and found that the atmospheric warming/cooling is the key factor causing intra-seasonal and interannual SST variabilities.
DTIC
Japan; Sea Surface Temperature; Surface Temperature

20080033288 Naval Postgraduate School, Monterey, CA USA
A Three-Point Sixth-Order Staggered Combined Compact Difference Scheme
Chu, Peter C; Fan, Chenwu; Feb 2000; 19 pp.; In English
Report No.(s): AD-A480583; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480583

A three-point, sixth-order, staggered, combined compact difference (SCCD) scheme is proposed for numerical models. The SCCD scheme is a generalization of the previously proposed combined compact difference (CCD) scheme, and has major improved features such as error and computational (CPU) time reduction especially for odd-order difference equations with odd-number boundary conditions. For nonperiodic boundaries, an additional sixth -or fifth-order boundary condition is proposed, The stability of the SCCD scheme is studied using the eigenvalue analysis.
DTIC
Difference Equations; Eigenvalues; Mathematical Models

20080033291 Army Engineer Research and Development Center, Vicksburg, MS USA
Long-Term Structural Solution for the Mouth of Colorado River Navigation Channel, Texas
Kraus, Nicholas C; Lin, Lihwa; Smith, Ernest R; Heilman, Daniel J; Thomas, Robert C; Apr 2008; 188 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480608; ERDC/CHL TR-08-4; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480608

This report describes a study performed for the U.S. Army Engineer District, Galveston, to develop a structural solution involving modified or new jetties in support of a reliable shallow-draft channel at the Mouth of the Colorado River (MCR), Texas. The site has experienced excessive sediment shoaling that has denied full project features to navigation channel users. The study took a multidisciplinary approach involving field measurements, shoreline analysis, numerical modeling of shoreline change and longshore sand transport, numerical modeling of inlet processes, and preliminary design of a new east jetty. The study concluded that the MCR was not performing as intended because (1) the Colorado River was diverted to Matagorda Bay in 1992 as part of an environmental restoration project, thus depriving the inlet of the river's discharge of water and associated scouring action; (2) the weir jetty system constructed over 1988-1990 was too wide and the weir section too long; and (3) the sediment impoundment basin associated with the weir is dangerous for people wade fishing and allows sediment to be bypassed during times of high water. The solution obtained is to construct a new east jetty parallel to and 500 ft (152 m) from the west jetty. It is recommended that past bypassing practice be continued through dredging of the impoundment fillet expected to form on the beach adjacent to the new east jetty and placing that material on the west beach. The preliminary jetty design incorporates experience with jetties of similar size inlets along the Texas coast.
DTIC
Colorado River (North America); Navigation; Sediments

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20080032794 Idaho National Engineering Lab., Idaho Falls, ID, USA
Radiation Fields in the Vicinity of Compact Accelerator Neutron Generators
Chichester, D. L.; Blackbrun, B. W.; Caffrey, A. J.; Oct. 2006; 7 pp.; In English
Report No.(s): DE2007-911895; INL/CON-06-11957; No Copyright; Avail.: National Technical Information Service (NTIS)

Intense pulsed radiation fields emitted from sealed tube neutron generators provide a challenge for modern health physics

survey instrumentation. The spectral sensitivity of these survey instruments requires calibration under realistic field conditions while the pulsed emission characteristics of neutron generators can vary from conditions of steady-state operation. As a general guide for assessing radiological conditions around neutron generators, experiments and modeling simulations have been performed to assess radiation fields near DD and DT neutron generators. The presence of other materials and material configurations can also have important effects on the radiation dose fields around compact accelerator neutron generators.
NTIS
Measuring Instruments; Neutrons; Radiation Distribution

20080032809 Idaho National Engineering Lab., Idaho Falls, ID, USA
Coherent Control of Optically Generated and Detected Picosecond Surface Acoustic Phonons. Symposium on Laser Spectroscopy
Hurley, D. H.; Lewis, R.; Dec. 2006; 12 pp.; In English
Report No.(s): DE2007-911862; INL/CON-06-11860; No Copyright; Avail.: Department of Energy Information Bridge

Coherent control of elementary optical excitations is a key issue in ultrafast materials science. Manipulation of electronic and vibronic excitations in solids as well as chemical and biological systems on ultrafast time scales has attracted a great deal of attention recently. In semiconductors, coherent control of vibronic excitations has been demonstrated for bulk acoustic and optical phonons generated in superlattice structures. The bandwidth of these approaches is typically fully utilized by employing a 1-D geometry where the laser spot size is much larger than the superlattice repeat length. In this presentation we demonstrate coherent control of optically generated picosecond surface acoustic waves using sub-optical wavelength absorption gratings. The generation and detection characteristics of two material systems are investigated (aluminum absorption gratings on Si and GaAs substrates).
NTIS
Conferences; Control Surfaces; Laser Spectroscopy; Phonons

20080032881 International Business Machines Corp., San Diego, CA, USA; Defense Advanced Research Projects Agency, Arlington, VA, USA
Magnetic Tunnel Barriers and Associated Magnetic Tunnel Junctions with High Tunneling Magnetoresistance
Parkin, S. S. P., Inventor; 15 Jul 04; 29 pp.; In English
Contract(s)/Grant(s): MDA972-01-C-0051
Patent Info.: Filed Filed 15 Jul 04; US-Patent-Appl-SN-10-891 363
Report No.(s): PB2008-100058; No Copyright; Avail.: CASI: A03, Hardcopy

Magnetic tunneling devices are formed from a first body centered cubic (bcc) magnetic layer and a second bcc magnetic layer. At least one spacer layer of bcc material between these magnetic layers exchange couples the first and second bcc magnetic layers. A tunnel barrier in proximity with the second magnetic layer permits spin-polarized current to pass between the tunnel barrier and the second layer; the tunnel barrier may be either MgO and Mg--ZnO. The first magnetic layer, the spacer layer, the second magnetic layer, and the tunnel barrier are all preferably (100) oriented. The MgO and Mg--ZnO tunnel barriers are prepared by first depositing a metallic layer on the second magnetic layer (e.g., a Mg layer), thereby substantially reducing the oxygen content in this magnetic layer, which improves the performance of the tunnel barriers.
NTIS
Magnetoresistivity; Patent Applications; Tunnel Junctions

20080032925 Brookhaven National Lab., Upton, NY USA
RHIC Hydrogen Jet Luminescence Monitor
Russo, T.; Bellavia, S.; Gassner, D.; Thieberger, P.; Tsang, T.; January 2006; 7 pp.; In English
Report No.(s): DE2007-913081; BNL-79224-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

A hydrogen jet polarimeter was developed for the RHIC accelerator to improve the process of measuring polarization. Particle beams intersecting with gas molecules can produce light by the process known as luminescence. This light can then be focused, collected, and processed giving important information such as size, position, emittance, motion, and other parameters. The RHIC hydrogen jet polarimeter was modified in 2005 with specialized optics, vacuum windows, light transport, and a new camera system making it possible to monitor the luminescence produced by polarized protons intersecting the hydrogen beam. This paper describes the configuration and preliminary measurements taken using the RHIC hydrogen jet polarimeter as a luminescence monitor.
NTIS
Gas Jets; Hydrogen; Luminescence

20080032928 College of William and Mary, Williamsburg, VA, USA
Nucleon Form Factor Measurements and Interpretation
Perdrisat, C. F.; Aug. 17, 2007; 10 pp.; In English
Report No.(s): DE2007-912882; No Copyright; Avail.: National Technical Information Service (NTIS)
The data base for the form factors of the nucleon obtained from elastic ep scattering is discussed, as well as some recent developments in their calculation.
NTIS
Form Factors; Nucleons

20080032933 Brookhaven National Lab., Upton, NY USA
Technical Design Report of the Forward Silicon Vertex (FVTX)
Jun. 27, 2007; 177 pp.; In English
Report No.(s): DE2007-912839; BNL-79216-2007; No Copyright; Avail.: National Technical Information Service (NTIS)
The main goal of the RHIC heavy ion program is the discovery of the novel ultra-hot high density state of matter predicted by the fundamental theory of strong interactions and created in collisions of heavy nuclei, the Quark-Gluon Plasma (QGP). From measurements of the large elliptic flow of light mesons and baryons and their large suppression at high transverse momentum pT that have been made at RHIC, there is evidence that new degrees of freedom, characteristic of a deconfined QCD medium, drive the dynamics of nucleus nucleus collisions. It has been recognized, however, that the potential of light quarks and gluons to characterize the properties of the QGP medium is limited and the next phase of the RHIC program calls for the precise determination of its density, temperature, opacity and viscosity using qualitatively new probes, such as heavy quarks. We propose the construction of two Forward Silicon Vertex Trackers (FVTX) for the PHENIX experiment that will directly identify and distinguish charm and beauty decays within the acceptance of the muon spectrometers. The FVTX will provide this essential coverage over a range of forward and backward rapidities ($1.2 < (y) < 2.4$) a rapidity range coverage which not only brings significantly larger acceptance to PHENIX but which is critical for separating cold nuclear matter effects from QGP effects and is critical for measuring the proton spin contributions over a significant fraction of the kinematic range of interest.
NTIS
Radiation Detectors; Silicon

20080032934 Brookhaven National Lab., Upton, NY, USA
National Synchrotron Light Source 2006 Activity Report
Miller, L. M.; Snyder, K. J.; Wright, N. A.; Giordano, S. A.; January 2006; 228 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-912837; No Copyright; Avail.: National Technical Information Service (NTIS)
An impressive array of highlights is included in this Activity Report to illustrate this extraordinary productivity and its impact to science, technology, and society. For example, one user group investigated new materials for use in lithium-ion batteries, the most common type of battery found in portable electronics and the most promising type for hybrid cars. Another user group determined the atomic crystal structure and functional mechanism of an enzyme essential for eliminating unwanted, non-nutritional compounds such as drugs, industrial chemicals, and toxic compounds from the body. And in yet another interesting study, NSLS staff and users made improvements to microbeam radiation therapy, an experimental form of radiation therapy that has been under investigation for many years.
NTIS
Light Sources; Radiation Sources; Synchrotron Radiation; Synchrotrons

20080033070 Brookhaven National Lab., Upton, NY USA
Secondary Emission Electron Gun Using External Primaries
Srinivasan-Rao, T., Inventor; Ben-Zvi, I., Inventor; Kewisch, J., Inventor; Chang, X., Inventor; 13 Aug 04; 25 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Patent Info.: Filed Filed 13 Aug 04; US-Patent-Appl-SN-10-917 309
Report No.(s): PB2008-100826; No Copyright; Avail.: CASI: A03, Hardcopy
An electron gun for generating an electron beam is provided, which includes a secondary emitter. The secondary emitter includes a non-contaminating negative-electron-affinity (NEA) material and emitting surface. The gun includes an accelerating region which accelerates the secondaries from the emitting surface. The secondaries are emitted in response to a primary beam

generated external to the accelerating region. The accelerating region may include a superconducting radio frequency (RF) cavity, and the gun may be operated in a continuous wave (CW) mode. The secondary emitter includes hydrogenated diamond. A uniform electrically conductive layer is superposed on the emitter to replenish the extracted current, preventing charging of the emitter. An encapsulated secondary emission enhanced cathode device, useful in a superconducting RF cavity, includes a housing for maintaining vacuum, a cathode, e.g., a photocathode, and the non-contaminating NEA secondary emitter with the uniform electrically conductive layer superposed thereon.
NTIS
Electron Beams; Electron Guns; Patent Applications; Secondary Emission

20080033078 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA
Trigger Probe for Determining the Orientation of the Power Distribution of an Electron Beam
Elmer, J. W., Inventor; Palmer, T. A., Inventor; Teruya, A. T., Inventor; 21 Jun 05; 12 pp.; In English
Contract(s)/Grant(s): DE-W-7405ENG-48
Patent Info.: Filed Filed 21 Jun 05; US-Patent-Appl-SN-11-158 481
Report No.(s): PB2008-100965; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to a probe for determining the orientation of electron beams being profiled. To accurately time the location of an electron beam, the probe is designed to accept electrons from only a narrowly defined area. The signal produced from the probe is then used as a timing or triggering fiducial for an operably coupled data acquisition system. Such an arrangement eliminates changes in slit geometry, an additional signal feedthrough in the wall of a welding chamber and a second timing or triggering channel on a data acquisition system. As a result, the present invention improves the accuracy of the resulting data by minimizing the adverse effects of current slit triggering methods so as to accurately reconstruct electron or ion beams.
NTIS
Actuators; Electron Beams; Patent Applications; Welding

20080033089 Ingersoli, Buchanah,PC, Alexandria, VA, USA; North Carolina Univ., Chapel Hill, NC, USA
Large-Area Individually Addressable Multi-Beam X-Ray Sustem and Method of Forming Same
Zhou, O. Z., Inventor; Lu, J., Inventor; Qiu, Q., Inventor; 22 Oct 04; 17 pp.; In English
Contract(s)/Grant(s): N00014-98-1-05907
Patent Info.: Filed Filed 22 Oct 04; US-Patent-Appl-SN-10-970 384
Report No.(s): PB2008-100641; No Copyright; Avail.: CASI: A03, Hardcopy

A structure to generate x-rays has a plurality of stationary and individually electrically addressable field emissive electron sources with a substrate composed of a field emissive material, such as carbon nanotubes. Electrically switching the field emissive electron sources at a predetermined frequency field emits electrons in a programmable sequence toward an incidence point on a target. The generated x-rays correspond in frequency and in position to that of the field emissive electron source. The large-area target and array or matrix of emitters can image objects from different positions and/or angles without moving the object or the structure and can produce a three dimensional image. The x-ray system is suitable for a variety of applications including industrial inspection/quality control, analytical instrumentation, security systems such as airport security inspection systems, and medical imaging, such as computed tomography.
NTIS
Patent Applications; X Rays; Beams (Radiation)

20080033282 New Mexico Univ., Albuquerque, NM USA
Measurements of Secondary Electron Yield from Materials with Application to Depressed Collectors
Schamiloglu, Edl; Gilmore, Mark; Apr 4, 2008; 41 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0051
Report No.(s): AD-A480575; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480575

This final technical report reviews the research activities during the period of this grant, emphasizing the final year. The key finding of our study is that the total incident electron dose is a critical parameter affecting secondary electron emission (SEE). A completely automated experimental set-up was implemented that allowed for measurement of secondary electron yield (SEY) as a function of beam energy, angle of incidence of primary electrons, electron dose, and time. We present SEY data for copper, plasma-sprayed boron carbide, and titanium nitride samples with principal attention given to the dose

dependence. Experiments were conducted in the energy range 5 - 1000 eV using DC voltages. Modified empirical formulas are proposed that incorporate the dose effect and match the experimental measurements.
DTIC
Accumulators; Aerosols; Electron Emission; Samplers

20080033339 Queens Univ., Kingston, Ontario Canada
Development of a Dynamic Biomechanical Model for Load Carriage: Phase 1 Part A: Equipment Upgrades to Accommodate Dynamic Biomechanical Modeling
Stevenson, Joan M; Reid, Susan A; Bryant, J T; Hadcock, Lindsay J; Morin, Evelyn L; Aug 2005; 74 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480684; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480684

Part A of Phase I of the contract was to develop the instrumentation so that a dynamic biomechanical model could be developed. The specific objectives were: (a) to develop Fastrak(TM) software for relative pack person motion, (b) construct smaller strap force gauges, (c) build and calibrate a moment of inertia platform, (d) modify the Load Carriage compliance tester to automate two degrees of freedom and (e) create a full body mapping of mannequin. This report describes the purposes and outputs available from the pack person motion, describes the development, construction, calibration and protocol for use of smaller strap sensors and the moment of inertia platform, and the development and steps involved in modifying the LC compliance tester and the mannequin mapping. For the most part, tasks were developmental and construction based with no data analyses, other than to confirm the accuracy and precision of the instrumentation. This report deals only with Part A consisting of five sub parts of the contract. Part B involved changing the technical manuals based on the upgrades stated within this report. Part C of this contract is under separate cover and was to develop a long range plan and budget for dynamic biomechanical modeling. Part D was to assist with the NATO HFM Specialist Meeting entitled 'Soldier Mobility: Innovations in Load Carriage System Design and Evaluation' held on 27-29 June 2000. Part D is described by the NATO RTO MP 56 Technical Proceedings Report entitled: 'Soldier Mobility: Innovations in Load Carriage System Design and Evaluation.'
DTIC
Biodynamics; Carriages; Dynamic Models; Loads (Forces)

20080033428 Hoffman Warnick and D'Alessandro, LLC, Albancy, NY, USA
Multi-Directional Viewing and Imaging
Mian, Z. F., Inventor; 16 Aug 05; 14 pp.; In English
Contract(s)/Grant(s): M67854-04-C-1022
Patent Info.: Filed Filed 16 Aug 05; US-Patent-Appl-SN-11-205 242
Report No.(s): PB2008-100653; No Copyright; Avail.: CASI: A03, Hardcopy

A solution for directing electromagnetic radiation, such as visible light, from multiple fields of view in differing directions to a single view point is provided. The radiation received from one or more fields of view is directed onto a first reflective surface, the radiation reflected off of the first reflective surface is then directed to a view point that comprises a transparent portion of the first reflective surface. In this manner, the invention enables the viewing and/or imaging of the radiation from any location in the full panorama at a single location.
NTIS
Imaging Techniques; Patent Applications; Viewing

20080033452 Library of Congress, Washington, DC USA
High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments
Wilson, Clay; Mar 26, 2008; 20 pp.; In English
Report No.(s): AD-A480808; CRS-RL32544; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Electromagnetic Pulse (EMP) is an instantaneous, intense energy field that can overload or disrupt at a distance numerous electrical systems and high technology microcircuits, which are especially sensitive to power surges. A large scale EMP effect can be produced by a single nuclear explosion detonated high in the atmosphere. This method is referred to as High-Altitude EMP (HEMP). A similar, smaller-scale EMP effect can be created using non-nuclear devices with powerful batteries or reactive chemicals. This method is called High Power Microwave (HPM). Several nations, including reported sponsors of terrorism, may currently have a capability to use EMP as a weapon for cyber warfare or cyber terrorism to disrupt

communications and other parts of the U.S. critical infrastructure. Also, some equipment and weapons used by the U.S. military may be vulnerable to the effects of EMP.
DTIC
Electromagnetic Pulses; High Altitude; Microwaves

20080033468 Environmental Security Technology Certification Program, Arlington, VA USA
Electromagnetic Surveys for 3-D Imaging of Subsurface Contaminants
Nov 2000; 55 pp.; In English
Report No.(s): AD-A480856; CU-9718; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents cost and performance data for a demonstration sponsored and funded by the Department of Defense's (DoD) Environmental Security Technology Certification Program (ESTCP). GEHM Environmental Corporation and the Center for Environmental Technology at the University of Missouri (Columbia) were contracted by the Naval Facilities Engineering Service Center (NFESC) to investigate the use of quasi-static electromagnetic (EM) resistivity surveys to detect dense non-aqueous phase liquid (DNAPL) contamination in the subsurface at two U.S. DoD installations. This EM resistivity survey technique is a surface to borehole geophysical method that generates a three-dimensional (3-D) image of subsurface features based on their contrasting resistive properties.
DTIC
Contaminants; Electromagnetic Properties; Imaging Techniques; Surveys

20080033470 Executive Office of the President, Washington, DC USA
The National Nanotechnology Initiative. Strategic Plan
Dec 2007; 53 pp.; In English
Report No.(s): AD-A480863; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ability to image, measure, model, and manipulate matter on the nanoscale is leading to new technologies that will impact virtually every sector of our economy and our daily lives. Nanoscale science, engineering, and technology are enabling promising new materials and applications across many fields including healthcare, electronics, aeronautics, and energy. Realizing these possibilities requires continued research and accelerated innovation. The USA has been and is now the recognized leader in nanotechnology research and development (R&D), but this lead cannot be assumed to be permanent. Thus, the National Nanotechnology Initiative (NNI) is as important as ever to ensuring U.S. leadership in nanotechnology R&D. The NNI has created a thriving nanoscale science and engineering R&D environment within the USA. As a result, scientific understanding of nanometer-scale phenomena has expanded enormously. An extensive network of R&D centers is already established. Commercialization resulting from NNI supported research is growing. Yet exploiting the full value that nanotechnology offers depends on sustained R&D. Barriers to innovation and technology transfer need to be lowered. Researchers, educators, and technicians with new skills are required. Furthermore, nanotechnology must be developed responsibly.
DTIC
Nanotechnology; Technology Transfer

20080033482 Michigan Univ., Ann Arbor, MI USA
Evaluation of a Magnetically-Filtered Faraday Probe for Measuring the ion Current Density Profile of a Hall Thruster
Rovey, Joshua L; Walker, Micthell L; Gallimore, Alec D; Peterson, Peter Y; Jul 2004; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-00-1-0201; F49620-01-1-0061
Report No.(s): AD-A480909; AIAA-2004-3948; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ability of a magnetically-filtered Faraday probe (MFFP) to obtain the ion current density profile of a Hall thruster is investigated. The MFFP is designed to eliminate the collection of low energy, charge-exchange (CEX) ions by using a variable magnetic field as an ion filter. In this study, a MFFP, boxed Faraday probe (BFP), and nude Faraday probe are used to measure the ion current density profile of a 5 kW Hall thruster operated over the range of 300-500 V and 5-10 mg/s. The probes are evaluated in the University of Michigan Large Vacuum Test Facility at operating pressures within the range of 3.3x10-6 Torr to 8.4x10-6 Torr on xenon in order to study the ability of the Faraday probe designs to filter out CEX ions. Detailed examination of the results shows that the nude probe measures a greater ion current density profile than both the MFFP and BFP over the range of angular positions investigated for each operating condition. Because all other parameters are identical, the differences between the current density profiles obtained by each probe are attributed to the ion filtering systems employed.

Analysis of the results shows that the MFFP provides the best agreement with flight-test data and between operating pressures.
DTIC
Current Density; Faraday Effect; Hall Thrusters; Ion Currents; Magnetic Fields

20080033484 Northeastern Univ., Boston, MA USA
A Unified Approach to the Processing and Fusion of Time and Frequency Domain EMI Data for UXO Discrimination
Miller, Eric L; Jan 7, 2003; 32 pp.; In English
Report No.(s): AD-A480915; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The problem of detecting and classify buried objects situ electromagnetic induction (EMI) sensing technologies has received considerable attention in recent years in a range of application areas including unexploded ordinance (UXO) and landmine remediation. In the last decade or so, considerable advances have been made in the area of EMI instrumentation yielding sensors capable of providing data both in the time and frequency domains which convey far more information concerning the structure of buried objects than is the case with older metal detectors.
DTIC
Ammunition; Frequencies; Magnetic Induction

20080033490 Army Space and Missile Defense Command, Huntsville, AL USA
Theory and Measurements of Angle-of- Arrival of Diffraction-Limited Electromagnetic Wave Beams in the Turbulent Atmosphere
McMillan, R W; Smith, R A; Holder, E J; Kerce, J C; Nov 1, 2006; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480930; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Atmospheric turbulence has been shown to have measurable effects on the angle-of-arrival (AOA) of electromagnetic wave beams, but these effects are on the order of a few microradians, which is a negligible level for most applications. In this paper, we present a theory describing this phenomenon and compare this theory to one-way measurements made over a 3.5 km path and two way measurements made over a 25 km path using an Xband interferometric radar.
DTIC
Diffraction; Electromagnetic Radiation; Turbulence

20080033495 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Project UX-1353: GEM-3D (SEED)
O'Neill, Kevin; Apr 30, 2004; 50 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-UX-1353
Report No.(s): AD-A480945; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A new frequency domain (FD) UWB electromagnetic induction (EMI) sensor, the GEM-3D, was constructed, debugged, demonstrated at the bench and 'backyard' level. Proceeding from the configuration of the existing Geophex GEM-3, two additional orthogonal receivers were located at the center of the sensor head, so that the new instrument completely define field that constitutes the EMI response of an object of interest. The instrument has an expanded bandwidth from 30 Hz at least 50 kHz, with a maximum of about 15 frequencies recordable in each vector channel. The new sensor is handheld, therefore capable of being swept and tilted in any direction, generating arbitrary angles of excitation and reception ('views') laser positioning system that was implemented is capable of sub-millimeter accuracy, and was configured to provide all tilt angles. The bench version of the instrument that was achieved appears to work well by both quantitative and qualitative criteria.
DTIC
Detectors; Magnetic Induction; Seeds

20080033529 Patti and Brill, Chicago, IL, USA
Method for Etching Mesa Isolation in Antimony-Based Compound Semiconductor Structures
Nam, P. S., Inventor; Lange, M. D., Inventor; Tsai, R. S., Inventor; 12 Aug 04; 6 pp.; In English
Contract(s)/Grant(s): N00014-01-2-0014-0001
Patent Info.: Filed Filed 12 Aug 04; US-Patent-Appl-SN-10-918 119
Report No.(s): PB2008-101496; No Copyright; Avail.: CASI: A02, Hardcopy

Antimony-based semiconductor devices are formed over a substrate structure (10) that includes an antimony-based buffer layer (24) and an antimony-based buffer cap (26). Multiple epitaxial layers (30-42) formed over the substrate structure (10)

are dry etched to form device mesas (12) and the buffer cap (26) provides a desirably smooth mesa floor and electrical isolation around the mesas.
NTIS
Antimony; Antimony Compounds; Etching; Isolation; Mesas; Patent Applications; Semiconductor Devices

20080033743 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Experimental Technique for Developing Intermediate Strain Rates in Ductile Metals
Gardenier, IV, Hugh E; Mar 2008; 194 pp.; In English
Report No.(s): AD-A480283; AFIT/GAE/ENY/08-M10; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480283

Quantifying the strain-rate sensitive dynamic properties of structural materials is an important area of research in the solid mechanics field. Property evaluation is typically accomplished using dynamic tests which involve rapid loading or impact of specimens. In these tests, inertial forces and wave propagation make it difficult to accurately record the material response to a loading condition at an equivalent location. Furthermore, these tests typically generate high strain rates (in excess of 10^3 s^- 1 and an experimental method for generating rates of strain in the intermediate strain rate regime which is relatively simple, low cost, and reliable is still lacking. This research effort develops an experimental technique for generating tensile plastic strain rates up to 10^2 s^-1 in ductile metals. The technique relies on an impact from a load cell instrumented drop weight machine capable of delivering a suitable impact velocity and energy to globally deform a slotted beam specimen. At impact, a state of plastic uniaxial tensile stress is created in the ligament underneath a slot. The ligament is instrumented with an electrical-resistance strain gauge, and the strain history from the gauge is measured and stored in a digital oscilloscope. The Johnson-Cook constitutive equation is assumed to reflect the material behavior and its parameters are determined through a matching of the experimental strain history with a finite element simulation.
DTIC
Ductility; Experiment Design; Metals; Strain Rate

20080033810 Ingraais, Fisher and Lorenz, PC, Scottsdale, AZ, USA
Multi-State Magnetoresistance Random Access Cell with Improved Memory Storage Density
Slaughter, J. M., Inventor; Savtchenko, L., Inventor; Korkin, A. A., Inventor; Goronkin, H., Inventor; 25 Aug 05; 9 pp.; In English
Contract(s)/Grant(s): MDA972-96-3-0016
Patent Info.: Filed Filed 25 Aug 05; US-Patent-Appl-SN-11-212 321
Report No.(s): PB2008-100623; No Copyright; Avail.: CASI: A02, Hardcopy

A multi-state magnetoresistive random access memory device having a pinned ferromagnetic region with a magnetic moment vector fixed in a preferred direction in the absence of an applied magnetic field, a non-ferromagnetic spacer layer positioned on the pinned ferromagnetic region, and a free ferromagnetic region with an anisotropy designed to provide a free magnetic moment vector within the free ferromagnetic region with N stable positions, wherein N is a whole number greater than two, positioned on the non-ferromagnetic spacer layer. The number N of stable positions can be induced by a shape anisotropy of the free ferromagnetic region wherein each N stable position has a unique resistance value.
NTIS
Computer Storage Devices; Magnetoresistivity; Memory (Computers); Patent Applications; Random Access

20080034540 Lawrence Livermore National Lab., Livermore, CA USA
Asynchronous Event-Driven Particle Algorithms
Donev, A.; Mar. 06, 2007; 12 pp.; In English
Report No.(s): DE2007-914599; UCRL-CONF-228704; No Copyright; Avail.: Department of Energy Information Bridge

We present in a unifying way the main components of three examples of asynchronous event-driven algorithms for simulating physical systems of interacting particles. The first example, hard-particle molecular dynamics (MD), is well-known. We also present a recently-developed diffusion kinetic Monte Carlo (DKMC) algorithm, as well as a novel event-driven algorithm for Direct Simulation Monte Carlo (DSMC). Finally, we describe how to combine MD with DSMC in an event-driven framework, and discuss some promises and challenges for event-driven simulation of realistic physical systems.
NTIS
Algorithms; Particle Acceleration; Synchronism

20080034541 Fermi National Accelerator Lab., Batavia, IL, USA; Ohio State Univ., Columbus, OH, USA; Pennsylvania Univ., Philadelphia, PA, USA; Rutgers - The State Univ., New Brunswick, NJ, USA

Request for Extension of Fermilab Proposal 310. (Further Study of High Energy Neutrino Interactions at NAL (May 31, 1974))

Cooper, P. S.; Cline, D.; Gilchriese, M.; Heagy, M.; Ling, T. Y.; Jan. 01, 2007; 27 pp.; In English

Report No.(s): DE2007-914594; FERMILAB-PROPOSAL-310-E; No Copyright; Avail.: Department of Energy Information Bridge

A number of interesting events have occurred in particle physics, particularly in neutrino physics, just before or since Fermi1ab experiment E-310 began data-taking in late 1976. These pose new questions for neutrino experiments or, in some instances, sharpen old questions, which indicate that an extension of the running time of E-310 would be of value. The questions are concerned with the possible existence of new quarks beyond charm and new leptons. We anticipate that some of them are answered more or less definitively in the data already taken in E-310. Others need to be addressed through data obtained under different conditions than those utilized for the E-310 data in hand. Specifically, it is desirable to use different (and previously unavailable) v and v- beams, and also to modify the event trigger arrangement by adding new counters. We propose the extension of E-310 to include use of long-spill, two-horn focussed beams for v and v-. The long-spill property makes possible use of the high-intensity, low-energy features of these beams in our experiment. The modified trigger arrangement will aid in that use, and, more importantly, allow us to eliminate suspected trigger biasses in the detection of mu1timuons. We request 2 x 10(x 18) protons on target (POT) with the horn system focussed for negative particles and another 2 x 10 POT for positive partic1es. We prefer the horn system to be operated without a plug. The trigger modifications involve modest changes in the present E-310 apparatus and, therefore, we should be prepared to begin data-taking early in the long-spill horn run scheduled for mid-August, 1978, if this extension is approved.

NTIS

Antineutrinos; High Energy Interactions; Inelastic Scattering; Nucleons

20080034542 Fermi National Accelerator Lab., Batavia, IL, USA

Top Quark Mass: Past, Present and Future

Guitierrez, G.; January 2006; 9 pp.; In English

Report No.(s): DE2007-914593; FERMILAB-BONF-07-335-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The top quark is the most massive elementary particle discovered thus far. Its large mass may help explain the mechanism by which fundamental particles gain mass - the Standard Model's greatest standing mystery. Today the top quark mass, together with the W boson mass, plays an important role in constraining the Higgs boson mass. The current status of the top quark mass measurement and a brief outline of the expectation at the Large Hadron Collider and the International Linear Collider will be covered.

NTIS

Quarks; Elementary Particles

20080034543 Fermi National Accelerator Lab., Batavia, IL, USA

Superconducting Travelling Wave Ring with High Gradient Accelerating Section

Avrakhov, P.; Solyak, N.; January 2007; 3 pp.; In English

Report No.(s): DE2007-914592; FERMILAB-CONF-07-297-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

Use of a superconducting travelling wave accelerating (STWA) structure instead of a standing wave cavity has major advantages in increasing the accelerating gradient in the ILC. In contrast with standing wave cavity STWA requires feedback loop, which sends wave from the structure output to input, making a superconducting travelling wave ring (STWR). One or few input couplers need to excite STWR and compensate power dissipations due to beam loading. To control travelling wave regime in the structure two independent knobs can be used for tuning both resonant ring frequency and backward wave. We discuss two variants of the STWR with one and two feed couplers.

NTIS

Gradients; Mathematical Models; Superconductivity; Traveling Waves

20080034544 Northern Illinois Univ., De Kalb, IL, USA; Argonne National Lab., IL USA
Impact of Transverse Irregularities at the Photocathode on the Production of High-Charge Electron Bunches
Rihaoui, M.; Bohn, C. L.; Piot, P.; Power, J. G.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-FG02-04ER41323
Report No.(s): DE2007-914591; No Copyright; Avail.: National Technical Information Service (NTIS)

The properties of electron beams produced in a photoinjector are strongly dependent on the initial conditions, i.e. the photocathode drive laser shape and its uniformity. We explore the impact of well-defined transverse laser perturbations on the evolution of the electron beam both in configuration and velocity spaces and especially investigate how certain types of perturbations evolve as the beam propagates in the Argonne Wakefield Accelerator facility. Numerical simulations performed with IMPACT-T are presented. Finally preliminary experimental results aimed at validating our simulations are discussed.
NTIS
Bunching; Electron Beams; Electron Bunching; Irregularities; Photocathodes

20080034545 Fermi National Accelerator Lab., Batavia, IL, USA
Operational Aspects of the Main Injector Large Aperture Quadrupole (WQB)
Chou, W.; Bartelson, L.; Brown, B.; Capista, D.; Crisp, J.; January 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-07CH11359
Report No.(s): DE2007-914590; FERMILAB-CONF-07344-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

A two-year Large Aperture Quadrupole (WQB) Project was completed in the summer of 2006 at Fermilab. Nine WQBs were designed, fabricated and bench-tested by the Technical Division. Seven of them were installed in the Main Injector and the other two for spares. They perform well. The aperture increase meets the design goal and the perturbation to the lattice is minimal. The machine acceptance in the injection and extraction regions is increased from 40 to 60 mm-mrad. This paper gives a brief report of the operation and performance of these magnets.
NTIS
Apertures; Injectors; Quadrupoles

20080034548 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Universidade Sao Judas Tadeu, Sao Paulo, Brazil; Instituto de Fisica Teorica, Sao Paulo, Brazil
Brazilian Relativistic O(q(sup4)) Two-Pion Exchange Nucleon-Nucleon Potential: Parametrized Version
da Rocha, C. A.; Higa, R.; Robilotta, M. R.; Mar. 01, 2007; 5 pp.; In English
Report No.(s): DE2007-914548; No Copyright; Avail.: Department of Energy Information Bridge

In our recent works we derived a chiral O(q4) two-pion exchange nucleon-nucleon potential (TPEP) formulated in a relativistic baryon (RB) framework, expressed in terms of the so called low energy constants (LECs) and functions representing covariant loop integrations. In order to facilitate the use of the potential in nuclear applications, we present a parametrized version of our configuration space TPEP.
NTIS
Brazil; Nucleon-Nucleon Interactions; Pions

20080034549 Brookhaven National Lab., Upton, NY USA; Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; University of the Pacific, Stockton, CA, USA; Carnegie-Mellon Univ., Pittsburgh, PA, USA
Results and Frontiers in Lattice Baryon Spectroscopy
Bulava, J.; Edwards, R.; Fleming, G.; Juge, K. J.; Lichtl, A. C.; Aug. 16, 2007; 4 pp.; In English
Report No.(s): DE2007-914547; No Copyright; Avail.: National Technical Information Service (NTIS)

The Lattice Hadron Physics Collaboration (LHPC) baryon spectroscopy effort is reviewed. To date the LHPC has performed exploratory Lattice QCD calculations of the low-lying spectrum of Nucleon and Delta baryons. These calculations demonstrate the effectiveness of our method by obtaining the masses of an unprecedented number of excited states with definite quantum numbers. Future work of the project is outlined.
NTIS
Baryons; Hadrons; Spectroscopy

20080034551 Brookhaven National Lab., Upton, NY USA

Study of Polarized Proton Acceleration in J-PARC

Luccio, A. U.; Bai, M.; Roser, T.; Hatanaka, H.; Molodojentsev, A.; Nov. 2006; 6 pp.; In English

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

Report No.(s): DE2007-914496; BNL-77496-2006-CP; No Copyright; Avail.: Department of Energy Information Bridge

We have studied the feasibility of polarized proton acceleration in rhe J-PARC accelerator facility, consisting of a 400 MeV linac, a 3 GeV rapid cycling synchrotron (RCS) and a 50 GeV synchrotron (MR). We show how the polarization of the beam can be preserved using an rf dipole in the RCS and two superconductve partial helical Siberian snakes in the MR. The lattice of the MR will be modified with the addition of quadrupoles to compensate for the focusing properties of the snakes. NTIS

Protons; Linear Accelerators; Radio Frequencies; Quadrupoles

20080034553 Carnegie-Mellon Univ., Pittsburgh, PA, USA; Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Yale Univ., New Haven, CT, USA; Brookhaven National Lab., Upton, NY USA

Hadronic Resonances from Lattice QCD

Bulava, J.; Edwards, R.; Fleming, G.; Judge, K. J.; Aug. 2007; 8 pp.; In English

Report No.(s): DE2007-914476; No Copyright; Avail.: National Technical Information Service (NTIS)

The determination of the pattern of hadronic resonances as predicted by Quantum Chromodynamics requires the use of non-perturbative techniques. Lattice QCD has emerged as the dominant tool for such calculations, and has produced many QCD predictions which can be directly compared to experiment. The concepts underlying lattice QCD are outlined, methods for calculating excited states are discussed, and results from an exploratory Nucleon and Delta baryon spectrum study are presented.

NTIS

Hadrons; Quantum Chromodynamics

20080034554 Pennsylvania State Univ-Berks, Reading, PA, USA; Tufts Univ., Medford, MA, USA; Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

Flavor Dependence of T-odd PDFs

Gamberg, L. P.; Goldstein, G. R.; Schlegel, M.; Aug. 20, 2007; 6 pp.; In English

Report No.(s): DE2007-914444; No Copyright; Avail.: Department of Energy Information Bridge

The flavor dependence of the naive time reversal odd ('T-odd') parton distributions for u- and d-quarks are explored in the spectator model. The flavor dependence of h (1) is of significance for the analysis of the azimuthal cos(2 phi) asymmetries in unpolarized SIDIS and DY-processes, as well as for the overall physical understanding of the distribution of transversely polarized quarks in unpolarized nucleons. As a by-product of the formalism, we calculate the chiral-odd but 'T-even' function h(1L) which enables us to present a prediction for the single spin asymmetry A(UL) (/sin(2/phi)) for a longitudinally polarized target in SIDIS.

NTIS

Partons; Flavor (Particle Physics)

20080034555 Stanford Linear Accelerator Center, CA, USA

Technical Challenges for Head-On Collisions and Extraction at the ILC

Napoly, O.; Delferriere, O.; Durante, M.; Payet, J.; Rippon, C.; Aug. 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-914435; SLAC/PUB-12744; No Copyright; Avail.: Department of Energy Information Bridge

An interaction region with head-on collisions is considered as an alternative to the baseline ILC configuration. Progress in the final focus optics design includes engineered large bore superconducting final doublet magnets and their 3D magnetic integration in the detector solenoids. Progress on the beam separation optics is based on technical designs of electrostatic separator and special extraction quadrupoles. The spent beam extraction is realized by a staged collimation scheme relying on realistic collimators.

NTIS

Collimators; Collisions; Extraction

20080034556 National Nuclear Security Administration, Las Vegas, NV, USA
X-Ray Diffraction Project Final Report, Fiscal Year 2006
Oct. 2006; 12 pp.; In English
Contract(s)/Grant(s): DE-AC52-06NA25946
Report No.(s): DE2007-914425; DOE/NV-25946-078; No Copyright; Avail.: National Technical Information Service (NTIS)

An x-ray diffraction diagnostic system was developed for determining real-time shock-driven lattice parameter shifts in single crystals at the gas gun at TA-IV at Sandia National Laboratories (SNL). The signal-to-noise ratio and resolution of the system were measured using imaging plates as the detector and by varying the slit width. This report includes tests of the x-ray diffraction system using a phosphor coupled to a charge-coupled device (CCD) camera by a coherent fiber-optic bundle. The system timing delay was measured with a newly installed transistor-transistor logic (TTL) bypass designed to reduce the x-ray delay time. The axial misalignment of the Bragg planes was determined with respect to the optical axis for a set of eight LiF (lithium fluoride) crystals provided by SNL to determine their suitability for gas gun experiments.
NTIS
Crystals; Silicon; X Ray Diffraction

20080034558 Stanford Linear Accelerator Center, CA, USA; London Univ., UK; Daresbury Lab., UK; Rutherford Appleton Lab., Chilton, UK
Material Damage Test for ILC Collimators
Fernandez-Hernando, J. L.; Blair, G. A.; Boogert, S. T.; Ellwood, G. E.; Keller, L.; Aug. 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-914436; SLAC/PUB-12742; No Copyright; Avail.: Department of Energy Information Bridge

Simulations were completed to determine the energy deposition of an ILC bunch using FLUKA, Geant4 and EGS4 to a set of different spoiler designs. These shower simulations were used as inputs to thermal and mechanical studies using ANSYS. This paper presents a proposal to optimise the material choice and mechanical design of ILC spoilers jaws using ATF and benchmark the energy deposition simulations and the ANSYS studies giving the researchers valuable data which will help achieve a definitive ILC spoiler design.
NTIS
Collimators; Computerized Simulation; Damage; Damage Assessment

20080034561 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Single Crystal Niobium RF Cavity of the TESLA Shape
Singer, W.; Singer, X.; Kneisel, P.; Sep. 01, 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC05-84ER40150
Report No.(s): DE2007-914631; JLAB-ACO-07-709; DOE/ER/40150-4322; No Copyright; Avail.: Department of Energy Information Bridge

A fabrication method for single crystal niobium cavities of the TESLA shape was proposed on the basis of metallographic investigations and electron beam welding tests on niobium single crystals. These tests showed that a cavity can be produced without grain boundaries even in the welding area. An appropriate annealing allows the outgassing of hydrogen and stress relaxation of the material without destruction of the single crystal. A prototype single crystal single cell cavity was built. An accelerating gradient of 37.5 MV/m was reached after approximately 110 mu-m of Buffered Chanical Polishing (BCP) and in situ baking at 120DGC for 6 hrs with a quality factor exceeding 2x10(exp 10) at 1.8 K. The developed fabrication method can be extended to fabrication of multi cell cavities.
NTIS
Cavities; Crystals; Metal Crystals; Niobium; Radio Frequencies; Shapes; Single Crystals

20080034579 Fermi National Accelerator Lab., Batavia, IL, USA; Centre National de la Recherche Scientifique, Cedex, France
Non Susy Searches at the Tevatron (June 6, 2007)
Muanza, G. S.; Jun. 06, 2007; 4 pp.; In English
Report No.(s): DE2007-908680; FERMILAB-CONF-07-189-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent searches for non-SUSY exotics in pp collisions at a center-of-mass energy of 1.96 TeV at the Tevatron Run II are

reported. The emphasis is put on the results of model-driven analyses which were updated to the full Run IIA datasets corresponding to integrated luminosities of about 1 fb-1.
NTIS
Bosons; Particle Accelerators

20080034580 Fermi National Accelerator Lab., Batavia, IL, USA; Oxford Univ., Oxford, UK
Minos Results, Progress and Future Prospects
Raufer, T. M.; May 31, 2007; 8 pp.; In English
Report No.(s): DE2007-908359; FERMILAB-CONF-07-149-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The MINOS long baseline experiment has been collecting neutrino beam data since March 2005 and has accumulated 3 x 10 (20) protons-on-target (POT) to date. MINOS uses Fermilab's NuMI neutrino beam which is measured by two steel-scintillator tracking calorimeters, one at Fermilab and the other 735 km downstream, in northern Minnesota. By observing the oscillatory structure in the neutrino energy spectrum, MINOS can precisely measure the neutrino oscillation parameters in the atmospheric sector.
NTIS
Muons; Neutrinos

20080034589 Morehouse Coll., Atlanta, GA, USA; Lawrence Livermore National Lab., Livermore, CA USA
Measurements of the Properties of Highly-Charged High-Z Ions
Smith, A. J.; January 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-FG02-98ER14877
Report No.(s): DE2007-901632; No Copyright; Avail.: Department of Energy Information Bridge

We had proposed carrying out a systematic experimental investigation of the atomic physics of highly charged, high-Z ions, produced in the Lawrence Livermore National Laboratory (LLNL) electron beam ion trap (EBIT-I) in its high energy mode, superEBIT. In particular we were going to accurately measure line positions for An=0 transitions in few electron high-Z ions; this was meant to enable us to investigate relativistic and quantum electrodynamics QED contributions to the energy levels as well as the nuclear properties of heavy ions. We were also going to measure cross sections for various electron-ion interactions, the degree of polarization of emitted x-rays, and radiation cooling rates of various ionization stages of highly charged, high-Z ions. This would enable us to study fundamental atomic physics of high-Z ions at relativistic electron impact energies and in the intense nuclear fields of highly ionized, high-Z ions. This would extend previous measurements we have carried out to a regime where there is a paucity of good data. These measurements were expected to generate increased theoretical interest and activity in this area. The project will extend a very successful collaboration between Morehouse College (MC) and a national laboratory LLNL, Minority student training and development are major components of the proposal.
NTIS
Electron Beams; Ion Beams; Ions; Traps

20080034598 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Accurate Iterative Analytic Solution of the Kapchinskij-Vladimirskij Equations for the Case of a Matched Beam
Anderson, O. A.; Oct. 06, 2006; 12 pp.; In English
Report No.(s): DE2007-913160; No Copyright; Avail.: Department of Energy Information Bridge

The well-known Kapchinskij-Vladimirskij (KV) equations are difficult to solve in general, but the problem is simplified for the matched-beam case with sufficient symmetry. We show that the interdependence of the two KV equations is eliminated, so that only one needs to be solved, a great simplification. We present an iterative method of solution which can potentially yield any desired level of accuracy. The lowest level, the well-known smooth approximation, yields simple, explicit results with good accuracy for weak or moderate focusing fields. The next level improves the accuracy for high fields; we previously showed (Part. Accel. 52, 133 (1996)) how to maintain a simple explicit format for the results. That paper used expansion in a small parameter to obtain results of second-level accuracy. The present paper, using straight forward iteration, obtains equations of first, second, and third levels of accuracy. For a periodic lattice with beam matched to lattice, we use the lattice and beam parameters as input and solve for phase advances and envelope functions. We find excellent agreement with

numerical solutions over a wide range of beam emittances and intensities.
NTIS
Analysis (Mathematics); Iterative Solution; Proton Beams

20080034600 Brookhaven National Lab., Upton, NY USA
Single Spin Asymmetries of Identified Hadrons in p +p(alpha +)Square Roots s equal 62.4 and 200 GeV
Lee, J. H.; Videbaek, F.; Jul. 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-913074; BNL-79175-2007; No Copyright; Avail.: Department of Energy Information Bridge
No abstract available
Asymmetry; Hadrons

20080034611 Neutron Sciences, Inc., Knoxville, TN, USA
Gamma-Free Neutron Detector Based Upon Lithium Phosphate Nanoparticles
Wallace, S. A.; January 2006; 18 pp.; In English
Contract(s)/Grant(s): DE-FG02-06ER84637
Report No.(s): DE2007-913098; No Copyright; Avail.: Department of Energy Information Bridge
A gamma-free neutron-sensitive scintillator is needed to enhance radiation sensing and detection for nonproliferation applications. Such a scintillator would allow very large detectors to be placed at the perimeter of spent-fuel storage facilities at commercial power plants, so that any movement of spontaneously emitted neutrons from spent nuclear fuel or weapons grade plutonium will be noted in real-time. The material must have an efficiency greater than that presently available using scintillating glass fibers and helium-3 tubes, but the most important need is for a detector material that is totally free of gamma interference. This project will develop technology for manufacturing large panels of fluor-doped plastic containing lithium-6 phosphate nanoparticles. In order to detect neutrons, the nanoparticles must be sufficiently small so that the plastic remains transparent. In this way, the triton and alpha particles generated by the capture of the neutron will result in a photon burst that can be coupled to a wavelength shifting (WLS) fiber, producing an optical signal of about ten nanoseconds at the face of a multianode photomultiplier. In Phase I, a patent-pending process for manufacturing the lithium-6 phosphate nanoparticles will be characterized, and the feasibility of embedding the nanoparticles in a plastic scintillator material will be determined.
NTIS
Lithium; Nanoparticles; Neutron Counters; Neutrons; Phosphates; Scintillation Counters; Sensitivity

20080034612 Karlsruhe Univ., Germany; Kernforschungszentrum G.m.b.H., Karlsruhe, Germany
Measurement of the Charge Asymmetry in Top-Antitop Quark Production with the CDF II Experiment
Weinelt, J.; Dec. 15, 2006; 108 pp.; In English
Report No.(s): DE2007-911835; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Asymmetry; Quarks

20080034613 Santander Univ., Cantabria, Santander, Spain
Measurement of the t overbar t Production Cross Section in p overbar p Collisions at square root of s equals 1.96 TeV Using Lepton Plus Jets Events in the CDF Detector at FERMILAB
January 2006; 173 pp.; In English
Report No.(s): DE2007-911833; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Collisions; Leptons; Quarks

20080034614 Pusan National Univ., Pusan, Korea, Republic of; Kyungpook National Univ., Taegu, Korea, Republic of; Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Large Grain Niobium Cavity R and D in Asia and the Future
Saito, K.; Furuta, F.; Saeki, T.; Inoue, H.; Shim, J.; Sep. 01, 2007; 12 pp.; In English
Report No.(s): DE2007-914634; JLAB-ACO-07-708; DOE/ER/40150-4323; No Copyright; Avail.: Department of Energy Information Bridge
The status of the large grain niobium cavity R&D in Asia and the future scope are presented. Recently KEK has received

CBMM and NingXia large grain niobium sheets through collaborations. KEK has fabricated 1.3 GHz single cell cavities using these materials and measured the cavity performance. Those results are presented in this paper.
NTIS
Asia; Cavities; Niobium; Superconductivity

20080034617 Fermi National Accelerator Lab., Batavia, IL, USA
Magnetic Error Analysis of Recycler PBAR Injection Transfer Line
Yang, M. J.; January 2007; 3 pp.; In English
Report No.(s): DE2007-915562; FERMILAB-CONF-07-260-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

Detailed study of Fermilab Recycler Ring anti-proton injection line became feasible with its BPM system upgrade, though the beamline has been in existence and operational since year 2000. Previous attempts were not fruitful due to limitations in the BPM system. Among the objectives are the assessment of beamline optics and the presence of error fields. In particular the field region of the permanent Lambertson magnets at both ends of R22 transfer line will be scrutinized.
NTIS
Error Analysis; Injection; Magnets

20080034618 Fermi National Accelerator Lab., Batavia, IL, USA
Longitudinal Momentum Mining of Antiprotons at the Fermilabr Recycler: Past, Present, and Future
Bhat, C. M.; Chase, B. E.; Gattuso, C.; Joireman, P. W.; January 2007; 3 pp.; In English
Report No.(s): DE2007-915561; FERMILAB-CONF-07-283-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

The technique of longitudinal momentum mining (LMM) in the Fermilab Recycler was adopted in early 2005 to extract thirty-six equal intensity and equal 6D-emittance antiproton bunches for proton-antiproton collider operation in the Tevatron. Since that time, several improvements have been made in the Recycler and the mining technique to handle higher intensity beams. Consequently, the Recycler has become a key contributor to the increased luminosity performance observed during Tevatron Run IIb. In this paper, we present an overview of the improvements and the current status of the momentum mining technique.
NTIS
Antiprotons; Mining; Momentum; Particle Accelerators

20080034619 Rutgers - The State Univ., Piscataway, NJ, USA; Fermi National Accelerator Lab., Batavia, IL, USA
Copper 3.9 GHz TM110 Cavity for Emittance Exchange
Koeth, T. W.; Fliller, R. P.; Edwards, D. A.; Edwards, H. T.; January 2007; 4 pp.; In English
Report No.(s): DE2007-915560; FERMILAB-CONF-07-307-AD-APC; No Copyright; Avail.: National Technical Information Service (NTIS)

An experiment is being developed at the FNAL Photoinjector Lab to demonstrate the exchange of longitudinal emittance with a transverse horizontal emittance. The longitudinal electric field of a TM110 cavity vanishes on axis and increases linearly with transverse displacement. This shearing electric field is pivotal to the exchange. The design of this TM110 cavity is a variant of the Fermilab 3.9 GHz superconducting deflecting mode cavity; however, the cavity was constructed of OFHC copper. The authors report on the construction, field flatness, polarization and high power testing of a TM110 cavity.
NTIS
Cavities; Copper; Emittance; Superconducting Cavity Resonators

20080034620 Fermi National Accelerator Lab., Batavia, IL, USA
Status of 3.9 GHz Superconducting RF Cavity Technology at Fermilab
Harms, E.; Arkan, T.; Bellantoni, L.; Carter, H.; Edwards, H.; January 2007; 3 pp.; In English
Report No.(s): DE2007-915559; FERMILAB-CONF-07-311-AD-APC-TD; No Copyright; Avail.: Department of Energy Information Bridge

Fermilab is involved in an effort to assemble 3.9 GHz superconducting RF cavities into a four cavity cryomodule for use at the DESY TTF/FLASH facility as a third harmonic structure. The design gradient of the cavities is 14 MV/m. This effort involves design, fabrication, intermediate testing, assembly, and eventual delivery of the cryomodule. We report on all facets

of this enterprise from design through future plans. Included will be test results of single 9-cell cavities, lessons learned, and current status.
NTIS
Cavities; Particle Accelerators; Radio Frequencies; Superconducting Cavity Resonators; Superconductivity

20080034621 Fermi National Accelerator Lab., Batavia, IL, USA
Present and Future High-Energy Accelerators for Neutrino Experiments
Kourbanis, I.; January 2007; 6 pp.; In English
Report No.(s): DE2007-915557; FERMILAB-CONF-07-272-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

There is an active neutrino program making use of the high-energy (larger than 50 GeV) accelerators both in USA at Fermilab with NuMI and at CERN in Europe with CNGS. In this paper we will review the prospects for high intensity high energy beams in those two locations during the next decade.
NTIS
Neutrinos; Particle Accelerators; Emittance

20080034622 Texas A&M Univ., College Station, TX, USA; Fermi National Accelerator Lab., Batavia, IL, USA
Recent Electroweak Results from CDF
Safonov, A. N.; May 2007; 5 pp.; In English
Report No.(s): DE2007-915556; FERMILAB-CONF-07-193-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Precision experimental studies of the electroweak processes are of utmost importance for understanding the mechanism of spontaneous symmetry breaking in the Standard Model (SM) and verifying the SM gauge structure predicted by the SU(2)xSU(2)xU(1) symmetry group. Furthermore, these measurements provide an insight and indirect constraints on the properties of physics beyond our current direct reach. A perfect example is constraints arising from the W mass measurement on the Higgs sector. There is a potential for discovery of new physics should a signicant deviation in the measured quantities from the SM predictions be detected. Finally, precision measurements combined with other experimental data constrain parton distribution functions (PDFs), which is important in view of upcoming LHC experiments. CDF has a strong program of electroweak measurements, some of the highlights and their motivations are: Measurement of the W mass: strong implications on the Higgs mass; Studies of the diboson production: a direct measurement of the trilinear couplings and sensitivity to new physics; Measurements of W and Z production cross-sections: a test of the higher order calcuations in the context of the SM; Studies of the W and Z production asymmetries: PDF constaints.
NTIS
Electroweak Interactions (Field Theory); Standard Model (Particle Physics); Distribution Functions; Measuring Instruments

20080034623 Fermi National Accelerator Lab., Batavia, IL, USA
Managing Government Funded Scientific Consortia
Banerjee, B.; Jun. 2007; 5 pp.; In English
Report No.(s): DE2007-915554; FERMILAB-CONF-07-204; No Copyright; Avail.: Department of Energy Information Bridge

In recent years, it is becoming apparent that good science not only requires the talents of individual scientists, but also state-of-the-art laboratory facilities. These faculties, often costing millions to billions of dollars, allow scientists unprecedented opportunities to advance their knowledge and improve the quality of human life. To make optimum use of these experimental facilities, a significant amount of computational simulations is required. These mega-projects require large-scale computational facilities and complementary infrastructures of network and software. For physical sciences in US, most of these research and development efforts are funded by the US Department of Energy (DOE) and National Science Foundation (NSF). Universities, US National Laboratories, and occasionally industrial partners work together on projects awarded with different flavors of government funds managed under different rules. At Fermilab, we manage multiple such collaborative computing projects for university and laboratory consortia. In this paper, I explore important lessons learned from my experience with these projects. Using examples of projects delivering computing infrastructure for the Lattice QCD Collaboration, I explain how the use of federal enterprise architecture may be deployed to run projects effectively. I also describe the lessons learned in the process.
NTIS
Management Planning; Organizations

20080034624 Idaho National Engineering Lab., Idaho Falls, ID, USA

Flexible Neutron Shielding for a Glovebox Within the Idaho National Laboratory Radioisotope Power System Program. AGS Annual Conference and Expo 2007

Walsh, S.; Jul. 2007; 6 pp.; In English

Report No.(s): DE2007-915537; INL/CON-07-12910; No Copyright; Avail.: Department of Energy Information Bridge

Neutron shielding was desired to reduce worker exposure during handling of plutonium-238 (Pu-238) in a glovebox at the Idaho National Laboratory. Due to the unusual shape of the glovebox, standard methods of neutron shielding were impractical and would have interfered with glovebox operations. A silicon-based, boron-impregnated material was chosen due to its flexibility. This paper discusses the material, the installation, and the results from neutron source testing. Neutron shielding was desired to reduce worker exposure during handling of plutonium-238 (Pu-238) in a glovebox at the Idaho National Laboratory. Due to the unusual shape of the glovebox, standard methods of neutron shielding were impractical and would have interfered with glovebox operations. A silicon-based, boron-impregnated material was chosen due to its flexibility. This paper discusses the material, the installation, and the results from neutron source testing.

NTIS

Conferences; Handling Equipment; Laboratory Equipment; Neutrons; Radiation Shielding; Shielding

20080034676 Argonne National Lab., IL, USA

Evaluated Decay Data for (sup 246)Cm

Kondev, F. G.; Feb. 20, 2007; 24 pp.; In English

Contract(s)/Grant(s): DE-AC02-06CH11357

Report No.(s): DE2007-914958; ANL/NDM-164; No Copyright; Avail.: Department of Energy Information Bridge

The Nuclear Data and Measurement Series document results of studies in the field of microscopic nuclear data. The primary objective is the dissemination of information in the comprehensive form required for nuclear technology applications. This Series is devoted to: (a) measured microscopic nuclear parameters, (b) experimental techniques and facilities employed in measurements, (c) the analysis, correlation and interpretation of nuclear data, and (d) the compilation and evaluation of nuclear data. Contributions to this Series are reviewed to assure technical competence and, unless otherwise stated, the contents can be formally referenced. This Series does not supplant formal journal publication, but it does provide the more extensive information required for technological applications (e.g., tabulated numerical data) in a timely manner.

NTIS

Data Acquisition; Decay

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*.

20080032769 NASA Glenn Research Center, Cleveland, OH, USA

Characterization and Simulation of the Thermoacoustic Instability Behavior of an Advanced, Low Emissions Combustor Prototype

DeLaat, John C.; Paxson, Daniel E.; July 2008; 26 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 21-23 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.03.19.04

Report No.(s): NASA/TM-2008-215291; AIAA Paper 2008-4878; E-16576; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080032769

Extensive research is being done toward the development of ultra-low-emissions combustors for aircraft gas turbine engines. However, these combustors have an increased susceptibility to thermoacoustic instabilities. This type of instability was recently observed in an advanced, low emissions combustor prototype installed in a NASA Glenn Research Center test stand. The instability produces pressure oscillations that grow with increasing fuel/air ratio, preventing full power operation. The instability behavior makes the combustor a potentially useful test bed for research into active control methods for combustion instability suppression. The instability behavior was characterized by operating the combustor at various pressures, temperatures, and fuel and air flows representative of operation within an aircraft gas turbine engine. Trends in instability behavior versus operating condition have been identified and documented, and possible explanations for the trends provided. A simulation developed at NASA Glenn captures the observed instability behavior. The physics-based simulation

includes the relevant physical features of the combustor and test rig, employs a Sectored 1-D approach, includes simplified reaction equations, and provides time-accurate results. A computationally efficient method is used for area transitions, which decreases run times and allows the simulation to be used for parametric studies, including control method investigations. Simulation results show that the simulation exhibits a self-starting, self-sustained combustion instability and also replicates the experimentally observed instability trends versus operating condition. Future plans are to use the simulation to investigate active control strategies to suppress combustion instabilities and then to experimentally demonstrate active instability suppression with the low emissions combustor prototype, enabling full power, stable operation.
Author
Combustion Chambers; Combustion Stability; Prototypes; Computerized Simulation; Aircraft Engines; Exhaust Emission; Thermoacoustic Effects

20080033081 UT-Battelle, LLC, Oak Ridge, TN, USA
Truck Acoustic Data Analyzer System
Haynes, H. D., Inventor; Akerman, A., Inventor; Ayers, C. W., Inventor; 19 Aug 04; 12 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Patent Info.: Filed Filed 19 Aug 04; US-Patent-Appl-SN-10-922 023
Report No.(s): PB2008-100961; No Copyright; Avail.: CASI: A03, Hardcopy

A passive vehicle acoustic data analyzer system having at least one microphone disposed in the acoustic field of a moving vehicle and a computer in electronic communication the microphone(s). The computer detects and measures the frequency shift in the acoustic signature emitted by the vehicle as it approaches and passes the microphone(s). The acoustic signature of a truck driving by a microphone can provide enough information to estimate the truck speed in miles-per-hour (mph), engine speed in rotations-per-minute (RPM), turbocharger speed in RPM, and vehicle weight.
NTIS
Acoustic Properties; Data Systems; Patent Applications; Sound Detecting and Ranging; Trucks

20080033113 NASA Glenn Research Center, Cleveland, OH, USA
Modeling and Prediction of Fan Noise
Envia, Ed; June 29, 2008; 17 pp.; In English; Acoustics '08 Conference, 29 Jun. - 4 Jul. 2008, Paris, France; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080033113

Fan noise is a significant contributor to the total noise signature of a modern high bypass ratio aircraft engine and with the advent of ultra high bypass ratio engines like the geared turbofan, it is likely to remain so in the future. As such, accurate modeling and prediction of the basic characteristics of fan noise are necessary ingredients in designing quieter aircraft engines in order to ensure compliance with ever more stringent aviation noise regulations. In this paper, results from a comprehensive study aimed at establishing the utility of current tools for modeling and predicting fan noise will be summarized. It should be emphasized that these tools exemplify present state of the practice and embody what is currently used at NASA and Industry for predicting fan noise. The ability of these tools to model and predict fan noise is assessed against a set of benchmark fan noise databases obtained for a range of representative fan cycles and operating conditions. Detailed comparisons between the predicted and measured narrowband spectral and directivity characteristics of fan nose will be presented in the full paper. General conclusions regarding the utility of current tools and recommendations for future improvements will also be given.
Author
Aircraft Engines; Engine Noise; Fans; Aeroacoustics

20080033237 Greeneridge Sciences, Inc., Santa Barbara, CA USA
A Miniature Acoustic Recording Tag: Applications to Assess Marine Widelife Response to Sound
Burgess, William C; Apr 2008; 17 pp.; In English
Contract(s)/Grant(s): N00014-03-C-0262
Report No.(s): AD-A480428; GS0105A-0801; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480428

Understanding the interaction between manmade sound and marine wildlife on the scale of populations demands large sample sizes across many species. Recognizing this, Greeneridge Sciences, Inc. partnered with five separately-supported investigators to accelerate transition of its miniature acoustic recording tag, the Bioacoustic Probe. The tag quantifies the acoustic stimuli experienced by a subject while monitoring changes in the subject's dive behavior that may be associated with

its sound exposure. The collaborative use of this technology has yielded new data on the association of behavior with acoustics for blue, fin, humpback, and sperm whales, northern fur seals, and blacktip reef sharks.
DTIC
Acoustics; Animals; Marine Biology; Miniaturization; Recording Instruments; Underwater Acoustics; Wildlife

20080033487 Woods Hole Oceanographic Inst., MA USA
Mid-Frequency Sonar Interactions with Beaked Whales
Foote, Kenneth G; Feijoo, Gonzalo R; Rye, Kent; Reidenberg, Joy; Hastings, Mardi; Jan 2007; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-07-1-0992
Report No.(s): AD-A480921; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The top-level goal of this project is to build an interactive online modeling and visualization system, called the Virtual Beaked Whale, to enable users to predict mid-frequency sonar-induced acoustic fields inside beaked whales and other marine mammals. Another high-level goal is to acquire new high-resolution morphometric and physical-property data on beaked whales for use in the model. It is hoped that the availability of such a system together with high-quality data will give researchers insight into the nature of sonar interactions with beaked whales, ultimately to introduce objectivity into a public discussion that has been hampered by lack of a scientific approach. It is hoped further that the tool will prove useful in evaluating alternate sonar transmit signals that retain the required information content but with substantially reduced physical effects in beaked whales.
DTIC
Animals; Frequencies; Mammals; Marine Biology; Sonar; Whales

20080033491 Bucknell Univ., Lewisburg, PA USA
Sensor Localization Using Radio and Acoustic Transmissions from a Mobile Access Point
Kozick, Richard J; Sadler, Brian M; Lee, Chin-Chen; Tong, Lang; Nov 1, 2006; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480934; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We consider the problem of sensor node localization in a randomly deployed sensor network, using a mobile access point (AP). The mobile AP can be used to localize many sensors simultaneously in a broadcast mode, without a preestablished sensor network. We consider a multi-modal approach, combining radio and acoustics. The radio broadcasts timing, location information, and acoustic signal parameters. The acoustic emission may be used at the sensor to measure Doppler stretch, time delay, received signal strength, or angle of arrival. We focus on the case of narrowband Doppler shift in this paper, and we present a maximum likelihood estimator for sensor localization and show that its performance achieves the Cramer-Rao bound.
DTIC
Acoustic Emission; Broadcasting; Doppler Effect; Position (Location); Radio Transmission; Sound Transmission

20080033499 Washington Univ., Seattle, WA USA
Shallow Water Mid-Frequency Research and FY07 Experiment
Tang, Dajun; May 5, 2008; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0275
Report No.(s): AD-A480957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Long-term goals: To understand mid-frequency (1-10 kHz) acoustics in shallow waters through measurements and modeling, including propagation, reflection, and forward- and backscatter. The top-level goals of this effort are to understand the important environmental processes, which impact mid-frequency sonar performances in shallow water environments; and to develop means to efficiently collect those environmental data. The LEAR (Littoral Environmental Acoustics Research) acoustics field experiment, part of Shallow Water 2006 (SW06) project, yielded abundant data sets carefully collected for the purpose of investigating mid-frequency (1-10 kHz) acoustics interacting with environments. Both acoustic data and relevant environmental data were measured contemporaneously to facilitate close model/data comparison.
DTIC
Acoustics; Frequencies; Shallow Water; Sound Waves; Wave Propagation

20080033684 NASA Langley Research Center, Hampton, VA, USA

Output-Adaptive Tetrahedral Cut-Cell Validation for Sonic Boom Prediction

Park, Michael A.; Darmofal, David L.; August 18, 2008; 19 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754; Copyright; Avail.: CASI: A03, Hardcopy

A cut-cell approach to Computational Fluid Dynamics (CFD) that utilizes the median dual of a tetrahedral background grid is described. The discrete adjoint is also calculated, which permits adaptation based on improving the calculation of a specified output (off-body pressure signature) in supersonic inviscid flow. These predicted signatures are compared to wind tunnel measurements on and off the configuration centerline 10 body lengths below the model to validate the method for sonic boom prediction. Accurate mid-field sonic boom pressure signatures are calculated with the Euler equations without the use of hybrid grid or signature propagation methods. Highly-refined, shock-aligned anisotropic grids were produced by this method from coarse isotropic grids created without prior knowledge of shock locations. A heuristic reconstruction limiter provided stable flow and adjoint solution schemes while producing similar signatures to Barth-Jespersen and Venkatakrishnan limiters. The use of cut-cells with an output-based adaptive scheme completely automated this accurate prediction capability after a triangular mesh is generated for the cut surface. This automation drastically reduces the manual intervention required by existing methods.

Author

Computational Fluid Dynamics; Supersonic Flow; Pressure Distribution; Inviscid Flow; Shock Waves; Refining; Sonic Booms

20080033813 Coburn (Thompson) LLP, Saint Louis, MO, USA

Synthetically Generated Sound Cues

Tillotson, B. J., Inventor; 10 Aug 04; 13 pp.; In English

Contract(s)/Grant(s): MDA972-02-9-0005

Patent Info.: Filed Filed 10 Aug 04; US-Patent-Appl-SN-10-915 309

Report No.(s): PB2008-100657; No Copyright; Avail.: CASI: A03, Hardcopy

Communication systems and apparatus to allow a user to perceive the relative spatial location or present position of other elements of interest in a control space, such as the location of a speaker participating in a telephone conference or that of an aircraft carrier to a remotely piloted vehicle on final approach. The system inserts synthetic sound cues into the communication to the user that represent the relative postion(s). In one embodiment, the user will perceive the communication as though it were communicated through free space to the user from the relative position of the represented source, so that, for example, the squad leader will perceive his wingman to be at his immediate left. Methods of conveying relative position sound cues are also provided.

NTIS

Auditory Perception; Cues; Patent Applications; Sound Transmission

20080033837 Banner and Witcoff Ltd., Chicago, IL, USA; Science Applications International Corp., San Diego, CA, USA

Acoustic Fence

McDonald, L. R., Inventor; Hicks, G. W., Inventor; 18 Oct 04; 28 pp.; In English

Contract(s)/Grant(s): N41756-02-C-4682

Patent Info.: Filed Filed 18 Oct 04; US-Patent-Appl-SN-10-967 953

Report No.(s): PB2008-100638; No Copyright; Avail.: CASI: A03, Hardcopy

Methods and apparatus determine if an underwater intruder passes under a protective boundary. A sonar sensor system comprises a plurality of sonar sensor modules that are spaced on a protective boundary. A sonar sensor module comprises a sonar transducer (sonar array) that is characterized by an omni-directional radiation pattern that may overlap an omni-directional radiation pattern of an adjacent sonar sensor module transducer. The sonar sensor module collects sonar data such as range information of the target in relation to time. A central processor obtains the sonar data from each sonar module through a telemetry link. The central processor processes the sonar data from the plurality of sonar sensor modules in order to determine an estimated path of the target and may determine if the target should be considered as a threatening underwater intruder from a calculated threat level estimate based on this data.

NTIS

Acoustic Measurement; Patent Applications

20080033968 NASA Glenn Research Center, Cleveland, OH, USA

A Comparison of Three PML Treatments for CAA (and CFD)

Goodrich, John W.; May 05, 2008; 16 pp.; In English; 14th AIAA/CEAS Aeroacoustics Conference, 5-7 May 2008, Vancouver, Canada

Contract(s)/Grant(s): WBS 984754.02.07.03.17.02

Report No.(s): AIAA Paper 2008-2922; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080033968

In this paper we compare three Perfectly Matched Layer (PML) treatments by means of a series of numerical experiments, using common numerical algorithms, computational grids, and code implementations. These comparisons are with the Linearized Euler Equations, for base uniform base flow. We see that there are two very good PML candidates, and that can both control the introduced error. Furthermore, we also show that corners can be handled with essentially no increase in the introduced error, and that with a good PML, the outer boundary is the most significant source of err

Author

Computational Fluid Dynamics; Perfectly Matched Layers; Algorithms; Computational Grids; Base Flow; Boundaries; Uniform Flow

20080034485 NASA Langley Research Center, Hampton, VA, USA

Efficient Unstructured Grid Adaptation Methods for Sonic Boom Prediction

Campbell, Richard L.; Carter, Melissa B.; Deere, Karen A.; Waithe, Kenrick A.; August 18, 2008; 17 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.07.14.03

Report No.(s): AIAA-2008-7327; Copyright; Avail.: CASI: A03, Hardcopy

This paper examines the use of two grid adaptation methods to improve the accuracy of the near-to-mid field pressure signature prediction of supersonic aircraft computed using the USM3D unstructured grid flow solver. The first method (ADV) is an interactive adaptation process that uses grid movement rather than enrichment to more accurately resolve the expansion and compression waves. The second method (SSGRID) uses an a priori adaptation approach to stretch and shear the original unstructured grid to align the grid with the pressure waves and reduce the cell count required to achieve an accurate signature prediction at a given distance from the vehicle. Both methods initially create negative volume cells that are repaired in a module in the ADV code. While both approaches provide significant improvements in the near field signature (< 3 body lengths) relative to a baseline grid without increasing the number of grid points, only the SSGRID approach allows the details of the signature to be accurately computed at mid-field distances (3-10 body lengths) for direct use with mid-field-to-ground boom propagation codes.

Author

Unstructured Grids (Mathematics); Elastic Waves; Compression Waves; Computational Grids; Near Fields; Sonic Booms; Supersonic Aircraft

20080034486 NASA Langley Research Center, Hampton, VA, USA

A Grid Sourcing and Adaptation Study Using Unstructured Grids for Supersonic Boom Prediction

Carter, Melissa B.; Deere, Karen A.; August 18, 2008; 22 pp.; In English; 26th AIAA Applied Aerodynamics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.07.14.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034486

NASA created the Supersonics Project as part of the NASA Fundamental Aeronautics Program to advance technology that will make a supersonic flight over land viable. Computational flow solvers have lacked the ability to accurately predict sonic boom from the near to far field. The focus of this investigation was to establish gridding and adaptation techniques to predict near-to-mid-field (<10 body lengths below the aircraft) boom signatures at supersonic speeds using the USM3D unstructured grid flow solver. The study began by examining sources along the body the aircraft, far field sourcing and far field boundaries. The study then examined several techniques for grid adaptation. During the course of the study, volume sourcing was introduced as a new way to source grids using the grid generation code VGRID. Two different methods of using the volume sources were examined. The first method, based on manual insertion of the numerous volume sources, made great improvements in the prediction capability of USM3D for boom signatures. The second method (SSGRID), which uses an a priori adaptation approach to stretch and shear the original unstructured grid to align the grid and pressure waves, showed similar results with a more automated approach. Due to SSGRID s results and ease of use, the rest of the study focused on

developing a best practice using SSGRID. The best practice created by this study for boom predictions using the CFD code USM3D involved: 1) creating a small cylindrical outer boundary either 1 or 2 body lengths in diameter (depending on how far below the aircraft the boom prediction is required), 2) using a single volume source under the aircraft, and 3) using SSGRID to stretch and shear the grid to the desired length.
Author
Unstructured Grids (Mathematics); Grid Generation (Mathematics); Sonic Booms; Supersonic Speed; Near Fields; Elastic Waves; Aeronautical Engineering; Computational Fluid Dynamics

20080034649 NASA Langley Research Center, Hampton, VA, USA
A Portable Infrasonic Detection System
Shams, Qamar A.; Burkett, Cecil G.; Zuckerwar, Allan J.; Lawrenson, Christopher C.; Masterman, Michael; August 19, 2008; 13 pp.; In English; 2008 Meeting of the Military Sensing Symposia (MSS) Specialty Group on Battlespace Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, 19-21 Aug. 2008, Laurel, MD, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 167804.08.07.89I1.01; Copyright; Avail.: CASI: A03, Hardcopy

During last couple of years, NASA Langley has designed and developed a portable infrasonic detection system which can be used to make useful infrasound measurements at a location where it was not possible previously. The system comprises an electret condenser microphone, having a 3-inch membrane diameter, and a small, compact windscreen. Electret-based technology offers the lowest possible background noise, because Johnson noise generated in the supporting electronics (preamplifier) is minimized. The microphone features a high membrane compliance with a large backchamber volume, a prepolarized backplane and a high impedance preamplifier located inside the backchamber. The windscreen, based on the high transmission coefficient of infrasound through matter, is made of a material having a low acoustic impedance and sufficiently thick wall to insure structural stability. Close-cell polyurethane foam has been found to serve the purpose well. In the proposed test, test parameters will be sensitivity, background noise, signal fidelity (harmonic distortion), and temporal stability. The design and results of the compact system, based upon laboratory and field experiments, will be presented.
Author
Infrasonic Frequencies; Acoustic Impedance; Windshields; Structural Stability; Background Noise; Impedance; Polyurethane Foam; Signal Distortion

20080034654 NASA Langley Research Center, Hampton, VA, USA
Assessment of Near-Field Sonic Boom Simulation Tools
Casper, J. H.; Cliff, S. E.; Thomas, S. D.; Park, M. A.; McMullen, M. S.; Melton, J. E.; Durston, D. A.; August 18, 2008; 15 pp.; In English; 26th AIAA Applied Aerodynamics Conferen, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 984754.02.07.07.14.03
Report No.(s): AIAA Paper 2008-6592; Copyright; Avail.: CASI: A03, Hardcopy

A recent study for the Supersonics Project, within the National Aeronautics and Space Administration, has been conducted to assess current in-house capabilities for the prediction of near-field sonic boom. Such capabilities are required to simulate the highly nonlinear flow near an aircraft, wherein a sonic-boom signature is generated. There are many available computational fluid dynamics codes that could be used to provide the near-field flow for a sonic boom calculation. However, such codes have typically been developed for applications involving aerodynamic configuration, for which an efficiently generated computational mesh is usually not optimum for a sonic boom prediction. Preliminary guidelines are suggested to characterize a state-of-the-art sonic boom prediction methodology. The available simulation tools that are best suited to incorporate into that methodology are identified; preliminary test cases are presented in support of the selection. During this phase of process definition and tool selection, parallel research was conducted in an attempt to establish criteria that link the properties of a computational mesh to the accuracy of a sonic boom prediction. Such properties include sufficient grid density near shocks and within the zone of influence, which are achieved by adaptation and mesh refinement strategies. Prediction accuracy is validated by comparison with wind tunnel data.
Author
Aerodynamic Configurations; Computational Fluid Dynamics; Sonic Booms; Prediction Analysis Techniques; Grid Generation (Mathematics)

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*.

20080033414 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Improved Feature Extraction, Feature Selection, and Identification Techniques That Create a Fast Unsupervised Hyperspectral Target Detection Algorithm

Johnson, Robert J; Mar 2008; 245 pp.; In English

Report No.(s): AD-A480711; AFIT/GOR/ENS/08-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research extends the emerging field of hyperspectral image (HSI) target detectors that assume a global linear mixture model (LMM) of HSI and employ independent component analysis (ICA) to unmix HSI images. Via new techniques to fully automate feature extraction, feature selection, and target pixel identification, an autonomous global anomaly detector, AutoGAD, has been developed for potential employment in an operational environment for real-time processing of HSI targets. For dimensionality reduction (initial feature extraction prior to ICA), a geometric solution that effectively approximates the number of distinct spectral signals is presented. The solution is based on the theory of the shape of the eigenvalue curve of the covariance matrix of spectral data containing noise. For feature selection, previously a subjective definition called significant kurtosis change was used to denote the separation between targets classes and non-target classes. This research presents two new measures, potential target signal to noise ratio (PT SNR) and max pixel score which computed for each of the ICA features to create a new two dimensional feature space where the overlap between target and non-target classes is reduced compared to the one dimensional kurtosis value feature space. Finally, after target feature selection, adaptive noise filtering, but with an iterative approach, is applied to the signals. The effect is a reduction in the power of the noise while preserving the power of the target signal prior to target identification to reduce false positive detections. A zero-detection histogram method is applied to the smoothed signals to identify target locations to the user. Matlab code for the AutoGAD algorithm is provided.

DTIC

Algorithms; Detection; Imagery; Pattern Recognition; Selection; Target Acquisition

20080033449 Air Force Research Lab., Edwards AFB, CA USA

A Fundamental Classification of Atomization Processes

Lightfoot, Malissa D; Oct 12, 2007; 48 pp.; In English

Contract(s)/Grant(s): Proj-5026

Report No.(s): AD-A480802; AFRL-RZ-ED-JA-2007-451; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A device-independent framework to classify and describe atomization is developed. This framework divides atomizers into various classes based on the geometry of the liquid prior to breakup. These classes are general enough to encompass the vast majority of existent atomizers while still describing important aspects of the atomization physics. Across these classes a limited number of atomization regimes exist which are grouped based on the magnitude and rate of the atomization processes. Existent literature is reviewed to show how it fits into the current construction of five classes (jet, sheet, film, prompt and blob) and three mode (bulk fluid, mixed and surface). This framework also clarifies the underlying physics of the atomization process. This process consists of the initiation and growth of a disturbance followed by its breakdown. Several categories of disturbance initiation and disturbance breakdown are described supported by examples from the literature.

DTIC

Atomizing; Classifications

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*.

20080032793 Idaho National Engineering Lab., Idaho Falls, ID, USA
Evaluation of the HTR-10 Reactor as a Benchmark for Physics Code QA
Terry, W. K.; Kim, S. S.; Montierth, L. M.; Cogliati, J. J.; Ougouag, A. M.; Sep. 2006; 10 pp.; In English
Report No.(s): DE2007-911673; INL/CON-06-11699; No Copyright; Avail.: Department of Energy Information Bridge

The HTR-10 is a small (10 MWt) pebble-bed research reactor intended to develop pebble-bed reactor (PBR) technology in China. It will be used to test and develop fuel, verify PBR safety features, demonstrate combined electricity production and co-generation of heat, and provide experience in PBR design, operation, and construction. As the only currently operating PBR in the world, the HTR-10 can provide data of great interest to everyone involved in PBR technology. In particular, if it yields data of sufficient quality, it can be used as a benchmark for assessing the accuracy of computer codes proposed for use in PBR analysis. This paper summarizes the evaluation for the International Reactor Physics Experiment Evaluation Project (IRPhEP) of data obtained in measurements of the HTR-10s initial criticality experiment for use as benchmarks for reactor physics codes.
NTIS
High Temperature Gas Cooled Reactors; Reactor Physics

20080034675 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Multi-Threaded Event Reconstruction with JANA
Lawrence, D.; Sep. 01, 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC05-06OR23177
Report No.(s): DE2007-914722; JLAB-PHY-07-723; DOE/OR/23177-0142; No Copyright; Avail.: Department of Energy Information Bridge

The C++ reconstruction framework JANA has been written to support the next generation of Nuclear Physics experiments at Jefferson Lab in anticipation of the 12GeV upgrade. The JANA framework was designed to allow multi-threaded event processing with a minimal impact on developers of reconstruction software. As we enter the multi-core (and soon many-core) era, thread-enabled code will become essential to utilizing the full processor power available without invoking the logistical overhead of managing many individual processes. Event-based reconstruction lends itself naturally to mutli-threaded processing. Emphasis will be placed on the multi-threading features of the framework. Test results of the scaling of event processing rates with number of threads are presented.
NTIS
Software Engineering; Reconstruction

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*.

20080032808 NASA Marshall Space Flight Center, Huntsville, AL, USA
Grazing-Incidence Neutron Optics based on Wolter Geometries
Gubarev, M. V.; Ramsey, B. D.; Mildner, D. F. R.; May 11, 2008; 1 pp.; In English; American Conference on Neutron Scattering, 11-15 May 2008, Santa Fe, NM, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The feasibility of grazing-incidence neutron imaging optics based on the Wolter geometries have been successfully demonstrated. Biological microscopy, neutron radiography, medical imaging, neutron crystallography and boron neutron capture therapy would benefit from high resolution focusing neutron optics. Two bounce optics can also be used to focus neutrons in SANS experiments. Here, the use of the optics would result in lower values of obtainable scattering angles. The high efficiency of the optics permits a decrease in the minimum scattering vector without lowering the neutron intensity on sample. In this application, a significant advantage of the reflective optics over refractive optics is that the focus is independent

of wavelength, so that the technique can be applied to polychromatic beams at pulsed neutron sources.
Derived from text
Grazing Incidence; Neutron Sources; Optics; Imaging Techniques; Fabrication

20080032856 Defense Advanced Research Projects Agency, Arlington, VA, USA
Multiple GaInNAs Quantum Wells for High Power Applications
Ha, W., Inventor; Gambin, V., Inventor; Harris, J. S., Inventor; 30 Dec 04; 10 pp.; In English
Contract(s)/Grant(s): DARPA-MDA-972-00-1-0024
Patent Info.: Filed Filed 30 Dec 04; US-Patent-Appl-SN-11-027 436
Report No.(s): PB2008-100440; No Copyright; Avail.: CASI: A02, Hardcopy

In connection with an optical-electronic semiconductor device, improved photoluminescent output is provided at wavelengths approaching and beyond 1.3 .mu.m. According to one aspect, a multiple quantum well strain compensated structure is formed using a GaInNAs-based quantum well laser diode with GaNAs-based barrier layers. By growing tensile-strained GaNAs barrier layers, a larger active region with multiple quantum wells can be formed increasing the optical gain of the device. In example implementations, both edge emitting laser devices and vertical cavity surface emitting laser (VCSEL) devices can be grown with at least several quantum wells, for example, nine quantum wells, and with room temperature emission approaching and beyond 1.3 mu m.
NTIS
Patent Applications; Quantum Wells; Semiconductor Devices; Optical Equipment

20080032858 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA
Compact Imaging Spectrometer Utilizing Immersed Gratings (PAT-APPL-10-920 880)
Chrisp, M. P., Inventor; Lerner, S. A., Inventor; Kuzmenko, P. J., Inventor; Bennett, C. L., Inventor; 17 Aug 04; 17 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 17 Aug 04; US-Patent-Appl-SN-10-920 880
Report No.(s): PB2008-100439; No Copyright; Avail.: CASI: A03, Hardcopy

A compact imaging spectrometer with an immersive diffraction grating that compensates optical distortions. The imaging spectrometer comprises an entrance slit for transmitting light, means for receiving the light and directing the light, an immersion grating, and a detector array. The entrance slit, the means for receiving the light, the immersion grating, and the detector array are positioned wherein the entrance slit transmits light to the means for receiving the light and the means for receiving the light directs the light to the immersion grating and the immersion grating receives the light and directs the light to the means for receiving the light, and the means for receiving the light directs the light to the detector array.
NTIS
Imaging Spectrometers; Patent Applications; Gratings (Spectra)

20080032943 NASA Marshall Space Flight Center, Huntsville, AL, USA
Design Study of an 8 Meter Monolithic Mirror UV/Optical Space Telescope
Stahl, H. Philip; May 23, 2008; 1 pp.; In English; SPIE: Astronomical Instrumentation 2008, 23 - 28 Jun. 2008, Marseille, France; No Copyright; Avail.: Other Sources; Abstract Only

This paper will review a recent NASA MSFC preliminary study that demonstrated the feasibility of launching a 6 to 8 meter class monolithic primary mirror telescope to Sun-Earth L2 using an Ares V. The study started with the unique capabilities of the Ares V vehicle and examined the feasibility of launching a large aperture low cost low risk telescope based on a conventional ground based glass primary mirror. Specific technical areas studied included optical design; structural design/analysis including primary mirror support structure, sun shade and secondary mirror support structure; thermal analysis; launch vehicle performance and trajectory; spacecraft including structure, propulsion, GN & C, avionics, power systems and reaction wheels; operations & servicing, mass budget and system cost. The study telescope was an on-axis three-mirror anastigmatic design with a fine steering mirror. The observatory has a 100 arc-minute (8.4 X 12 arc-minutes) of diffraction limited field of view at a wavelength les than 500 nm. The study assumed that the primary mirror would be fabricated from an existing Schott Zerodur residual VLT blank edged to 6.2 meters, 175 mm thick at the edge with a mass of 11,000 kg. The entire mass budget for the observatory including primary mirror, structure, light baffle tube, instruments, space craft, avionics, etc. is less than 40,000 kg - a 33% mass margin on the Ares V's 60,000 kg Sun-Earth L2 capability. An

8 meter class observatory would have a total mass of less than 60,000 kg of which the primary mirror is the largest contributor. Author

Ultraviolet Telescopes; Spaceborne Telescopes; Mirrors; Design Analysis; Optical Equipment; Optical Properties; Functional Design Specifications

20080033056 Akerman Senterfit, West Palm Beach, FL, USA

Silicon Nanocrystal/Erbium Doped Waveguide (SNEW) Laser

Simpson, J. T., Inventor; 20 Aug 04; 19 pp.; In English

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

Patent Info.: Filed Filed 20 Aug 04; US-Patent-Appl-SN-10-922 735

Report No.(s): PB2008-100716; No Copyright; Avail.: CASI: A03, Hardcopy

A rare earth-doped solid-state integrated laser which includes an optical waveguide, and a laser cavity including at least one subwavelength mirror. The subwavelength mirror is disposed in or on the optical waveguide. The optical waveguide portion within the laser cavity includes active media comprising both a rare earth and semiconducting atoms or compounds. A structure for pumping the semiconducting semiconducting atoms or compounds is provided, such as electrodes sandwiching the active media wherein the semiconducting atoms or compounds transfer energy obtained from the pumping to the rare earth, thus permitting the laser to laze.

NTIS

Additives; Erbium; Laser Materials; Nanocrystals; Patent Applications; Silicon; Solid State Lasers; Waveguide Lasers

20080033076 Ross (Sheridan) PC, Denver, CO, USA

Optical Diagnostics Integrated with Laser Spark Delivery System

Yalin, A., Inventor; Willson, B., Inventor; Defoort, M., Inventor; Collins, G., Inventor; 4 Aug 05; 30 pp.; In English

Contract(s)/Grant(s): DE-FC26-02NT41335

Patent Info.: Filed Filed 4 Aug 05; US-Patent-Appl-SN-11-197 833

Report No.(s): PB2008-100970; No Copyright; Avail.: CASI: A03, Hardcopy

A spark delivery system for generating a spark using a laser beam is provided, and includes a laser light source and a laser delivery assembly. The laser delivery assembly includes a hollow fiber and a launch assembly comprising launch focusing optics to input the laser beam in the hollow fiber. The laser delivery assembly further includes exit focusing optics that demagnify an exit beam of laser light from the hollow fiber, thereby increasing the intensity of the laser beam and creating a spark. Other embodiments use a fiber laser to generate a spark. Embodiments of the present invention may be used to create a spark in an engine. Yet other embodiments include collecting light from the spark or a flame resulting from the spark and conveying the light for diagnostics. Methods of using the spark delivery systems and diagnostic systems are provided.

NTIS

Diagnosis; Laser Beams; Lasers; Patent Applications; Sparks

20080033077 Greenlee Winner and Sullivan, P.C., Boulder, CA, USA

Stretchable Semiconductor Elements and Stretchable Electrical Circuits

Rogers, J. A., Inventor; Khang, D. Y., Inventor; 2 Jun 05; 113 pp.; In English

Contract(s)/Grant(s): DARPA-F8650-04-C-710; DE-FG02-91ER45439

Patent Info.: Filed Filed 2 Jun 05; US-Patent-Appl-SN-11-145 542

Report No.(s): PB2008-100966; No Copyright; Avail.: CASI: A06, Hardcopy

The invention provides methods and devices for fabricating printable semiconductor elements and assembling printable semiconductor elements onto substrate surfaces. Methods, devices and device components of the present invention are capable of generating a wide range of flexible electronic and optoelectronic devices and arrays of devices on substrates comprising polymeric materials. The present invention also provides stretchable semiconductor structures and stretchable electronic devices capable of good performance in stretched configurations.

NTIS

Circuits; Patent Applications; Semiconductors (Materials); Stretching

20080033252 Naval Research Lab., Washington, DC USA

Mechanical Design Report DARPA BOSS Program

Stroman, Richard O; Mar 21, 2008; 84 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480485; NRL/MR/6110--08-9116; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480485

Several prototype zoom (variable magnification) lens systems were developed for use with short-wave infrared cameras as part of the DARPA BOSS program at NRL. These zoom systems relied on novel GRIN (GRadient INdex) lenses, which were used in two ways. The first approach deformed the lenses to alter system magnification, while the second approach moved the lenses relative to one another. This report describes the mechanical designs of both a prototype utlizing the first approach and a prototype utilizing the second approach. Also discussed are the performance of these mechanical systems after fabrication and testing; and possible improvement to be made in future prototypes. Included in the report are detailed mechanical drawings of the last prototype built for this program, which was also the best performing.

DTIC

Cameras; Infrared Radiation; Lenses; Magnification; Mechanical Engineering

20080033278 University of Central Florida, Orlando, FL USA

Semiconductor Optical Nonlinearities in the IR

Van Stryland, Eric; Hagan, David; Sep 2007; 13 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0200

Report No.(s): AD-A480565; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480565

The goal of this research is to perform an experimental study of the nonlinear properties of semiconductors in the infrared spectral region to develop a fundamental understanding of their optical nonlinearities. This research will characterize the nonlinear response of promising materials, model the nonlinear response, design and model nonlinear optical switching systems, and build prototype switches. These materials are useful for a variety of important AF applications including sensor protection and infrared countermeasures.

DTIC

Nonlinear Optics; Semiconductors (Materials)

20080033485 Michigan Univ., Ann Arbor, MI USA

Magnetically Filtered Faraday Probe for Measuring the Ion Current Density Profile of a Hall Thruster

Rovey, Joshua L; Walker, Mitchell L R; Gallimore, Alec D; Peterson, Peter Y; Jan 2006; 9 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0201; F49620-01-1-0061

Report No.(s): AD-A480916; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ability of a magnetically filtered Faraday probe (MFFP) to obtain the ion current density profile of a Hall thruster is investigated. The MFFP is designed to eliminate the collection of low-energy, charge-exchange (CEX) ions by using a variable magnetic field as an ion filter. In this study, a MFFP, Faraday probe with a reduced acceptance angle (BFP), and nude Faraday probe are used to measure the ion current density profile of a 5 kW Hall thruster operating over the range of 300-500 V and 5-10 mg/s. The probes are evaluated on a xenon propellant Hall thruster in the University of Michigan Large Vacuum Test Facility at operating pressures within the range of 4.4 x 10(-4) Pa Xe (3.3 x 10(-6) Torr Xe) to 1.1 10(-3) Pa Xe (8.4 x 10(-6) Torr Xe)in order to study the ability of the Faraday probe designs to filter out CEX ions. Detailed examination of the results shows that the nude probe measures a greater ion current density profile than both the MFFP and BFP over the range of angular positions investigated for each operating condition. The differences between the current density profiles obtained by each probe are attributed to the ion filtering systems employed. Analysis of the results shows that the MFFP, operating at a +5 A solenoid current, provides the best agreement with flight-test data and across operating pressures.

DTIC

Current Density; Faraday Effect; Hall Thrusters; Ion Currents

20080033552 Coie (Perkins), LLP, Menlo, CA, USA

Optical Sensor with Layered Plasmon Structure for Enhanced Detection of Chemical Groups by SERS

Poponin, V., Inventor; 19 May 05; 31 pp.; In English

Contract(s)/Grant(s): AFSOR F49620-04-C-00058

Patent Info.: Filed Filed 19 May 05; US-Patent-Appl-SN-11-133 632
Report No.(s): PB2008-100660; No Copyright; Avail.: CASI: A03, Hardcopy

An optical sensor and method for use with a visible-light laser excitation beam and a Raman spectroscopy detector, for detecting the presence chemical groups in an analyte applied to the sensor are disclosed. The sensor includes a substrate, a plasmon resonance mirror formed on a sensor surface of the substrate, a plasmon resonance particle layer disposed over the mirror, and an optically transparent dielectric layer about 2-40 nm thick separating the mirror and particle layer. The particle layer is composed of a periodic array of plasmon resonance particles having (i) a coating effective to binding analyte molecules, (ii) substantially uniform particle sizes and shapes in a selected size range between 50-200 nm (ii) a regular periodic particle-to-particle spacing less than the wavelength of the laser excitation beam. The device is capable of detecting analyte with an amplification factor of up to 10(sup)12-10(sup)14, allowing detection of single analyte molecules.
NTIS
Chemical Analysis; Optical Measuring Instruments; Patent Applications; Plasmons; Raman Spectroscopy

20080033834 Fish and Richardson, P.C., Minneapolis, MN, USA
Diffraction-Based Pulse Shaping with a 2D Optical Modulator
Vaughan, J., Inventor; Hornung, T., Inventor; Feurer, T. S., Inventor; Nelson, K. A., Inventor; 21 Jul 05; 14 pp.; In English
Contract(s)/Grant(s): NSF CHE-0212375; DAAD 10-01-1-0647
Patent Info.: Filed Filed 21 Jul 05; US-Patent-Appl-SN-11-186 735
Report No.(s): PB2008-100635; No Copyright; Avail.: CASI: A03, Hardcopy

Disclosed is a method including: (1) dispersing frequency components of an input EM waveform along a first direction with each frequency component spatially extended along a second direction different from the first direction; (2) setting an amplitude for an output portion of each of the spatially extended frequency components; and (3) combining the output portions from the different frequency components to produce a temporally shaped output EM waveform, wherein setting the amplitude of each output portion comprises diffracting a corresponding input portion for the spatially extended frequency component along the second direction into different diffraction orders, wherein the combined output portions correspond to a common diffraction order. A system for performing the method is also disclosed.
NTIS
Diffraction; Modulators; Optical Equipment; Patent Applications

20080033835 Baker Botts, LLP, Dallas, TX, USA; Texas A&M Univ., College Station, TX, USA
Method for Characterizing Particles in Suspension from Frequency Domain Photon Migration Measurements
Sevick-Muraca, E. M., Inventor; Sun, Z., Inventor; Huang, Y., Inventor; 16 Aug 05; 35 pp.; In English
Contract(s)/Grant(s): CTS-9876583
Patent Info.: Filed Filed 16 Aug 05; US-Patent-Appl-SN-11-204 844
Report No.(s): PB2008-100634; No Copyright; Avail.: CASI: A03, Hardcopy

Methods are provided for measuring isotropic scattering coefficients of suspensions using multiply scattered radiation that is modulated in amplitude at selected modulation frequencies. The radiation may be light. Quantities describing diffusion of the multiply scattered radiation are preferably measured at a plurality of distances between source and receiver and a plurality of frequencies. Linear regression techniques are provided for maximizing accuracy of the scattering data at a selected wavelength of a radiation. Methods are provided for inversing an integral equation so as to determine a calculated value of scattering coefficient. Parameters are varied to minimize the difference between the calculated and measured scattering coefficients and thereby to determine volume fraction, particle size distribution and interparticle force between the particles in a suspension. By incorporating a first principles model to account for interparticle force, the measurements can be used to determine a parameter governing interparticle forces in a suspension. The suspension may be in a liquid or a gas.
NTIS
Frequencies; Migration; Patent Applications; Photons

20080034438 Naval Observatory, Washington, DC USA
Speckle Interferometry at the USNO Flagstaff Station: Observations Obtained in 2003-2004 and 17 New Orbits
Hartkopf, William I; Mason, Brian D; Rafferty, Theodore J; Apr 2008; 10 pp.; In English
Report No.(s): AD-A480792; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Results are presented for 353 speckle interferometric observations of double stars, obtained in 2003 and 2004 at the USNO Flagstaff Station using the 1.55 m Kaj Strand Astrometric Reflector. Separations range from 0’.12 to 7’.42, with a

median of 0’.42. These two observing runs concentrated on systems in need of improved orbital elements, and new solutions have been determined for 17 systems as a result.
DTIC
Speckle Interferometry; Orbital Elements; Double Stars; Astrometry

20080034584 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Chungbuk National Univ., Korea, Republic of
Magnetic Soft X-Ray Microscopy - Imaging Fast Spin Dynamics in Magnetic Nanostructures
Fischer, P.; Kim, D. H.; Mesler, B. L.; Chao, W.; Sakdinawat, A. E.; Jun. 2007; 3 pp.; In English
Report No.(s): DE2007-902453; No Copyright; Avail.: Department of Energy Information Bridge

Magnetic soft X-ray microscopy combines 15nm spatial resolution with 70ps time resolution and elemental sensitvity. Fresnel zone plates are used as X-ray optics and X-ray magnetic circular dichroism serves as magnetic contrast mechanism. Thus scientifically interesting and technologically relevant low dimensional nanomagnetic systems can be imaged at fundamental length and ultrafast time scales in a unique way. Studies include magnetization reversal in magnetic multilayers, nanopatterned systems, vortex dynamics in nanoelements and spin current induced phenomena.
NTIS
Microscopy; Nanostructures (Devices); Sensitivity; Spatial Resolution; Spin Dynamics; Temporal Resolution; X Ray Imagery; X Rays

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20080033123 NASA Langley Research Center, Hampton, VA, USA
A Study of the Effects of Atmospheric Phenomena on Mars Science Laboratory Entry Performance
Cianciolo, Alicia D.; Way, David W.; Powell, Richard W.; August 18, 2008; 14 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 857464.02.07.08; Copyright; Avail.: CASI: A03, Hardcopy

At Earth during entry the shuttle has experienced what has come to be known as potholes in the sky or regions of the atmosphere where the density changes suddenly. Because of the small data set of atmospheric information where the Mars Science Laboratory (MSL) parachute deploys, the purpose of this study is to examine the effect similar atmospheric pothole characteristics, should they exist at Mars, would have on MSL entry performance. The study considers the sensitivity of entry design metrics, including altitude and range error at parachute deploy and propellant use, to pothole like density and wind phenomena.
Author
Atmospheric Physics; Meteorology; Range Errors; Atmospheric Chemistry

20080033799 DeWitt Ross and Stevens, S.C., Madison, WI, USA
Plasma-Assisted Disinfection of Milking Machines
Denes, F. S., Inventor; Reinemann, D. J., Inventor; Manolache, S. O., Inventor; Helgren, J. M., Inventor; 18 Aug 04; 8 pp.; In English
Contract(s)/Grant(s): USDA-2004-35201-14121
Patent Info.: Filed Filed 18 Aug 04; US-Patent-Appl-SN-10-921 551
Report No.(s): PB2008-100971; No Copyright; Avail.: CASI: A02, Hardcopy

In a milking machine teat cup wherein an animal to be milked has its teat inserted into a teat cup liner during milking, a first electrode extends about or within at least a portion of the teat cup liner. To clean and/or disinfect the liner, a second electrode is inserted into the liner and the two electrodes are charged so as to generate plasma in any free space between the inserted second electrode and the interior surface of the liner. The generated plasma species destroy organisms that cause mastitis, and can additionally kill other unwanted organisms and/or perform cleaning of the liner’s interior.
NTIS
Antiseptics; Cattle; Linings; Patent Applications; Plasmas (Physics)

20080034559 Lawrence Livermore National Lab., Livermore, CA USA

Scrape-Off Layer Transport and Deposition Studies in DIII-D

Groth, M.; Allen, S. L.; Boedo, J. A.; Brooks, N. H.; Elder, J. D.; Oct. 30, 2006; 51 pp.; In English

Report No.(s): DE2007-914619; UCRL-CONF-225694; No Copyright; Avail.: National Technical Information Service (NTIS)

Trace 13CH4 injection experiments into the main scrape-off layer of low density L-mode and high-density H-mode plasmas have been performed in the DIII-D tokamak (Luxon NF02) to mimic the transport and deposition of carbon arising from a main chamber sputtering source. These experiments indicated entrainment of the injected carbon in plasma flow in the main SOL, and transport toward the inner divertor. Ex-situ surface analysis showed enhanced 13C surface concentration at the corner formed by the divertor floor and the angled target plate of the inner divertor in L-mode; in H-mode, both at the corner and along the surface bounding the private flux region inboard of the outer strike point. Interpretative modeling was made consistent with these experimental results by imposing a parallel carbon ion flow in the main SOL toward the inner target, and a radial pinch toward the separatrix. Predictive modeling carried out to better understand the underlying plasma transport processes suggests that the deuterium flow in the main SOL is related to the degree of detachment of the inner divertor leg. These simulations show that carbon ions are entrained with the deuteron flow in the main SOL via frictional coupling, but higher charge state carbon ions may be suspended upstream of the inner divertor X-point region due to balance of the friction force and the ion temperature gradient.

NTIS

Deposition; Plasmas (Physics); Tokamak Devices

20080034565 Lawrence Livermore National Lab., Livermore, CA USA

Studies of Electron and Proton Isochoric Heating for Fast Ignition

Mackinnon, A. J.; Key, M. H.; Akli, K.; Beg, F.; Clarke, R. J.; Oct. 04, 2006; 10 pp.; In English

Report No.(s): DE2007-914614; UCRL-CONF-225008; No Copyright; Avail.: National Technical Information Service (NTIS)

Isochoric heating of inertially confined fusion plasmas by laser driven MeV electrons or protons is an area of great topical interest in the inertial confinement fusion community, particularly with respect to the fast ignition (FI) proposal to use this technique to initiate burn in a fusion capsule. Experiments designed to investigate electron isochoric heating have measured heating in two limiting cases of interest to fast ignition, small planar foils and hollow cones. Data from Cu Ka fluorescence, crystal x-ray spectroscopy of Cu K shell emission, and XUV imaging at 68eV and 256 eV are used to test PIC and Hybrid PIC modeling of the interaction. Isochoric heating by focused proton beams generated at the concave inside surface of a hemi-shell and from a sub hemi-shell inside a cone have been studied with the same diagnostic methods plus imaging of proton induced Ka. Conversion efficiency to protons has also been measured and modeled. Conclusions from the proton and electron heating experiments will be presented. Recent advances in modeling electron transport and innovative target designs for reducing igniter energy and increasing gain curves will also be discussed.

NTIS

Electrons; Heating; Ignition; Isochoric Processes; Plasma Heating; Protons

20080034603 Sandia National Labs., Albuquerque, NM USA

Estimating Z-Pinch Computing Resources

Bruner, T. A.; Apr. 2007; 20 pp.; In English

Report No.(s): DE2007-912926; SAND2007-1504; No Copyright; Avail.: Department of Energy Information Bridge

The Z facility at Sandia National Laboratories produces high energy density environments. Computer simulations of the experiments provide key insights and help make the most efficient use of the facility. This document estimates the computer resources needed in order to support the experimental program. The resource estimate is what we would like to have in about five years and assumes that we will have a robust, scalable simulation capability as well as enough physicists to run the simulations.

NTIS

Estimating; Laboratories; Plasmas (Physics); Zeta Pinch

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20080032936 National Science Foundation, Washington, DC USA
Method and Apparatus for Providing Shear-Induced Alignment of Nanostructure in Thin Films
Angelescu, D. E., Inventor; Waller, J. H., Inventor; Wu, M. W., Inventor; Chaikin, P. M., Inventor; Register, R. A., Inventor; 14 Dec 04; 14 pp.; In English
Patent Info.: Filed Filed 14 Dec 04; US-Patent-Appl-SN-11-011 495
Report No.(s): PB2008-100029; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus is disclosed for providing shear-induced alignment of nanostructures, such as spherical nanodomains, self-assembled nanodomains, and particles, in thin films, such as block copolymer (BCP) thin films. A silicon substrate is provided, and a thin film is formed on the substrate. A pad is then applied to the thin film, and optionally, a weight can be positioned on the pad. Optionally, a thin fluid layer can be formed between the pad and the thin film to transmit shear stress to the thin film. The thin film is annealed and the pad slid in a lateral direction with respect to the substrate to impart a shear stress to the thin film during annealing. The shear stress aligns the nanostructures in the thin film. After annealing and application of the shear stress, the pad is removed, and the nanostructures are uniformly aligned.
NTIS
Alignment; Nanostructure (Characteristics); Nanostructures (Devices); Thin Films

20080033090 National Bureau of Standards, Washington, DC, USA; General Electric Research and Development, Schenectady, NY, USA
Superconductive Materials and Some of their Properties
Roberts, B. W.; May 1969; 134 pp.; In English; Original contains black and white illustrations
Report No.(s): NBS Technical Note 482; No Copyright; Avail.: CASI: A07, Hardcopy

This is a noncritical compilation of data on superconductive materials that has been extracted from a portion of the literature published up to early 1968. The properties concerned are composition, critical temperature, critical magnetic field, crystallographic data, and lowest temperature tested for superconductivity. The compilation also includes, bibliography, general reference review articles and a special tabulation of high magnetic field superconductors.
Author
Superconductivity; Superconductors (Materials)

20080033744 Air Force Research Lab., Eglin AFB, FL USA
Positrons, Quantum Crystals, and Nanoparticles (Oh My!) - Quantum Mechanics in Action at the USAF
Lindsay, C M; Apr 2008; 61 pp.; In English
Report No.(s): AD-A480284; AFRL-RW-EG-TP-2008-7408; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480284

CONCLUSIONS: Solid parahydrogen produced by Rapid Vapor Deposition is amenable to Polarization Spectroscopy: Facilitates the assignment of the crystal field fine structure in the spectra of rotating dopants; * Sheds light on cluster formation in doped parahydrogen samples; * Provides new insight into the annealing behavior of the solid parahydrogen produced by RVD; * Electron and Positron irradiation of solid hydrogen presently underway.
DTIC
Crystals; Nanoparticles; Positrons; Quantum Mechanics; Quantum Theory

20080033930 Hamilton, Brook, Smith and Reynolds, Concord, MA, USA; Kopin Corp., Taunton, MA, USA
Domain Epitaxy for Thin Film Growth
Narayan, J., Inventor; 18 Jan 05; 14 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725; W-31-109-ENG-38
Patent Info.: Filed Filed 18 Jan 05; US-Patent-Appl-SN-11-038 008
Report No.(s): PB2008-100614; No Copyright; Avail.: CASI: A03, Hardcopy

A method of forming an epitaxial film on a substrate includes growing an initial layer of a film on a substrate at a

temperature T(sub growth), said initial layer having a thickness h and annealing the initial layer of the film at a temperature T(sub anneal), thereby relaxing the initial layer, wherein said thickness h of the initial layer of the film is greater than a critical thickness h(sub c). The method further includes growing additional layers of the epitaxial film on the initial layer subsequent to annealing. In some embodiments, the method further includes growing a layer of the film that includes at least one amorphous island.
NTIS
Epitaxy; Patent Applications; Thin Films

20080034569 Lawrence Livermore National Lab., Livermore, CA USA
High Power Picosecond Laser Pulse Recirculation
Shverdin, M. Y.; Jovanovic, I.; Gibson, D.; Hartemann, F.; Anderson, S.; Mar. 27, 2007; 5 pp.; In English
Report No.(s): DE2007-914608; UCRL-PROC-229440; No Copyright; Avail.: National Technical Information Service (NTIS)

We designed and constructed a nonlinear crystal-based short pulse recirculation cavity that traps the second harmonic of an incident high power laser. This scheme aims to increase the efficiency of Compton-scattering based light sources.
NTIS
Cavities; Circulation; High Power Lasers; Picosecond Pulses; Pulsed Lasers

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*.

20080033148 Naval Postgraduate School, Monterey, CA USA
An Instability Theory of Air-Sea Interaction for Coastal Upwelling
Chu, P C; Aug 1988; 11 pp.; In English
Contract(s)/Grant(s): ATM; 83-14206
Report No.(s): AD-A480256; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480256

A surface wind (seabreeze) thermally generated by differential sea surface temperature, is introduced to Gill-Clarke's model (1974) trough wind stress for investigating the effects of seabreeze on coastal upwelling A coupled air-sea system is treated as an eigenvalue problem. The solutions show that the thermally forced local winds break down the coastal Kelvin wave into three parts: small-scale (L<100 km) growing and stationary modes, mesoscale (100 km<L<200 km) decaying and fast-moving modes, and 'large'-scale (L>200 km) coastal Kelvin modes The consistency of the length scale between the most growing mode predicted by this mode and the observed cold/warm alternation pattern of surface water near the Peruvian Coast (around 13 S) implies that seabreeze may play some role in coastal upwelling.
DTIC
Air Water Interactions; Coasts; Ocean Surface; Sea Water; Surface Temperature; Upwelling Water

20080033272 Naval Postgraduate School, Monterey, CA USA
On Haney-Type Surface Thermal Boundary Conditions for Ocean Circulation Models
Chu, Peter C; Chen, Yuchun; Lu, Shihua; May 1998; 13 pp.; In English
Report No.(s): AD-A480546; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480546

Haney-type surface thermal boundary conditions linearly connect net downward surface heat flux Q to air sea temperature difference (gradient-type condition) Delta T1 or to climate/synoptic sea temperature difference (restoring- type condition) Delta T2 by a coupling coefficient k. In this study, the authors used the global reanalyzed data (6-h resolution) of Q, surface air temperature T-alpha, and sea surface temperature To from the National Centers for Environmental Prediction during 1 October 1994-31 December 1995 to verify the validity of Haney-type surface thermal boundary conditions. First, daily means of these variables were computed to get rid of diurnal variation. Second, the cross-correlation coefficients (CCC) between Q and (Delta T1, Delta T2) were calculated. The ensemble mean CCC fields show (i) no correlation between Q and Delta T2 anywhere in the world oceans, (ii) no correlation between Q and Delta T1 in the equatorial regions, and (c) evident correlation (CCC greater or equal to 0.7) between Q and Delta T1 in the middle and high latitudes. Third, the variance analysis was

conducted and a value of 70 W m(-2) K(-1) (65 W m(-2) K(-1)) was suggested for the coupling coefficient k in the northern (southern) middle and high latitude zone. Thus, the authors find that the restoring-type surface thermal conditions by no means represent the net air - ocean heat flux anywhere in the world oceans. However, the gradient-type surface thermal condition represents the net heat flux quite well for the middle and high latitudes. In addition, it is also found that, if the solar shortwave component is treated separately, the gradient-type condition will have more fidelity for the middle and high latitudes.
DTIC
Boundary Conditions; Heat Flux; Ocean Currents; Ocean Models; Statistical Analysis; Surface Properties

20080033325 Naval Postgraduate School, Monterey, CA USA
South China Sea Warm Pool Detected in Spring from the Navy's Master Oceanographic Observational Data Set (MOODS)
Chu, Peter C; Tseng, Hsing-Chia; Chang, C P; Chen, J M; Jul 15, 1997; 12 pp.; In English
Report No.(s): AD-A480664; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480664

A South China Sea warm pool with sea surface temperature (SST) higher than 29.5C, recently reported by Chu and Chang [1995a, b] and Chu et al. [1997}, appears in the central South China Sea (west of the Luzon Island) in boreal spring, strengthens until the onset of the summer monsoon (mid-May) and then weakens and disappears at the end of May. The transient features and interannual variabilities of the warm pool have not yet been studied. Here we use a subset of the U.S. Navy's Master Oceanographic Observation Data Set (MOODS) to investigate the surface thermal features. First, we employed an optimal interpolation scheme to build up a 10-day interval synoptic data set for December 1963 to November 1984 on a 0.5c x 1c grids (finer resolution in zonal direction) from the MOODS SST data. An ensemble mean SST field (T) was established with a rather weak horizontal gradient (28.5C near the Palawan Island to 26C near the southeast China coast). Second, we performed a composite analysis to obtain the averaged SST anomaly field ~T deviating from the ensemble mean for the winter and spring seasons (December- May). During December-March, ~T is negative almost everywhere throughout the whole South China Sea. In early April, positive ~T with closed isoline (warm pool) was evident west of Luzon Island. In May, the central SCS warm anomaly becomes stronger. On May 11-20, the central SCS warm pool (114-119E, 14-19N) has ~T > 1.8C. The size of the warm pool is around 200,000 km2.
DTIC
China; Coasts; Moods; Oceanographic Parameters; Seas; Surface Temperature; Thermodynamic Properties

20080033328 Naval Postgraduate School, Monterey, CA USA
Temporal and Spatial Variabilities of the South China Sea Surface Temperature Anomaly
Chu, Peter C; Lu, Shihua; Chen, Yuchun; Sep 15, 1997; 20 pp.; In English
Report No.(s): AD-A480667; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480667

No abstract available
Anomalies; China; Ocean Currents; Sea Surface Temperature; Seas; Surface Temperature

20080033335 Naval Postgraduate School, Monterey, CA USA
Temporal and Spatial Variabilities of the South China Sea Surface Temperature Anomaly
Chu, Peter C; Lu, Shihua; Chen, Yuchun; Mar 1997; 20 pp.; In English
Report No.(s): AD-A480680; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480680

No abstract available
Anomalies; China; Sea Surface Temperature; Seas; Surface Temperature

20080033337 Pennsylvania State Univ., University Park, PA USA
Discontinuous Galerkin FEM Formulation for Linear Thermo-Elasto-Dynamic Problems
Costanzo, Francesco; Feb 2008; 8 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0007
Report No.(s): AD-A480682; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480682

The project's objective is to enhance the state of the art in the dynamic fracture modeling of thermo-elastic materials by

studying the effects of temperature and rate dependence of the fracture properties on the resulting dynamic failure behavior. The project includes the development of (1) a discontinuous Galerkin space-time finite element method (DGFEM) for linear thermo-elasto-dynamic problems; (2) modeling the rate and temperature sensitive fracture properties via cohesive zone (CZ) models. The CZ modeling will include the study of fracture under two failure criteria, a critical crack opening displacement one and a maximum stress one. The project began December 1, 2004. Accomplishments to date are: (1) a DGFEM that is unconditionally stable; (2) a computer code implementation of such FEM scheme capable of adaptive self-refinement; (3) a new technique based on the immersed boundary method for the modeling of crack surfaces in FE calculations in which the crack representation is completely independent of the underlying FE grid. A paper reporting the formulation in question and companion calculations has been accepted pending reviews and three others are under development. The implementation of CZ models in FEM has yet to begin.
DTIC
Discontinuity; Galerkin Method; Thermoelasticity

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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*.

20080032802 NASA Marshall Space Flight Center, Huntsville, AL, USA
SERVIR: Environmental Decision Making in the Americas
Lapenta, William; Irwin, Dan; May 27, 2008; 1 pp.; In English; AGU 2008 Joint Assembly Conference, 27-30 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

SERVIR is a regional visualization and monitoring system for Mesoamerica that integrates satellite and other geospatial data for improved scientific knowledge and decision making by managers, researchers, students, and the general public. SERVIR addresses the nine societal benefit areas of the Global Earth Observation System of Systems (GEOSS). This talk will provide an overview of products and services available through SERVIR.
Author
Decision Making; Earth Observations (From Space); Remote Sensing

20080033008 National Kaohsiung Marine Univ., Kaohsiung, Taiwan, Province of China
A Novel Grey-Based Feature Ranking Method for Feature Subset Selection
Huang, Chi-Chun; Chang, Hsin-Yun; Yang, Cheng-Hong; Journal of the Chinese Institute of Engineers, Volume 31, No. 3; May 2008, pp. 509-514; In English; See also 20080032994
Contract(s)/Grant(s): NSC 95-2221-E-022-010; Copyright; Avail.: Other Sources

In this paper, a novel grey-based feature ranking method for feature subset selection is proposed. The classification effectiveness of each attribute of a specific classification problem is proposed and then each attribute can be ranked. Features with higher classification effectiveness are more important and relevant and thus considered as the final feature subset for pattern classification. Experiments performed on various application domains are reported to demonstrate the performance of the proposed approach. The proposed approach yields better performance than other existing feature subset selection methods and is helpful for improving the classification accuracy in pattern classification.
Author
Classifications; Data Mining; Machine Learning; Ranking; Domains; Accuracy

20080033083 Blakely Sokoloff Taylor and Zafman, Los Angeles, CA, USA
Retrieval and Display of Data Objects Using a Cross-Group Ranking Metric
Gerasoulis, A., Inventor; Wang, W., Inventor; Seo, H. J., Inventor; 13 Oct 05; 7 pp.; In English
Contract(s)/Grant(s): DARPA-Z-883601
Patent Info.: Filed Filed 13 Oct 05; US-Patent-Appl-SN-11-250 341
Report No.(s): PB2008-100956; No Copyright; Avail.: CASI: A02, Hardcopy

Techniques to assign a ranking value to objects in a database such as a collection of cross referencing documents, the World-Wide Web or a hyperlinked database are described. The ranking value assigned to a given data object represents a cross-cluster strength metric and is a function of the object's importance across all groups or clusters in which the object is classified. The cross-cluster strength metric may be particularly beneficial in enhancing the performance of web-based search

engines because it emphasizes the importance of objects that appear in multiple groups while de-emphasizing the importance of objects that, while highly linked within one or a few groups, are relatively unlinked to objects in other groups.
NTIS
Patent Applications; Ranking

20080033141 Army Construction Engineering Research Lab., Champaign, IL USA
Requirements Composer: User's Manual
Nachtigall, Susan D; Brucker, Beth A; Oct 2004; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-622784AT41
Report No.(s): AD-A480222; ERDC/CERL-SR-04-29; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480222

Facility Composer is a suite of tools for use by facility planners, designers, and engineers during the initial phases of facility planning and design. In Facility Composer, customer-specific and computable criteria are associated with a growing facility model that continues throughout the life cycle of the facility. Facility Composer's ability to maintain a linkage between criteria and project elements (site, building, story, etc.) is beneficial in that it: (1) helps in defining criteria and recording their rationale; (2) helps ensure that critical criteria are followed, and that desired characteristics are recorded and addressed; (3) helps organize criteria and makes them available at their point of use; and (4) simplifies creation, maintenance, and distribution of new criteria. This work has developed user documentation for the Requirements Composer application, to help users develop corporate and building specific criteria libraries.
DTIC
Manuals; User Manuals (Computer Programs); User Requirements

20080033155 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Delphi Study Assessing Long-Term Access to Electronic Medical Records (EMR)
Nicholson, Byron D; Mar 2008; 82 pp.; In English
Report No.(s): AD-A480268; AFIT/GIR/ENV/08-M15; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480268

This research effort addressed the issue of long-term access to electronic medical records as technological generations become obsolete, thereby preventing the access to patient health information. Using the Delphi methodology, experts with experience in electronic medical records and applicable systems provided insight based on their years of hands-on experience managing and/or using records and these systems. The end result of this research was a collection of ideas that medical institutions and medical informaticians must consider to ensure that patients and hospitals do not lose long-term access to electronic medical records as electronic medical records and technology continually evolves. Results of the study identified the need for more research in this particular area as no definitive solution to long-term access to electronic medical records was revealed. Additionally, the research findings highlighted the fact that a few medical institutions may actually be concerned about long-term access to electronic records.
DTIC
Computer Techniques; Delphi Method (Forecasting)

20080033180 Air Force Research Lab., Mesa, AZ USA
Directory of AFRL/HEA Technical Publications Submitted to DTIC from 1969 to 2007
Bell, Herbert H; Casey, Elizabeth P; Sep 2007; 77 pp.; In English
Contract(s)/Grant(s): Proj-1123
Report No.(s): AD-A480314; AFRL-HE-AZ-TR-2007-0008; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480314

Since 1969, the Air Force Research Laboratory, Human Effectiveness Directorate, Warfighter Readiness Research Division (AFRL/HEA) has submitted technical publications to the Defense Technical Information Center (DTIC) documenting the unique research and development efforts conducted by this organization to improve warfighter training. However, since the inception of AFRL/HEA, there have been many name changes to reflect the basic mission of this organization. The list of documents in this paper was prepared to assist the user in finding all publications published by this division, regardless of the organization name at the time of publication. This paper is a chronological listing of all division

publications. The list includes the AFRL document number, the DTIC accession document (AD) number, job order number (JON), report title, and author(s), of all the documents that were published by the Warfighter Readiness Research Division since its inception in 1969.
DTIC
Bibliographies; Directories; Education; Military Technology; Research and Development

20080033214 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Empirical Investigation of Factors Influencing Knowledge Management System Success
Whitfield, Jr, John F; Mar 2008; 108 pp.; In English
Report No.(s): AD-A480394; AFIT/GIR/ENV/08-M24; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480394

Knowledge has been viewed as a critical component for organizations. Consequently, organizations implement Knowledge Management Systems (KMSs) to seek competitive advantages, but they may encounter mixed results. This research draws on previous information system and knowledge management system success-related literature and selects eight factors that are believed to be critical for the successful implementation of a KMS. These factors were derived through a literature search of current KMS success-related literature. The purpose of this study is to identify factors that could have a clear influence on the development and implementation of KMSs. The study presents the empirical examination of a theoretical model of KMS success for predicting system use by law enforcement officers. The research findings were accomplished through a validated questionnaire that surveyed 10 law enforcement officers from various agencies. These results contribute to the literature by empirically supporting the hypothesized relationships between identified success factors and KMS success. Though limited in sample size, this research can serve as a foundation for future studies, which can help identify other factors critical for KMS success. The comprehensive model can be used to undertake further research and thus add value to knowledge management system-based literature. In addition to its theoretical contributions, the study also presents important practical implications through the identification of specific infrastructure capabilities leading to KMS success.
DTIC
Information Management; Information Systems; Law (Jurisprudence); Management Systems; Organizations

20080033217 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Simulation of National Intelligence Process with Fusion
Lupa, Joseph; Mar 2008; 87 pp.; In English
Report No.(s): AD-A480399; AFIT/GOR/ENS/08-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480399

This work is a follow-on effort of two previous Master's theses. The first was 'Modeling and Simulation of the Military Intelligence Process' by Captain Carl Pawling in 2004. The other was 'A Knowledge Matrix Modeling of the Intelligence Cycle' by Captain Kevin Whaley in 2005. Both of these theses were done to facilitate the study and analysis of the intelligence process for the National Security Space Organization (NSSO). Here, modifications are made to the Pawling model to include tasking multiple intelligence sources for data collection to fulfill Requests for Information (RFIs) and fusing the collected data into one new piece of intelligence. One fusion method is the one suggested by Whaley, which simply takes the best intelligence collected, while the other method captures the synergy of intelligence fusion. The two methods are compared to each other and to a baseline model where no fusion takes place.
DTIC
Computerized Simulation; Data Acquisition; Information Management; Intelligence; Multisensor Fusion; Simulation

20080033219 Navy Personnel Research Studies and Technology, Millington, TN USA
Annotated Bibliography of Diversity Research Issues in the Navy and U. S. Military
Burress, Landrus; Uriell, Zannette A; Kee, Amanda R; Rosenfeld, Paul; Alderton, David L; Apr 2008; 141 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480403; NPRST-TN-08-6; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480403

The Navy Personnel Research, Studies, and Technology Department (NPRST) (formerly Navy Personnel Research and Development Center) has been conducting research for many years on aspects of diversity and diversity-related issues such

as equal opportunity, discrimination, equity in discipline, sexual harassment, and pregnancy and parenthood in the Navy. Recently, top Navy leadership has expressed support for an encompassing diversity framework to guide Navy policy in these areas with the goals being to maximize teamwork and productivity so as to increase mission readiness. This Annotated Bibliography includes references to journal articles and reports about aspects of diversity issues in the Navy and, where appropriate, in the U.S. military as well. Additional references relate to diversity in the civilian workplace.
DTIC
Annotations; Bibliographies; Navy; Periodicals

20080033245 Naval Academy, Annapolis, MD USA
Ontology-Driven Information Extraction with OntoSyphon
McDowell, Luke K; Cafarella, Michael; Jan 2006; 17 pp.; In English
Contract(s)/Grant(s): MIPR-N0001405WR20153; N00014-02-1-0324
Report No.(s): AD-A480453; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480453

The Semantic Web's need for machine understandable content has led researchers to attempt to automatically acquire such content from a number of sources, including the web. To date, such research has focused on 'document-driven' systems that individually process a small set of documents, annotating each with respect to a given ontology. This paper introduces OntoSyphon, an alternative that strives to more fully leverage existing ontological content while scaling to extract comparatively shallow content from millions of documents. OntoSyphon operates in an 'ontology-driven' manner: taking any ontology as input, OntoSyphon uses the ontology to specify web searches that identify possible semantic instances, relations, and taxonomic information. Redundancy in the web, together with information from the ontology, is then used to automatically verify these candidate instances and relations, enabling OntoSyphon to operate in a fully automated, unsupervised manner. A prototype of OntoSyphon is fully implemented and we present experimental results that demonstrate substantial instance learning in a variety of domains based on independently constructed ontologies. We also introduce new methods for improving instance verification, and demonstrate that they improve upon previously known techniques.
DTIC
Computer Programs; Data Processing; Extraction

20080033476 RAND Corp., Santa Monica, CA USA
Analyzing Contingency Contracting Purchases for Operation Iraqi Freedom (Unrestricted Version)
Baldwin, Laura H; Ausink, John A; Campbell, Nancy F; Drew, John G; Roll, Jr, Charles R; Jan 2008; 115 pp.; In English
Contract(s)/Grant(s): FA7014-06-C-0001
Report No.(s): AD-A480884; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force asked RAND Project AIR FORCE to gather and analyze data on goods and services purchased to support Air Force missions in Operation Iraqi Freedom (OIF) in an effort to determine the size and extent of contractor support, and how plans for and the organization and execution of contingency contracting activities might be improved so that Contingency Contracting Officers (CCOs) can better support the warfighter in future operations. The motivation for undertaking this study was twofold. First, the contracting community did not have a comprehensive, detailed database of contingency purchases that would allow analyses of the types and amounts of goods and services purchased to support Air Force mission activities. Second, it was thought that insights from analyses of recent contingency contracting experiences would help inform decisions about a number of important policy issues related to planning, training, and CCO assignments. Such data could also be used to seek improvements in purchasing practices across the theater. The analyses presented here are based on CCO purchases occurring at purchasing organizations located within the CENTCOM AOR that supported OIF during FYs 2003 and 2004. The authors provide a baseline analysis of purchases, and then they describe the details of these transactions in terms of who made purchases, what types of goods and services were purchased, when the purchases were made, how the purchases were made (contracting tools used), and from whom (suppliers) the purchases were made. They then use these data to illustrate how such analyses can be applied to improve the following: (1) the alignment of contracting personnel with demands in theater, (2) the preparation of CCOs prior to deployment, (3) the ability of combat support planners to make trade-offs between advanced purchasing and management of resources and purchasing in theater as needed, and (4) the sharing of lessons among CCOs in theater.
DTIC
Contingency; Contract Management; Costs; Data Bases; Government Procurement; Logistics Management

20080033563 Department of Defense, Washington, DC USA

The Power of Information: Where it's Needed, When it's Needed, To Those Who Need It

Sep 1, 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480827; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Defense transformation hinges on the recognition that information is our greatest source of power. Information can be leveraged to allow decision makers at all levels to be more effective, make better decisions faster, and act sooner. Ensuring timely and trusted information is available where it is needed, when it is needed, and to those who need it is at the heart of the capability needed to conduct Net-Centric Operations (NCO). The DoD Chief Information Officer (CIO) provides the leadership to meet the Net-Centric vision and ultimately deliver the critical enabling capabilities required by the National Defense Strategy. Transforming to a Net-Centric Force requires fundamental changes in process, policy, and culture across the Department (defense operations, intelligence functions, and business processes). The technological change will be significant, but the cultural shift may be even more challenging. The hallmark of the 21st century is uncertainty. Net-Centricity is rooted in a simply principle: Confront uncertainty with agility. To be agile, data can no longer be 'owned'... it must be shared.
DTIC

Command and Control; Information Management

20080033890 Department of Energy, Oak Ridge, TN, USA

Workshop Panel Report on Accelerating the Spread of Knowledge about Science and Technology. An Examination of the Needs and Opportunities

Feb. 27, 2007; 28 pp.; In English

Report No.(s): PB2008-101075; No Copyright; Avail.: CASI: A03, Hardcopy

This workshop report includes observations, suggestions, and conclusions arrived at by a group of individuals with experience in several aspects of the problems associated with the rapid dissemination of scientific and technical information and knowledge. Deliberations of the participants were informed through presentations made by staff members of the Office of Scientific and Technical Information (OSTI), an element of the Office of Science in the U.S. Department of Energy (DOE). Rapid advances in information and communication technologies, often termed the advent of the Internet Age, afford compelling possibilities for those working at the leading edge of scientific and technical disciplines to achieve unfettered access to the information and knowledge they need to remain competitive in their fields. These changes also put responsibilities on the funding agencies to ensure that these possibilities are realized. The Department has embraced this opportunity brought about by the Internet Age, transitioning from information dissemination by the transport of atoms (i.e., paper in the form of printed journals, etc.) to the transport of photons (i.e., broadband communication on a world scale at the speed of light). DOE and many other institutions have struggled to keep up with the rate of change that occurred and continues without apparent limit. Within DOE, OSTI has innovatively responded to the challenges of emerging new information technologies and has parlayed these into the development of excellent new products and services. OSTI has made the transition from a printing press era to the electronic communication era in those activities for which it has responsibility in the Department of Energy. OSTI has also worked to broaden the ability of scientists and engineers to have access to a wider world of information and knowledge than just that generated by DOE programs. Within the government, OSTI has been both a technical leader, capitalizing on the Internet Age, and an organizational leader, promoting partnerships among agencies and governments to broaden access by researchers and the general public. This workshop report consists of three main sections: the vision, the current environment, and observations/conclusions.
NTIS

Information Dissemination; Research and Development; Technologies

20080033891 Department of Energy, Oak Ridge, TN, USA

DOE Science Accelerator: Advancing Science by Accelerating Science Access

Jun. 2006; 16 pp.; In English

Report No.(s): PB2008-101073; No Copyright; Avail.: CASI: A03, Hardcopy

To accelerate discovery, it is essential to accelerate the diffusion of science knowledge. This calls for a new era in the sophistication and breadth of the tools to access and use scientific knowledge. Herein, the Office of Scientific and Technical Information (OSTI), an organization of the U.S. Department of Energy (DOE) Office of Science, proposes the DOE Science Accelerator. Why build the DOE Science Accelerator. Because it is impractical for researchers to spend time finding and sifting through hundreds, if not thousands, of information sources in various disciplines and still have time for life-altering discoveries of their own. Scientists and science-attentive citizens need a time-saving single-search interface for the whole of science. They need to explore the deep Web, where specialized databases are beyond the reach of surface Web crawlers such

as Yahoo and Google. They need transformational knowledge-diffusion technologies that enable robust and rapid scientific discovery. The DOE Science Accelerator will meet those needs. Why now. Because it is now possible to develop the technology, and the foundation has been laid. A significant milestone was achieved in 2002 when Science.gov introduced the capability to search 30 major databases of federal science agencies. OSTI pioneered this effort, but it has taken the cooperative effort of 16 information organizations from 12 executive branch agencies to successfully launch and sustain this authoritative gateway to scientific knowledge. It is estimated that there are as many as 1,000 additional sources of scientific merit throughout the world of university, non-federal and foreign research entities. Information customers will only be able to reap the full benefit of these resources with the help of global search technology. Specifically, to accelerate advances in science and maximize the return on research investment, it is essential to create a global search capability to make these resources searchable and accessible.

NTIS

Data Bases; Information Systems; Estimating; Scientific Visualization

20080033893 Department of Energy, Germantown, MD, USA

Global Ocean Surface Water Partial Pressure of CO2 Database: Measurments Performed during 1968-2006. Version 1.0

Takahashi, T.; Sutherland, S. C.; Sep. 2007; 20 pp.; In English

Report No.(s): PB2008-101070; ORNL/CDIAC-152; NDP-088; No Copyright; Avail.: National Technical Information Service (NTIS)

More than 3 million measurements of surface water partial pressure of CO2 obtained over the global oceans during 19682006 are listed in the Lamont-Doherty Earth Observatory (LDEO) database, which includes open ocean and coastal water measurements. The data assembled include only those measured by equilibrator-CO2 analyzer systems and have been quality-controlled based on the stability of the system performance, the reliability of calibrations for CO2 analysis, and the internal consistency of data. To allow re-examination of the data in the future, a number of measured parameters relevant to pCO2 measurements are listed. The overall uncertainty for the pCO2 values listed is estimated to be - 2.5 iatm on the average. The data presented in this database include the analyses of partial pressure of CO2 (pCO2), sea surface temperature (SST), sea surface salinity (SSS), pressure of the equilibration, and barometric pressure in the outside air from the ships observation system. The global pCO2 data set is available free of charge as a numeric data package (NDP) from the Carbon Dioxide Information Analysis Center (CDIAC).

NTIS

Carbon Dioxide; Data Bases; Observatories; Ocean Surface; Oceans; Partial Pressure; Surface Water; Water Pressure

20080033938 North Carolina Univ., Chapel Hill, NC, USA

Pedestrian and Bicyclist Intersection Safety Indices. User Guide, April 2007

Carter, D. L.; Hunter, W. W.; Zegeer, C. V.; Stewart, J. R.; Apr. 2007; 54 pp.; In English

Contract(s)/Grant(s): DTFH61-00-C-00071

Report No.(s): PB2008-101294; No Copyright; Avail.: National Technical Information Service (NTIS)

The primary objective of this study was to develop safety indices to allow engineers, planners, and other practitioners to proactively prioritize intersection crosswalks and intersection approaches with respect to pedestrian and bicycle safety. The study involved collecting data on pedestrian and bicycle crashes, conflicts, avoidance maneuvers, and subjective ratings of intersection video clips by pedestrian and bicycle experts. There were a total of 68 intersection crosswalks selected for the pedestrian analysis from the cities of Philadelphia, PA; San Jose, CA; and Miami-Dade County, FL. The bicycle analysis included 67 intersection approaches from Gainesville, FL; Philadelphia, PA; and Portland and Eugene, OR. Prioritization models were developed based on expert safety ratings and behavioral data. Indicative variables included in the pedestrian safety index model included type of intersection control (signal or stop sign), number of through lanes, 85th percentile vehicle speed, main street traffic volume, and area type. Indicative variables in the bicycle safety models (for through, right-turn, and left-turn bike movements) included various combinations of: presence of bicycle lane, main and cross street traffic volumes, number of through lanes, presence of on-street parking, main street speed limit, presence of traffic signal, number of turn lanes, and others. Through this User Guide, practitioners will be able to use the safety indices to identify which crosswalks and intersection approaches have the highest priority for in-depth pedestrian and bicycle safety evaluations and subsequently use other tools to identify and address potential safety problems.

NTIS

Safety; Safety Factors; Traffic

20080034460 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Case-Based Exploration of Task/Technology Fit in a Knowledge Management Context

Moseley, Michael W; Mar 2008; 138 pp.; In English

Report No.(s): AD-A480318; AFIT/GIR/ENV/08-M19; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480318

Task/Technology Fit (TTF) posits that as the intersection of the task domain and the capabilities of an information system (IS) increases in magnitude, the performance gains experienced by user through use of the IS will be positively impacted. While rooted in the traditional IS literature, this research proposes that TTF be extended to incorporate additional factors unique to the context of Knowledge Management (KM). Based upon the findings of this research, it is reasonable to conclude that when employing the TTF model to determine KMS fitness, additional factors other than the task requirements and KMS capabilities should be considered. This research also shows that the social ecology present within the organization has significant impacts on KMS fit. Finally, this research lends credibility to the idea that KMS are indeed a unique subset of IS and that traditional IS models (such as TTF) should reflect the unique social nature of KM.

DTIC

Information Management; Information Systems

20080034616 Choate, Hall and Stewart, Boston, MA, USA

Methods of Classifying, Diagnosing, Stratifying and Treating Cancer Patients and Their Tumors

Botstein, D., Inventor; Brown, P. O., Inventor; Perou, C. M., Inventor; Ring, B., Inventor; Ross, D., Inventor; 10 Aug 05; 76 pp.; In English

Contract(s)/Grant(s): NCI-CA77097

Patent Info.: Filed Filed 10 Aug 05; US-Patent-Appl-SN-11-200 822

Report No.(s): PB2008-100742; No Copyright; Avail.: CASI: A05, Hardcopy

The invention provides a variety of reagents for use in the diagnosis and management of cancer, particularly breast cancer. cDNA microarray technology was used to identify genes whose expression profile across a large group of tumor samples correlates with that of cytokeratin 5 and cytokeratin 17, markers for basal cells of the normal mammary lactation gland. The invention demonstrates that tumors that express cytokeratin 5/6 and/or 17 have a poor prognosis relative to tumors overall. The invention provides basal marker genes and their expression products and uses of these genes for diagnosis of cancer and for identification of therapies for cancer. In particular, the invention provides basal marker genes including cadherin3, matrix metalloproteinase 14, and cadherin EGF LAG seven-pass G-type receptor 2. The invention provides antibodies to the polypeptides expressed by these genes and methods of use thereof.

NTIS

Cancer; Classifications; Diagnosis; Patent Applications; Patients; Stratification; Tumors

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.

20080032917 Michigan Univ., Ann Arbor, MI USA

Can Proactive Fuel Economy Strategies Help Automakers Mitigate Fuel-Price Risks

McManus, W.; Sep. 2006; 60 pp.; In English

Report No.(s): PB2007-113825; UMTRI-2006-38; No Copyright; Avail.: CASI: A04, Hardcopy

Detroit automakers opposed mandatory improvements in fuel economy when legislation was first proposed in the early 1970s, and continue to resist increases in the standards today. Their opposition appears to stem from an assumption that new-vehicle buyers value higher fuel economy only when fuel prices are extremely high. Automakers thus believe that higher fuel economy standards would diminish their profits, especially if fuel prices were much lower. Events of 2005 have made it clear that consumers are reacting to higher fuel prices by migrating to more fuel-efficient options; primarily to the detriment of Detroit automakers market share and profits. The authors discuss the economic viability of improving fuel economy as a strategy to mitigate the risk of high fuel prices and to gain competitive advantage in an automotive market in which customers demand, and are willing to pay for fuel efficiency. They adopt a 'scenario analysis' approach where individual automaker fuel

economy strategies are tested against various scenarios of fuel prices and other automaker fuel economy strategies. Their goal is to determine which strategies maximize variable profits and U.S. auto industry employment.
NTIS
Consumers; Risk

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*.

20080032732 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Does the Constellation Program Offer Opportunities to Achieve Space Science Goals in Space?
Thronson, Harley A.; Lester, Daniel F.; Dissel, Adam F.; Folta, David C.; Stevens, John; Budinoff, Jason G.; [2008]; 16 pp.; In English; 59th International Astronautical Conference/ International Astronautical Federation (IAC-08-A5.3.6), 28 Sep. - 3 Oct. 2008, Glasgow, Scotland, UK; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Future space science missions developed to achieve the most ambitious goals are likely to be complex, large, publicly and professionally very important, and at the limit of affordability. Consequently, it may be valuable if such missions can be upgraded, repaired, and/or deployed in space, either with robots or with astronauts. In response to a Request for Information from the US National Research Council panel on Science Opportunities Enabled by NASA's Constellation System, we developed a concept for astronaut-based in-space servicing at the Earth-Moon L1,2 locations that may be implemented by using elements of NASA's Constellation architecture. This libration point jobsite could be of great value for major heliospheric and astronomy missions operating at Earth-Sun Lagrange points. We explored five alternative servicing options that plausibly would be available within about a decade. We highlight one that we believe is both the least costly and most efficiently uses Constellation hardware that appears to be available by mid-next decade: the Ares I launch vehicle, Orion/Crew Exploration Vehicle, Centaur vehicle, and an airlock/servicing node developed for lunar surface operations. Our concept may be considered similar to the Apollo 8 mission: a valuable exercise before descent by astronauts to the lunar surface.
Author
Constellation Program; Space Missions; Aerospace Sciences; NASA Space Programs

20080033099 NASA Marshall Space Flight Center, Huntsville, AL, USA
Estimated Environmental Exposures for MISSE-3 and MISSE-4
Pippin, Gary; Normand, Eugene; Finckenor, Miria; June 23, 2008; 1 pp.; In English; National Space and Missile Materials Symposium, 23-27 Jun. 2008, Henderson, NV, USA; Copyright; Avail.: Other Sources; Abstract Only

Both modeling techniques and a variety of measurements and observations were used to characterize the environmental conditions experienced by the specimens flown on the MISSE-3 (Materials International Space Station Experiment) and MISSE-4 space flight experiments. On August 3, 2006, astronauts Jeff Williams and Thomas Reiter attached MISSE-3 and -4 to the Quest airlock on ISS, where these experiments were exposed to atomic oxygen (AO), ultraviolet (UV) radiation, particulate radiation, thermal cycling, meteoroid/space debris impact, and the induced environment of an active space station. They had been flown to ISS during the July 2006 STS-121 mission. The two suitcases were oriented so that one side faced the ram direction and one side remained shielded from the atomic oxygen. On August 18,2007, astronauts Clay Anderson and Dave Williams retrieved MISSE-3 and-4 and returned them to Earth at the end of the STS-118 mission. Quantitative values are provided when possible for selected environmental factors. A meteoroid/debris impact survey was performed prior to de-integration at Langley Research Center. AO fluences were calculated based on mass loss and thickness loss of thin polymeric films of known AO reactivity. Radiation was measured with thermoluminescent detectors. Visual inspections under ambient and 'black-light' at NASA LaRC, together with optical measurements on selected specimens, were the basis for the initial contamination level assessment.
Author
Space Shuttle Missions; Hypervelocity Impact; Meteorite Collisions; Thermal Cycling Tests; Space Debris; Spaceborne Experiments; Ultraviolet Radiation; Particulates; Contamination

20080033106 NASA Marshall Space Flight Center, Huntsville, AL, USA

Utilizing Mars Global Reference Atmospheric Model (Mars-GRAM 2005) to Evaluate Entry Probe Mission Sites

Justh, Hilary L.; Justus, Carl G.; June 23, 2008; 1 pp.; In English; Sixth International Planetary Probe Workshop, 23-27 Jun. 2008, Atlanta, GA, USA; Copyright; Avail.: Other Sources; Abstract Only

The Mars Global Reference Atmospheric Model (Mars-GRAM 2005) is an engineering-level atmospheric model widely used for diverse mission applications. An overview is presented of Mars-GRAM 2005 and its new features. The 'auxiliary profile' option is one new feature of Mars-GRAM 2005. This option uses an input file of temperature and density versus altitude to replace the mean atmospheric values from Mars-GRAM's conventional (General Circulation Model) climatology. Any source of data or alternate model output can be used to generate an auxiliary profile. Auxiliary profiles for this study were produced from mesoscale model output (Southwest Research Institute's Mars Regional Atmospheric Modeling System (MRAMS) model and Oregon State University's Mars mesoscale model (MMM5) model) and a global Thermal Emission Spectrometer (TES) database. The global TES database has been specifically generated for purposes of making Mars-GRAM auxiliary profiles. This data base contains averages and standard deviations of temperature, density, and thermal wind components, averaged over 5-by-5 degree latitude-longitude bins and 15 degree Ls bins, for each of three Mars years of TES nadir data. The Mars Science Laboratory (MSL) sites are used as a sample of how Mars-GRAM' could be a valuable tool for planning of future Mars entry probe missions. Results are presented using auxiliary profiles produced from the mesoscale model output and TES observed data for candidate MSL landing sites. Input parameters rpscale (for density perturbations) and rwscale (for wind perturbations) can be used to 'recalibrate' Mars-GRAM perturbation magnitudes to better replicate observed or mesoscale model variability.

Author

Atmospheric Models; Mars Probes; Thermal Emission; Atmospheric Temperature; Atmospheric General Circulation Models; Climatology; Mars Atmosphere; Mesoscale Phenomena

20080034697 NASA Langley Research Center, Hampton, VA, USA

NASA Langley Research Center

DelCorso, Joseph A.; August 18, 2008; 18 pp.; In English; 2008 Thermal Fluids and Analysis Workshop, 18-22 Aug. 2008, San Jose, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 526282.01.07.05.06; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080034697

This viewgraph presentation gives a general overview of the NASA Langley Research Center's activities including aeronautics, aerospace sciences, and space exploration.

CASI

NASA Space Programs; General Overviews; Aeronautics; Aerospace Sciences

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20080032727 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Time Variability of the Dust Sublimation Zones in Pre-Main Sequence Disk Systems

Sitko, Michael L.; Carpenter, W. J.; Grady, C. A.; Russel, R. W.; Lynch, D. K.; Rudy, R. J.; Mazuk, S. M.; Venturini, C. C.; Kimes, R. L.; Beerman, L. C.; Ablordeppey, K. E.; Puetter, R. C.; Wisnewski, P.; Brafford, S. M.; Polomski, E. R.; Hammel, H. B.; Perry, R. B.; Wilde, J. L.; October 07, 2007; 1 pp.; In English; 39th Annual DPS meeting, 7-12 Oct. 2007, Orlando, FL, USA

Contract(s)/Grant(s): NNH06CC03B; Copyright; Avail.: Other Sources; Abstract Only

The dust sublimation zone (DSZ) is the region of pre-main sequence (PMS) disks where dust grains most easily anneal, sublime, and condense out of the gas. Because of this, it is a location where crystalline material may be enhanced and redistributed throughout the rest of the disk. A decade-long program to monitor the thermal emission of the grains located in this region demonstrates that large changes in emitted flux occur in many systems. Changes in the thermal emission between 3 and 13.5 microns were observed in HD 31648 (MWC 480), HD 163296 (MWC 275), and DG Tau. This emission is consistent with it being produced at the DSZ, where the transition from a disk of gas to one of gas+dust occurs. In the case of DG Tau, the outbursts were accompanied by increased emission on the 10 micron silicate band on one occasion, while on

another occasion it went into absorption. This requires lofting of the material above the disk into the line of sight. Such changes will affect the determination of the inner disk structure obtained through interferometry measurements, and this has been confirmed in the case of HD 163296. Cyclic variations in the heating of the DSZ will lead to the annealing of large grains, the sublimation of smaller grains, possibly followed by re-condensation as the zone enters a cooling phase. Lofting of dust above the disk plane, and outward acceleration by stellar winds and radiation pressure, can re-distribute the processed material to cooler regions of the disk, where cometesimals form. This processing is consistent with the detection of the preferential concentration of large crystalline grains in the inner few AU of PMS disks using interferometric spectroscopy with the VLTI. Author

Pre-Main Sequence Stars; Dust; Emittance; Grain Size; Thermal Emission; Sublimation; Coolers; Stellar Winds

20080032728 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Evolution of Metals and Dust in the High-Redshift Universe (z greater than 6)

Dwek, Eliahu; August 25, 2007; 1 pp.; In English; Century of Cosmology Conference, 25 Aug. - 2 Sep. 2007, Venice, Italy; No Copyright; Avail.: Other Sources; Abstract Only

Dusty hyperluminous galaxies in the early universe provide unique environments for studying the role of massive stars in the formation and destruction of dust. At redshifts above approx. 6, when the universe was less than approx. 1 Gyr old, dust could have only condensed in the explosive ejecta of Type-II supernovae (SNe), since most of the progenitors of the AGB stars, the major alternative source of interstellar dust, did not have time to evolve off the main sequence. I will present analytical models for the evolution of the gas, dust, and metals in high redshift galaxies, with a special application to SDSS J1148+5251, a hyperluminous quasar at $z = 6.4$. I will also discuss possible star formation scenarios consistent with observational constraints on the dust and gas content of this object.
Author

Red Shift; Supernovae; Star Formation; Interstellar Matter; Main Sequence Stars; Cosmic Dust; Cosmic Gases; Ejecta; Metals

20080032729 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cosmological Inflation: A Personal Perspective

Kazanas, D.; September 17, 2007; 1 pp.; In English; Chaos in Astronomy Symposium, 17-20 Sep. 2007, Athens, Greece; No Copyright; Avail.: Other Sources; Abstract Only

Approximately twenty five years ago a novel proposal was made to explain two of the outstanding cosmological conundrums, namely those of the Horizon Problem and the Flatness Problem of the Universe. These are the fact that widely separated parts of the sky that have never been in causal contact during the evolution of the Universe have apparently the same CMB temperature and the fact that the mean density of the Universe is very close to the critical one, i.e. very close to the density that separates the closed and open models. These coincidences implied that the corresponding initial condition of the Universe must have been set to exquisite accuracy. This novel proposal posted that at these very early times, the energy density of the Universe was dominated by a fluid which had the equation state attributed to the vacuum (i.e. dominated by tension rather than pressure) and that this led to an exponential expansion of the Universe which was 'inflated' by many orders of magnitude of its original size. It was then shown that this 'inflation' could provide a resolution of the above outstanding problems. The talk will cover the speaker's personal perspective and contributions to this idea and the subsequent developments over the following 25 years since its inception.
Author

Cosmology; Horizon; Flux Density; Evolution (Development); Flatness

20080032730 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Probing the Galactic Binary Black Hole Spin with Photon Timing

Kazanas, Demosthenes; September 12, 2007; 1 pp.; In English; 8th Hellenic Astronomical Conference, 12-15 Sep. 2007, Thassos Island, Greece; No Copyright; Avail.: Other Sources; Abstract Only

It is generally considered that the X-ray emission in AGN and Galactic Black Hole Candidates is produced by flares above the surface of a geometrically thin optically thick accretion disk, which extends down to the Innermost Stable Circular Orbit (ISCO) of the black hole. We consider the influence of the black hole geometry on the light curves of these flares. To this end we follow a large number of photon orbits emitted impulsively in a locally isotropic fashion, at any phase of the disk orbit and examine their arrival times at infinity by an observer near the plane of the disk. We find out that the presence of the black hole spin induces a certain delay in the photon arrivals, as prograde photon orbits reach the observer on shorter (on the

average) times than the retrograde ones. We form a histogram of the differences in photon time arrivals and we find that it exhibits several well defined peaks depending on the flare position and the black hole spin separated by $\Delta t \simeq 30 M$, where M is the black hole mass. The peaks disappear as the spin parameter goes to zero, implying that one could in principle measure the value of the black hole spin with timing measurements of sufficiently high signal to noise ratio.
Author
Black Holes (Astronomy); Photons; Active Galactic Nuclei; X Ray Binaries

20080032731 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Chaotic Light Curves of Accreting Black Holes
Kazanas, Demosthenes; September 17, 2007; 1 pp.; In English; Chaos in Astronomy Symposium, 17-20 Sep. 2007, Athens, Greece; No Copyright; Avail.: Other Sources; Abstract Only

We present model light curves for accreting Black Hole Candidates (BHC) based on a recently developed model of these sources. According to this model, the observed light curves and aperiodic variability of BHC are due to a series of soft photon injections at random (Poisson) intervals and the stochastic nature of the Comptonization process in converting these soft photons to the observed high energy radiation. The additional assumption of our model is that the Comptonization process takes place in an extended but non-uniform hot plasma corona surrounding the compact object. We compute the corresponding Power Spectral Densities (PSD), autocorrelation functions, time skewness of the light curves and time lags between the light curves of the sources at different photon energies and compare our results to observation. Our model reproduces the observed light curves well, in that it provides good fits to their overall morphology (as manifest by the autocorrelation and time skewness) and also to their PSDs and time lags, by producing most of the variability power at time scales 2 a few seconds, while at the same time allowing for shots of a few msec in duration, in accordance with observation. We suggest that refinement of this type of model along with spectral and phase lag information can be used to probe the structure of this class of high energy sources.
Author
Black Holes (Astronomy); Light Sources; Accretion Disks; Light Curve

20080032781 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Lunar X-ray Observatory (LXO)
Porter, F. Scott; June 23, 2008; 1 pp.; In English; Society of Photo-optical Instrumentation Engineers Conference, 23-27 Jun. 2008, Marseilles, France
Contract(s)/Grant(s): WBS 811073.02.14.01.50; No Copyright; Avail.: Other Sources; Abstract Only

X-ray emission from charge exchange recombination between the highly ionized solar wind and neutral material i n Earth's magnetosheath has complicated x-ray observations of celestial objects with x-ray observatories including ROSAT, Chandra, XMM-Newton, and Suzaku. However, the charge-exchange emission can also be used as an important diagnostic of the solar-wind interacting with the magnetosheath. Soft x-ray observations from low-earth orbit or even the highly eccentric orbits of Chandra and XMM-Newton are likely superpositions of the celestial object of interest, the true extra-solar soft x-ray background, geospheric charge exchange, and heliospheric charge exchange. We show that with a small x-ray telescope placed either on the moon, in a similar vein as the Apollo ALSOP instruments, or at a stable orbit near L1, we can begin t o disentangle the complicated emission structure in the soft x-ray band. Here we present initial results of a feasibility study recently funded by NASA t o place a small x-ray telescope on the lunar surface. The telescope operates during lunar night to observe charge exchange interactions between the solar wind and magnetospheric neutrals, between the solar wind and the lunar atmosphere, and an unobstructed view of the soft x-ray background without the geospheric component.
Author
X Rays; Emission; Solar Wind; Low Earth Orbits; Lunar Observatories; X Ray Telescopes; Background Radiation; Charge Exchange; Lunar Atmosphere

20080032782 NASA Goddard Space Flight Center, Greenbelt, MD, USA
XMM Observations of 'New' Swift BAT Sources
Mushotzky, Richard F.; May 27, 2008; 1 pp.; In English; The X-ray Universe 2008, 27-30 May 2008, Granada, Spain; No Copyright; Avail.: Other Sources; Abstract Only

Because the E> 15 keV band is unaffected by absorption this band offers the best hope of obtaining an unbiased sample of AGN. The Swift BAT survey has produced the first large sample of hard x-ray bright AGN in the local universe providing the data necessary to determine the true characteristics of the AGN population. However to use this data one needs to obtain

the x-ray spectral properties of these objects.We will present the complete sample of x-ray spectra of the BAT objects and the implications of these data.
Author
X Ray Spectra; Universe; X Rays

20080032784 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Recent Improvements to the Calibration Models for RXTE/PCA
Jahoda, K.; May 18, 2008; 1 pp.; In English; 3rd IACHEC Meeting, 18-21 May 2008, Germany; No Copyright; Avail.: Other Sources; Abstract Only

We are updating the calibration of the PCA to correct for slow variations, primarily in energy to channel relationship. We have also improved the physical model in the vicinity of the Xe K-edge, which should increase the reliability of continuum fits above 20 keV. The improvements to the matrix are especially important to simultaneous observations, where the PCA is often used to constrain the continuum while other higher resolution spectrometers are used to study the shape of lines and edges associated with Iron.
Author
X Ray Timing Explorer; Calibrating; Iron; Continuums; Spectrometers

20080032855 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Stellar Evolutionary Effects on the Abundances of PAH and SN-Condensed Dust in Galaxies
Dwek, Eliahu; December 02, 2007; 1 pp.; In English; 4th Spitzer Science Center Conference: The Evolving ISM in the Milky Way and Nearby Galaxies, 2-5 Dec. 2007, California, USA; No Copyright; Avail.: Other Sources; Abstract Only

Spectral and photometric observations of nearby galaxies show a correlation between the strength of their mid-IR aromatic features, attributed to PAH molecules, and their metal abundance, leading to a deficiency of these features in low-metallicity galaxies. We suggest that the observed correlation represents a trend of PAH abundance with galactic age, reflecting the delayed injection of carbon dust into the ISM by AGB stars in the final post-AGB phase of their evolution. We also show that larger dust particles giving rise to the far-IR emission follow a distinct evolutionary trend closely related to the injection of dust by massive stars into the ISM.
Author
Cosmic Dust; Far Infrared Radiation; Asymptotic Giant Branch Stars; Polycyclic Aromatic Hydrocarbons

20080032913 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Evolution of Protoplanetary Disks: A Decade of HST Coronagraphy
Grady, C. A.; June 04, 2007; 13 pp.; In English; In the Spirit of Bernard Lyoy, 4-8 Jun. 2007, Berkeley, CA, USA
Contract(s)/Grant(s): NNH06CC28C; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032913

This viewgraph presentation reviews the evolution of protoplanetary disks with the use Hubble Space Telescope coronagrphic imagery. The contents include: 1) Why Protoplanetary Disks in a Meeting on Exo-Planets and Debris Disks; 2) Protoplanetary Disks; 3) Binaries; 4) Theoretical Expectations; 5) Expected Evolutionary Sequence; 6) HD 169142; 7) Inner Disk of HD 169142; 8) HD 169142 is not unique; 9) The Stranger Case of HD 135344; 10) Meeus Group II; 11) Lessons Learned; and 12) Implications for Future Instruments and Missions.
CASI
Coronagraphs; Hubble Space Telescope; Protoplanetary Disks; Imaging Techniques

20080032968 NASA Goddard Space Flight Center, Greenbelt, MD, USA
From the Big Bang to the Nobel Prize and the JWST
Mather, John C.; January 06, 2007; 1 pp.; In English; American Astronomical Association Meeting, 6-11 Jan. 2007, Seattle, WA, USA; No Copyright; Avail.: Other Sources; Abstract Only

I will describe the history of the universe, from the Big Bang to 2013, when the JWST is to be launched to look back towards our beginnings. I will discuss how the COBE results led to the Nobel Prize, how the COBE results have been confirmed and extended, and their implications for future observations. The James Webb Space Telescope will be used to examine every part of our history from the first stars and galaxies to the formation of individual stars and planets and the delivery of life-supporting materials to the Earth. I will describe the plans for the JWST and how observers may use it. With

luck, the JWST may produce a Nobel Prize for some discovery we can only guess today.
Author
Cosmic Background Explorer Satellite; James Webb Space Telescope; Galaxies; Planets

20080032971 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Wilkinson Microwave Anisotropy Probe (WMAP) Source Catalog
Wright, E.L.; Chen, X.; Odegard, N.; Bennett, C.L.; Hill, R.S.; Hinshaw, G.; Jarosik, N.; Komatsu, E.; Nolta, M.R.; Page, L.; Spergel, D.N.; Weiland, J.L.; Wollack, E.; Dunkley, J.; Gold, B.; Halpern, M.; Kogut, A.; Larson, D.; Limon, M.; Meyer, S.; Tucker, G.S.; [2008]; 29 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We present the list of point sources found in the WMAP 5-year maps. The technique used in the first-year and three-year analysis now finds 390 point sources, and the five-year source catalog is complete for regions of the sky away from the galactic plane to a 2 Jy limit, with SNR greater than 4.7 in all bands in the least covered parts of the sky. The noise at high frequencies is still mainly radiometer noise, but at low frequencies the CMB anisotropy is the largest uncertainty. A separate search of CMB-free V-W maps finds 99 sources of which all but one can be identified with known radio sources. The sources seen by WMAP are not strongly polarized. Many of the WMAP sources show significant variability from year to year, with more than a 2:l range between the minimum and maximum fluxes.
Author
Microwave Anisotropy Probe; Point Sources; Astronomical Catalogs; Radio Astronomy

20080032972 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Five-Year Wilkinson Microwave Anisotropy Probe (WMAP1) Observations: Galactic Foreground Emission
Gold, B.; Bennett, C.L.; Larson, D.; Hill, R.S.; Odegard, N.; Weiland, J.L.; Hinshaw, G.; Kogut, A.; Wollack, E.; Page, L.; Dunkley, J.; Jarosik, N.; Spergel, N.; Halpern, M.; Komatsu, E.; Meyer, S.S.; Nolta, M.R.; Wright, E.L.; [2008]; 39 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We present a new estimate of foreground emission in the WMAP data, using a Markov chain Monte Carlo (MCMC) method. The new technique delivers maps of each foreground component for a variety of foreground models, error estimates of the uncertainty of each foreground component, and provides an overall goodness-of-fit measurement. The resulting foreground maps are in broad agreement with those from previous techniques used both within the collaboration and by other authors. We find that for WMAP data, a simple model with power-law synchrotron, free-free, and thermal dust components fits 90% of the sky with a reduced X(sup 2) (sub v) of 1.14. However, the model does not work well inside the Galactic plane. The addition of either synchrotron steepening or a modified spinning dust model improves the fit. This component may account for up to 14% of the total flux at Ka-band (33 GHz). We find no evidence for foreground contamination of the CMB temperature map in the 85% of the sky used for cosmological analysis.
Author
Microwave Anisotropy Probe; Mathematical Models; Galactic Halos; Markov Chains; Monte Carlo Method

20080032973 NASA Goddard Space Flight Center, Greenbelt, MD, USA; NASA Goddard Space Flight Center, Greenbelt, MD, USA; NASA Goddard Space Flight Center, Greenbelt, MD, USA
Five-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Data Processing, Sky Maps, and Basic Results
Weiland, J.L.; Hill, R.S.; Odegard, 3.; Larson, D.; Bennett, C.L.; Dunkley, J.; Jarosik, N.; Page, L.; Spergel, D.N.; Halpern, M.; Meyer, S.S.; Tucker, G.S.; Wright, E.L.; [2008]; 43 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Wilkinson Microwave Anisotropy Probe (WMAP) is a Medium-Class Explorer (MIDEX) satellite aimed at elucidating cosmology through full-sky observations of the cosmic microwave background (CMB). The WMAP full-sky maps of the temperature and polarization anisotropy in five frequency bands provide our most accurate view to date of conditions in the early universe. The multi-frequency data facilitate the separation of the CMB signal from foreground emission arising both from our Galaxy and from extragalactic sources. The CMB angular power spectrum derived from these maps exhibits a highly coherent acoustic peak structure which makes it possible to extract a wealth of information about the composition and history of the universe. as well as the processes that seeded the fluctuations. WMAP data have played a key role in establishing ACDM as the new standard model of cosmology (Bennett et al. 2003: Spergel et al. 2003; Hinshaw et al. 2007: Spergel et al. 2007): a flat universe dominated by dark energy, supplemented by dark matter and atoms with density

fluctuations seeded by a Gaussian, adiabatic, nearly scale invariant process. The basic properties of this universe are determined by five numbers: the density of matter, the density of atoms. the age of the universe (or equivalently, the Hubble constant today), the amplitude of the initial fluctuations, and their scale dependence. By accurately measuring the first few peaks in the angular power spectrum, WMAP data have enabled the following accomplishments: Showing the dark matter must be non-baryonic and interact only weakly with atoms and radiation. The WMAP measurement of the dark matter density puts important constraints on supersymmetric dark matter models and on the properties of other dark matter candidates. With five years of data and a better determination of our beam response, this measurement has been significantly improved. Precise determination of the density of atoms in the universe. The agreement between the atomic density derived from WMAP and the density inferred from the deuterium abundance is an important test of the standard big bang model. Determination of the acoustic scale at redshift z = 1090. Similarly, the recent measurement of baryon acoustic oscillations (BAO) in the galaxy power spectrum (Eisenstein et al. 2005) has determined the acoustic scale at redshift z approx. 0.35. When combined, these standard rulers accurately measure the geometry of the universe and the properties of the dark energy. These data require a nearly flat universe dominated by dark energy consistent with a cosmological constant. Precise determination of the Hubble Constant, in conjunction with BAO observations. Even when allowing curvature (Omega(sub 0) does not equal 1) and a free dark energy equation of state (w does not equal -1), the acoustic data determine the Hubble constant to within 3%. The measured value is in excellent agreement with independent results from the Hubble Key Project (Freedman et al. 2001), providing yet another important consistency test for the standard model. Significant constraint of the basic properties of the primordial fluctuations. The anti-correlation seen in the temperature/polarization (TE) correlation spectrum on 4deg scales implies that the fluctuations are primarily adiabatic and rule out defect models and isocurvature models as the primary source of fluctuations (Peiris et al. 2003).
Derived from text
Astronomical Models; Cosmic Microwave Background Radiation; Cosmology; Dark Matter; Thermal Mapping; Anisotropy; Microwave Anisotropy Probe

20080033027 NASA Marshall Space Flight Center, Huntsville, AL, USA
A Naked-Eye Stellar Blast from the Distant Universe from GRB 080319B
Rasusin, J. L.; Karpov, S. V.; Sokolowski, M.; Granot, J.; Wu, X. F.; Pal'shin, V.; Covino, S.; vanderHorst, A. J.; Oates, S. R.; Schady, P.; Smith, R. J.; Cummings, J.; Starling, R. L. C.; Piotrowski, L. W.; Zhang, B.; Evans, P. A.; Holland, S. T.; Malek, K.; Kouveliotou, C., et al.; [2008]; 23 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Long duration gamma-ray bursts (GRBs) release copious amounts of energy across the entire electromagnetic spectrum, and so provide a window into the process of black hole formation from the collapse of a massive star. Over the last forty years, our understanding of the GRB phenomenon has progressed dramatically; nevertheless, fortuitous circumstances occasionally arise that provide access to a regime not yet probed. GRB 080319B presented such an opportunity, with extraordinarily bright prompt optical emission that peaked at a visual magnitude of 5.3, making it briefly visible with the naked eye. It was captured in exquisite detail by wide-field telescopes, imaging the burst location from before the time of the explosion. The combination of these unique optical data with simultaneous -ray observations provides powerful diagnostics of the detailed physics of this explosion within seconds of its formation. Here we show that the prompt optical and -ray emissions from this event arise from different spectral components within the same physical region located at a large distance from the source, implying an extremely relativistic outflow. Our observations also provide good evidence for a bright reverse shock component, implying a near equipartition magnetic field (comparable magnetic and kinetic energies) in the GRB outflow. The chromatic behaviour of the broadband afterglow is consistent with viewing the GRB down the very narrow inner core of a two-component jet that is expanding into a wind-like environment consistent with the massive star origin of long GRBs. These circumstances could explain the extreme properties of this GRB.
Author
Gamma Ray Bursts; Universe; Black Holes (Astronomy); Massive Stars

20080033313 Naval Observatory, Washington, DC USA
Speckle Interferometry of Massive and Cluster Stars
Mason, Brian; Hartkopf, William I; Gies, Douglas R; Henry, Todd J; Tokovinin, Andrei A; Sep 30, 2005; 7 pp.; In English Report No.(s): AD-A480647; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480647

Conducted on NOAO 4-m telescopes in 1994, the first speckle survey of O stars (Mason et al. 1998) had success far in excess of our expectations. In addition to the frequently cited multiplicity analysis, many of the new systems which were first

resolved in this paper are of significant astrophysical importance. Now, some ten years after the original survey, we propose to re-investigate all systems analyzed before (N = 195). Improvements in detector technology will allow for the detection of companions missed before as well as systems which may have been closer than the resolution limit in 1994. We will also make a rst high-resolution inspection of the additional O stars (N = 108) in the recent Galactic O Star Catalog of Ma z-Apell aniz & Walborn (2004). Further, we propose to investigate several additional samples of interesting objects, including 15 accessible Galactic WR stars from the speckle survey of Hartkopf et al. (1999), 16 massive, hot stars with separations which would indicate their applicability for mass determinations (for fully detached O stars masses are presently known for only twelve pairs), and 56 multiple stars for a study of their co-planarity statistics.
DTIC
Massive Stars; Speckle Interferometry; Wolf-Rayet Stars; Wolves

20080033579 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Five-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Likelihoods and Parameters from the WMAP Data
Dunkey, J.; Komatsu, E.; Nolta, M.R.; Spergel, D.N.; Larson, D.; Hinshaw, G.; Page, L.; Bennett, C.L.; Gold, B.; Jarosik, N.; Weiland, J.L.; Halpern, M.; Hill, R.S.; Kogut, A.; Limon, M.; Meyer, S.S.; Tucker, G.S.; Wollack, E.; Wright, E.L.; [2008]; 57 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy

The Wilkinson Microwave Anisotropy Probe (WMAP), launched in 2001, has mapped out the Cosmic Microwave Background with unprecedented accuracy over the whole sky. Its observations have led to the establishment of a simple concordance cosmological model for the contents and evolution of the universe, consistent with virtually all other astronomical measurements. The WMAP first-year and three-year data have allowed us to place strong constraints on the parameters describing the ACDM model. a flat universe filled with baryons, cold dark matter, neutrinos. and a cosmological constant. with initial fluctuations described by nearly scale-invariant power law fluctuations, as well as placing limits on extensions to this simple model (Spergel et al. 2003. 2007). With all-sky measurements of the polarization anisotropy (Kogut et al. 2003; Page et al. 2007), two orders of magnitude smaller than the intensity fluctuations. WMAP has not only given us an additional picture of the universe as it transitioned from ionized to neutral at redshift z approx.1100. but also an observation of the later reionization of the universe by the first stars. In this paper we present cosmological constraints from WMAP alone. for both the ACDM model and a set of possible extensions. We also consider tlle consistency of WMAP constraints with other recent astronomical observations. This is one of seven five-year WMAP papers. Hinshaw et al. (2008) describe the data processing and basic results. Hill et al. (2008) present new beam models arid window functions, Gold et al. (2008) describe the emission from Galactic foregrounds, and Wright et al. (2008) the emission from extra-Galactic point sources. The angular power spectra are described in Nolta et al. (2008), and Komatsu et al. (2008) present and interpret cosmological constraints based on combining WMAP with other data. WMAP observations are used to produce full-sky maps of the CMB in five frequency bands centered at 23, 33, 41, 61, and 94 GHz (Hinshaw et al. 2008). With five years of data, we are now able to place better limits on the ACDM model. as well as to move beyond it to test the composition of the universe. details of reionization. sub-dominant components, characteristics of inflation, and primordial fluctuations. We have more than doubled the amount of polarized data used for cosmological analysis. allowing a better measure of the large-scale E-mode signal (Nolta et al. 2008). To this end we describe an alternative way to remove Galactic foregrounds from low resolution polarization maps in which Galactic emission is marginalized over, providing a cross-check of our results. With longer integration we also better probe the second and third acoustic peaks in the temperature angular power spectrum, and have many more year-to-year difference maps available for cross-checking systematic effects (Hinshaw et al. 2008).
Derived from text
Anisotropy; Cosmic Microwave Background Radiation; Microwave Anisotropy Probe; Cosmology; Astronomical Models; Power Spectra; Dark Matter

20080033727 Naval Observatory, Washington, DC USA; Georgia State Univ., Atlanta, GA, USA; Boeing Co., Kihei, HI, USA
Search for Faint Companions to O-Stars Using the AEOS 3.6 Meter Telescope
Turner, Nils H; ten Brummelaar, Theo A; Roberts, Jr , Lewis C; Mason, Brian D; Hartkopf, William I; Gies, Douglas R; Sep 2006; 9 pp.; In English
Report No.(s): AD-A480348; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480348

O stars are the most massive and luminous main sequence stars in the sky. they are frequently found in clusters of other O and B type stars. Due to the intrinsic brightness of these stars and their typical large distances, physical companions found

by traditional techniques (spectroscopy, speckle interferometry, etc.) tend to be similar in mass and brightness to the primary. Adaptive optics observations allow one to probe for the fainter physical companions, further testing star formation scenarios and neighborhood conditions of O and B star clusters. We present the results of a multi-year survey of O stars using the Advanced Electro-Optical System (AEOS) 3.6-meter telescope specifically searching for additional companions.
DTIC
Electro-Optics; O Stars; Telescopes

20080033729 Naval Observatory, Washington, DC USA
Optical Reference Star Catalogs for Space Surveillance: Current Status and Future Plans
Seidelmann, P K; Gaume, R; Zacharias, N; Johnston, K; Dorland, B; Jan 2007; 12 pp.; In English
Report No.(s): AD-A480347; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480347

The current status of existing star catalogs of relevance for Space Surveillance applications will be reviewed. Hipparcos and Tycho 2 provided reference stars with milliarcsecond (mas) accuracies at their epoch of 1991.25. During the 16 years since then, the proper motion uncertainties have reduced the accuracies significantly. Ground-based programs such as the USNO CCD Astrograph Catalog (UCAC) will soon provide an all-sky, astrometrically accurate (20-70 mas) reference star catalog to 16th magnitude. The USNO-B astrometric catalog contains over a billion detections, providing astrometric positons (~200 mas) and photometry for stars down to V=21 magnitude. These catalogs and others are incorporated into the Naval Observatory Merged Astrometric Dataset (NOMAD); a 100 GB dataset containing astrometric and photometric data for about 1.1 billion stars.
DTIC
Astronomical Catalogs; Reference Stars

20080034475 NASA, Washington, DC, USA
Science with the Constellation-X Obsevatory
January 1999; 54 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NP-1998-067-GSFC; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034475

The Constellation X-Ray Mission is a high throughput X-ray facility emphasizing observations at high spectral resolution (E/DeltaE approximately equal to 300-3000) while covering a broad energy bandpass (0.25-40 keV). Constellation-X will provide a factor of nearly 100 increase in sensitivity over current high resolution X-ray spectroscopy missions and, in so doing, will obtain high quality spectra for all classes of X-ray sources over a wide range of luminosity and redshift. It is the X-ray astronomy equivalent of large ground-based optical telescopes such as the Keck Observatory and the ESO Very Large Telescope. Constellation-X is a key element in NASA's Structure and Evolution of the Universe (SEU) theme aimed at understanding the great mysteries of space, time, and energy. When observations commence towards the end of the next decade, Constellation-X will address many pressing questions concerning the extremes of gravity and the evolution of the Universe. X-ray observations of broadened iron emission lines in Active Galactic Nuclei will measure black hole masses and spins and will test General Relativity in the strong gravity limit. Constellation-X will show us how black holes evolve with cosmic time and, as accretion energy may be a dominant component, will provide critical information on the total energy output of the Universe. By looking across a broad range of redshift, Constellation-X will reveal the earliest formation of clusters of galaxies and tell us whether their properties are consistent with current models of galaxy formation. Present inventories indicate that many of the baryons predicted by Big Bang nucleosynthesis and subsequent stellar processing seem to be 'missing,' and Constellation-X will allow us to search for them-for example, in a hot, metal-enriched Intergalactic Medium. Exploring and expanding our cosmic horizons requires sensitive X-ray observations. This document is intended for scientists. It describes the Constellation-X science goals and mission capabilities and portrays the science that can be achieved. Constellation-X is envisioned as an international facility, open to all scientists.
Author
Constellation-X; X Ray Astronomy; Astronomical Observatories

20080034519 Naval Observatory, Washington, DC USA

Commission 4: Ephemerides

Krasinsky, George; Fukushima, Toshio; Chapront, J; Standish, Jr , E M; Hohenkerk, C; Kaplan, G; Seidelmann, P K; Bangert, J; Urban, S; Vondrak, J; Jan 2006; 5 pp.; In English

Report No.(s): AD-A480544; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA480544

A brief report listing the actions during the time period 2002-2005 of the following organizations: 1. Jet Propulsion Laboratory, Caltech, USA; 2. US Naval Observatory, Astronomical Applications Department; 3. Astronomical Institute, Czech Republic; 4. National Astronomical Observatory (NAOJ), Japan; 5. Her Majesties' National Almanac Office (HMNAO), UK; 6. Institute of Applied Astronomy, Russia; and 7. IMCCE (Institut de Mecanique Celeste et de Calcul des Ephemerides), Paris Observatory.

DTIC

Ephemerides; Astronomy

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20080032780 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Tracing the Energetics of the Universe with Constellation-X: Example Scientific Investigations

Hornschemeier, Ann; April 17, 2008; 1 pp.; In English; Galaxy Formation and Evolution as Revealed by Cosmic Gas, 17-19 Apr. 2008, Irvine, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Constellation-X will enable us to trace the energetics of a broad range of astrophysical phenomena owing to its capabilities for high spectral resolution X-ray spectroscopy. The dominant baryonic component of galaxy clusters and groups resides in the X-ray bandpass, and the hot phase of the ISM in galaxies harbors the heavy metal production from previous generation of stars. This talk will focus on a few example science questions that are expected to be important during the Constellation-X era. These include the nature of the missing baryons expected to reside in the hot portion of the Warm Hot Intergalactic Medium, which Constellation-X will address via absorption spectroscopy studies of background AGN. We will also discuss spatially resolved spectroscopy of metal enrichment and the effects of turbulence in clusters & groups and of starburst galaxy winds which deposit energy & metals into the Intergalactic Medium.

Author

Constellation-X; X Ray Astronomy; Starburst Galaxies; Galactic Clusters; X Ray Spectroscopy; High Resolution; Astrophysics; Absorption Spectroscopy

20080032903 NASA Goddard Space Flight Center, Greenbelt, MD, USA

First Science with the Keck Interferometer Nuller High Spatial Resolution N-Band Observations of the Recurrent Nova RS Ophiuchi

Barry, Richard K.; Danchi, W. C.; Traub, W.; Kuchner, M.; Wisniewski, J. P.; Akeson, R.; Colavita, M.; Greenhouse, M, A.; Koresko, C.; Serabyn, E.; Sokoloski, J. L.; June 23, 2008; 2 pp.; In English; SPIE 2008, 23-28 Jun. 2008, Marseille, France; Copyright; Avail.: Other Sources; Abstract Only

We report observations of the nova RS 0phiuchi using the Keck Interferometer Nuller (KIN) taken approximately 3.8 days following the most recent outburst that occurred on 2006 February 12. The KIN operates in N-band from approx. 8 to 12.5 microns in a nulling mode - the sparse aperture equivalent of the conventional coronagraphic technique used in filled aperture te1escopes. In this mode the stellar light is suppressed by a destructive fringe, effectively enhancing the contrast of the circumstellar material located near the star. In a second, constructive-fringe mode, the instrument detects primarily the light from the central, bright source. These are the outer and inner spatial regimes, resprectively. We will describe the capabilities of the KIN, including these unique modes, and outline how they were key in our discovery that dust does not appear to be created in the outburst as in previous models, but instead was created between nova events. We also show how these first results from the KIN are consistent with Spitzer data. The KIN data show evidence of enhanced neutral atomic hydrogen emission and atomic metals including silicon located in the inner spatial regime near the white dwarf (WD) relative to the outer regime. There are also nebular emission lines and evidence of hot silicate dust in the outer spatial region, centered at approximately 17 AU from the WD, that are not found in the inner regime. The KIN and Spitzer data suggest that these emissions were excited by the nova flash in the outer spatial regime before the blast wave reached these regions. We describe

the present results in terms of a new model for dust creation in recurrent novae that includes an increase in density in the plane of the orbit of the two stars created by a spiral shock wave caused by the motion of the stars through the cool wind of the red giant star. These data show the power and potential of the nulling technique which has been developed for the detection of Earth-like planets around nearby stars for the Terrestrial Planet Finder and Darwin missions.
Author
Astronomical Interferometry; Coronagraphs; Spatial Resolution; Stellar Motions; Terrestrial Planets; Neutral Gases; Detonation Waves; Emission Spectra; High Resolution; Neutral Atoms

20080032974 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Five-Year Wilkinson Microwave Anisotropy Probe (WMAP)Observations: Beam Maps and Window Functions
Hill, R.S.; Weiland, J.L.; Odegard, N.; Wollack, E.; Hinshaw, G.; Larson, D.; Bennett, C.L.; Halpern, M.; Kogut, A.; Page, L.; Dunkley, J.; Gold, B.; Jarosik, N.; Spergel, D.N.; Limon, M.; Nolta, M.R.; Tucker, G.S.; Wright, E.L.; [2008]; 48 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Cosmology and other scientific results from the WMAP mission require an accurate knowledge of the beam patterns in flight. While the degree of beam knowledge for the WMAP one-year and three-year results was unprecedented for a CMB experiment, we have significantly improved the beam determination as part of the five-year data release. Physical optics fits are done on both the A and the B sides for the first time. The cutoff scale of the fitted distortions on the primary mirror is reduced by a factor of approximately 2 from previous analyses. These changes enable an improvement in the hybridization of Jupiter data with beam models, which is optimized with respect to error in the main beam solid angle. An increase in main-beam solid angle of approximately 1% is found for the V2 and W1-W4 differencing assemblies. Although the five-year results are statistically consistent with previous ones, the errors in the five-year beam transfer functions are reduced by a factor of approximately 2 as compared to the three-year analysis. We present radiometry of the planet Jupiter as a test of the beam consistency and as a calibration standard; for an individual differencing assembly. errors in the measured disk temperature are approximately 0.5%.
Author
Microwave Anisotropy Probe; Cosmology; Space Missions; Astrophysics; Telescopes; Mathematical Models

20080032976 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Chandra Confirmation of a Pulsar Wind Nebula in DA 495
Arzoumanian, Z.; Safi-Harb, S.; Landecker, T.L.; Kothes, R.; Camilo, F.; [2008]; 30 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG06E090A; Copyright; Avail.: CASI: A03, Hardcopy

As part of a multiwavelength study of the unusual radio supernova remnant DA 495, we present observations made with the Chandra X-ray Observatory. Imaging and spectroscopic analysis confirms the previously detected X-ray source at the heart of the annular radio nebula, establishing the radiative properties of two key emission components: a soft unresolved source with a blackbody temperature of 1 MK consistent with a neutron star, surrounded by a nontherma1 nebula 40' in diameter exhibiting a power-law spectrum with photon index Gamma = 1.63, typical of a pulsar wind nebula. Morphologically, the nebula appears to be slightly extended along a direction, in projection on the sky, previously demonstrated to be of significance in radio and ASCA observations; we argue that this represents the orientation of the pulsar spin axis. At smaller scales, a narrow X-ray feature is seen extending out 5' from the point source, but energetic arguments suggest that it is not the resolved termination shock of the pulsar wind against the ambient medium. Finally, we argue based on synchrotron lifetimes in the nebular magnetic field that DA 495 represents the first example of a pulsar wind nebula in which electromagnetic flux makes up a significant part, together with particle flux, of the neutron star's wind.
Author
Pulsars; Nebulae; X Ray Astrophysics Facility; Supernova Remnants; X Ray Sources; Black Body Radiation; Neutron Stars; Magnetic Fields

20080033096 NASA Marshall Space Flight Center, Huntsville, AL, USA
An Imaging X-Ray Polarimetry Mission
Weisskopf, Martin C.; Bellazini, Ronaldo; Costa, Enrico; Ramsey, Brian; O'Dell, Steve; Elsner, Ronald; Pavlov, George; Matt, Giorgio; Kaspi, Victoria; Tennant, Allyn; Coppi, Paolo; Wu, Kinwah; Siegmund, Oswald; June 23, 2008; 1 pp.; In English; SPIE Astronomical Telescopes and Instrumentation 2008, 23-28 Jun. 2008, Marseilles, France; Copyright; Avail.: Other Sources; Abstract Only

Technical progress both in x-ray optics and in polarization-sensitive x-ray detectors, which our groups have pioneered,

enables a scientifically powerful---yet inexpensive---dedicated mission for imaging x-ray polarimetry. Such a mission is sufficiently sensitive to measure x-ray (linear) polarization for a broad range of cosmic sources --particularly those involving neutron stars, stellar black holes, and supermassive black holes (active galactic nuclei). We describe the technical elements, discuss a mission concept, and synopsize the important physical and astrophysical questions such a mission would address. Author

Polarimetry; Imaging Techniques; Astrophysics; Space Missions; X Ray Optics

20080033472 Naval Research Lab., Washington, DC USA

Angular Broadening of Intraday Variable AGNs II. Interstellar and Intergalactic Scattering

Lazio, T J; Ojha, Roopesh; Fey, Alan L; Kedziora-Chudczer, Lucyna; Cordes, James M; Jauncey, David L; Lovell, James E; Jan 1, 2008; 8 pp.; In English

Report No.(s): AD-A480869; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We analyze a sample of 58 multiwavelength, Very Long Baseline Array observations of active galactic nuclei (AGNs) to determine their scattering properties. Approximately 75% of the sample consists of AGNs that exhibit centimeter-wavelength intraday variability (interstellar scintillation), while the other 25% do not show intraday variability. We find that interstellar scattering is measurable for most of these AGNs, and the typical broadening diameter is 2 mas at 1 GHz. We find that the scintillating AGNs are typically at lower Galactic latitudes than the nonscintillating AGNs, consistent with the scenario that intraday variability is a propagation effect from the Galactic interstellar medium. The magnitude of the inferred interstellar broadening measured toward the scintillating AGNs, when scaled to higher frequencies, is comparable to the diameters inferred from analyses of the light curves for the more well-known intraday variable sources. However, we find no difference in the amount of scattering measured toward the scintillating versus nonscintillating AGNs. A consistent picture is one in which the scintillation results from localized regions ('clumps') distributed throughout the Galactic disk, but that individually make little contribution to the angular broadening. Of the 58 AGNs observed, 37 (64%) have measured redshifts. At best, a marginal trend is found for scintillating (nonscintillating) AGNs to have smaller (larger) angular diameters at higher redshifts. We also use our observations to try to constrain the possibility of intergalactic scattering. While broadly consistent with the scenario of a highly turbulent intergalactic medium, our observations do not place significant constraints on its properties. DTIC

Active Galactic Nuclei; Galaxies; Interstellar Matter; Scattering; Scintillation; Variability

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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*.

20080032725 NASA Marshall Space Flight Center, Huntsville, AL, USA

Launching to the Moon, Mars, and Beyond

Shivers, Charles Herbert; May 08, 2008; 32 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080032725

This viewgraph presentation reviews NASA's mission to launch to the Moon, Mars, and Beyond. The following questions will be answered: 1) What is NASA's mission? 2) Why do we explore? 3) What is our timeline? 4) Why the Moon first? 5) What will the vehicles look like? 5) What progress have we made? 6) Who will be doing the work? and 7) What are the benefits of space exploration?

Author

Mars Missions; Moon; Space Exploration; NASA Space Programs

20080032785 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Exploration of the Habitability of Mars with the SAM Suite Investigation on the 2009 Mars Science Laboratory

Mahaffy, P. R.; Cabane, M.; Webster, C. R., et al.; April 14, 2008; 1 pp.; In English; Astrobiology Science Conference 2008, 14-17 Apr. 2008, San Jose, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The 2009 Mars Science Laboratory (MSL) with a substantially larger payload capability that any other Mars rover, to date, is designed to quantitatively assess a local region on Mars as a potential habitat for present or past life. Its goals are (1) to assess past or present biological potential of a target environment, (2) to characterize geology and geochemistry at the MSL

landing site, and (3) to investigate planetary processes that influence habitability. The Sample Analysis at Mars (SAM) Suite, in its final stages of integration and test, enables a sensitive search for organic molecules and chemical and isotopic analysis of martian volatiles. MSL contact and remote surface and subsurface survey Instruments establish context for these measurements and facilitate sample identification and selection. The SAM instruments are a gas chromatograph (GC), a mass spectrometer (MS), and a tunable laser spectrometer (TLS). These together with supporting sample manipulation and gas processing devices are designed to analyze either the atmospheric composition or gases extracted from solid phase samples such as rocks and fines. For example, one of the core SAM experiment sequences heats a small powdered sample of a Mars rock or soil from ambient to -1300 K in a controlled manner while continuously monitoring evolved gases. This is followed by GCMS analysis of released organics. The general chemical survey is complemented by a specific search for molecular classes that may be relevant to life including atmospheric methane and its carbon isotope with the TLS and biomarkers with the GCMS.

Author

Habitability; Mars Surface; Planetary Geology; Roving Vehicles; Atmospheric Composition; Geochemistry; Landing Sites; Mass Spectrometers

20080032805 NASA Marshall Space Flight Center, Huntsville, AL, USA

The NASA Lunar Impact Monitoring Program

Suggs, Rob; May 28, 2008; 42 pp.; In English; Meteoroid Environments Office Workshop, 28 May 2008, Alabama, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080032805

We have a fruitful observing program underway which has significantly increased the number of lunar impacts observed. We have done initial test shots at the Ames Vertical Gun Range obtained preliminary luminous efficiency values. More shots and better diagnostics are needed to determine ejecta properties. We are working to have a more accurate ejecta. environment definition to support lunar lander, habitat, and EVA design. Data also useful for validation of sporadic model at large size range.

Derived from text

Lunar Programs; Ejecta; Extravehicular Activity; Habitats

20080032840 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Miniature Mass Spectrometers on Space and Planetary Missions

Brinckerhoff, William; March 05, 2008; 1 pp.; In English; Truly Portable Mass Spectrometry Symposium, 5-7 Mar. 2008, Louisianna, USA; Copyright; Avail.: Other Sources; Abstract Only

Space flight mass spectrometers contribute our understanding of the origin and evolution of our solar system and even of life itself. This fundamental role has motivated increasing interest in miniature mass spectrometry for planetary missions. Several remarkable new instruments are en route or under development to investigate the composition of planetary bodies such as Mars and comets. For instance, the Sample Analysis at Mars (SAM) suite on the 2009 Mars Science Laboratory (MSL) mission includes a quadrupole mass spectrometer with a sophisticated gas processing system as well as pyrolysis and chemical derivatization protocols for solid samples. Future missions will require even lighter, lower power, and yet more capable mass spectrometers, particularly to analyze samples in situ on planetary surfaces. We have been developing laser-based mass spectrometers for elemental and organic/molecular analysis of rock, ice, or fine particle samples. These typically use time-of-flight (TOF) mass analyzers, which are readily miniaturized and can detect both atomic species and complex organics that occur in a variety of planetary materials. For example, nonvolatile polycyclic aromatic hydrocarbons and kerogen-like macromolecular carbon are found in some carbonaceous meteorites, which derived from asteroid parent bodies. A single focused laser pulse is able to volatilize and ionize some of these compounds for direct TOF analysis. While this is possible without any sample preparation or contact, sensitivity and quantitative performance can improve significantly with some sample handling. As such we have also been examining robotic mechanisms and protocols to accompany space flight mass spectrometers. In addition, sensors in early development may significantly improve these capabilities, via use of techniques such as switchable polarity, ambient pressure, or resonant ionization; tandem mass spectrometry (TOF or ion trap); and chemical imaging.

Author

Mass Spectrometers; Miniaturization; Quadrupoles; Robotics; Solar System; Space Missions

20080032848 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Huygens GCMS Results from Titan

Niemann, Hasso B.; Demick, Jaime; Kasprzak, Wayne; Atreya, Sushil; Owen, Tobias; July 30, 2007; 1 pp.; In English; AOGS 2007 4th Annual Meeting, 30 Jul - 4 Aug. 2007, Bangkok, Thailand; Copyright; Avail.: Other Sources; Abstract Only

The Huygens Probe executed a successful entry, descent and impact on the Saturnian moon of Titan on January 14, 2005. The Gas Chromatograph Mass Spectrometer (GCMS) instrument conducted isotopic and compositional measurements throughout the two and one half hour descent from 146 km altitude, and on the surface for 69 minutes until loss of signal from the orbiting Cassini spacecraft. The GCMS incorporated a quadrupole mass filter with a secondary electron multiplier detection system. The gas sampling system provided continuous direct atmospheric composition measurements and batch sampling through three gas chromatographic (GC) columns, a chemical scrubber and a hydrocarbon enrichment cell. The GCMS gas inlet was heated to prevent condensation, and to evaporate volatiles from the surface after impact. Data products from the GCMS included altitude profiles of the major atmospheric constituents dinitrogen (N2) and methane (CH4), isotope ratios of 14N/15N, 12C/13C, and D/H, mole fractions of radiogenic argon (40Ar) and primordial argon (36Ar), and upper limits on the mole fractions of neon, krypton and xenon, which were found to be absent. Surface measurements confirmed the presence of ethane (C2H6) and cyanogen (C2N2). Later data products expanded atmospheric profiles to include the surface response of C2N2. C2H6, acetylene (C2H2), and carbon dioxide (CO2). More recent results include the profiles of benzene (C6H6) and molecular hydrogen (H2). The GCMS data are being further analyzed to obtain higher precision results and to identify other trace species ion the atmosphere and evaporating from the surface.

Author

Gas Chromatography; Huygens Probe; Mass Spectrometers; Titan

20080032896 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Astrobiology Sample Analysis Program (ASAP) for Advanced Life Detection Instrumentation Development and Calibration

Glavin, Daniel; Brinkerhoff, Will; Dworkin, Jason; Eigenbrode, Jennifer; Franz, Heather; Mahaffy, Paul; Stern, Jen; Blake, Daid; Sandford, Scott; Fries, marc; Steele, Andrew; Amashukeli, Xenia; Fisher, Anita; Grunthaner, Frank; Aubrey, Andrew; Bada, Jeff; Chiesl, Tom; Stockton, Amanda; Mathies, Rich; April 14, 2008; 1 pp.; In English; Astrobiology Science Conference 2008, 14-17 Apr. 2008, San Jose, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Scientific ground-truth measurements for near-term Mars missions, such as the 2009 Mars Science Laboratory (MSL) mission, are essential for validating current in situ flight instrumentation and for the development of advanced instrumentation technologies for life-detection missions over the next decade. The NASA Astrobiology Institute (NAI) has recently funded a consortium of researchers called the Astrobiology Sample Analysis Program (ASAP) to analyze an identical set of homogenized martian analog materials in a 'round-robin' style using both state-of-the-art laboratory techniques as well as in-situ flight instrumentation including the SAM gas chromatograph mass spectrometer and CHEMIN X-ray diffraction/ fluorescence instruments on MSL and the Urey and MOMA organic analyzer instruments under development for the 2013 ExoMars missions. The analog samples studied included an Atacama Desert soil from Chile, the Murchison meteorite, a gypsum sample from the 2007 AMASE Mars analog site, jarosite from Panoche Valley, CA, a hydrothermal sample from Rio Tinto, Spain, and a 'blind' sample collected during the 2007 MSL slow-motion field test in New Mexico. Each sample was distributed to the team for analysis to: (1) determine the nature and inventory of organic compounds, (2) measure the bulk carbon and nitrogen isotopic composition, (3) investigate elemental abundances, mineralogy and matrix, and (4) search for biological activity. The experimental results obtained from the ASAP Mars analog research consortium will be used to build a framework for understanding the biogeochemistry of martian analogs, help calibrate current spaceflight instrumentation, and enhance the scientific return from upcoming missions.

Author

Ground Truth; Mars Missions; Flight Instruments; Organic Compounds; X Ray Diffraction; Exobiology; Field Tests; Nitrogen; Carbon; Mineralogy; Activity (Biology)

20080033023 NASA Marshall Space Flight Center, Huntsville, AL, USA

NASA's Ares I and Ares V Launch Vehicles -- Effective Space Operations Through Efficient Ground Operations

Dumbacher, Daniel L.; Singer, Christopher E.; Onken, Jay F.; May 12, 2008; 2 pp.; In English; AIAA SpaceOps 2008, 12-16 May 2008, Heidelberg, Germany; No Copyright; Avail.: Other Sources; Abstract Only

The USA (U.S.) plans to return to the Moon by 2020, with the development of a new human-rated space transportation system to replace the Space Shuttle, which is due for retirement in 2010 after it completes its missions of building the International Space Station and servicing the Hubble Space Telescope. Powering the future of space-based scientific

exploration will be the Ares I Crew Launch Vehicle, which will transport the Orion Crew Exploration Vehicle to orbit where it will rendezvous with the Lunar Lander. which will be delivered by the Ares V Cargo Launch Vehicle. This new transportation infrastructure, developed by the National Aeronautics and Space Administration (NASA), will allow astronauts to leave low-Earth orbit for extended lunar exploration and preparation for the first footprint on Mars. All space-based operations begin and are controlled from Earth. NASA's philosophy is to deliver safe, reliable, and cost-effective solutions to sustain a multi-billion-dollar program across several decades. Leveraging 50 years of lessons learned, NASA is partnering with private industry, while building on proven hardware experience. This paper will discuss how the Engineering Directorate at NASA's Marshall Space Flight Center is working with the Ares Projects Office to streamline ground operations concepts and reduce costs. Currently, NASA's budget is around $17 billion, which is less than 1 percent of the U.S. Federal budget. Of this amount, NASA invests approximately $4.5 billion each year in Space Shuttle operations, regardless of whether the spacecraft is flying or not. The affordability requirement is for the Ares I to reduce this expense by 50 percent, in order to allow NASA to invest more in space-based scientific operations. Focusing on this metric, the Engineering Directorate provides several solutions-oriented approaches, including Lean/Six Sigma practices and streamlined hardware testing and integration, such as assembling major hardware elements before shipping to the Kennedy Space Center for launch operations. This paper provides top-level details for several cost saving initiatives, including both process and product improvements that will result in space transportation systems that are designed with operations efficiencies in mind. The Engineering Directorate provides both the intellectual capital embodied in an experienced workforce and unique facilities in which to validate the information technology tools that allow a nationwide team to collaboratively connect across miles that separate them and the engineering disciplines that integrate various piece parts into a whole system. As NASA transforms ground-based operations, it also is transitioning its workforce from an era of intense hands-on labor to a new one of mechanized conveniences and robust hardware with simpler interfaces. Ensuring that space exploration is on sound footing requires that operations efficiencies be designed into the transportation system and implemented in the development stage. Applying experience gained through decades of ground and space op'erations, while using value-added processes and modern business and engineering tools, is the philosophy upon which a new era of exploration will be built to solve some of the most pressing exploration challenges today -- namely, safety, reliability, and affordability.

Author

Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Ground Operational Support System; Cost Effectiveness; Space Transportation System Flights; Space Exploration; NASA Programs; Launch Vehicles; Low Earth Orbits

20080033111 New Mexico Univ., Albuquerque, NM, USA

Carbothermal Processing of Lunar Regolith Using Methane

Balasubramaniam, R.; Hegde, U.; Gokoglu, S.; February 10, 2008; 5 pp.; In English; STAIF-2008: Institute of Space and Nuclear Power Studies, 10-14 Feb. 2008, New Mexico, USA; Original contains black and white illustrations

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ONLINE: http://hdl.handle.net/2060/20080033111

The processing of lunar regolith for the production of oxygen is a key component of the In-Situ Resource Utilization plans currently being developed by NASA. Among various candidate processes, the modeling of oxygen production by hydrogen reduction, molten salt electrolysis, and carbothermal processing are presently being pursued. In the carbothermal process, a portion of the surface of the regolith in a container is heated by exposure to a heat source such as a laser beam or a concentrated solar heat flux, so that a small zone of molten regolith is established. The molten zone is surrounded by solid regolith particles that are poor conductors of heat. A continuous flow of methane is maintained over the molten regolith zone. Our model is based on a mechanism where methane pyrolyzes when it comes in contact with the surface of the hot molten regolith to form solid carbon and hydrogen gas. Carbon is deposited on the surface of the melt, and hydrogen is released into the gas stream above the melt surface. We assume that the deposited carbon mixes in the molten regolith and reacts with metal oxides in a reduction reaction by which gaseous carbon monoxide is liberated. Carbon monoxide bubbles through the melt and is released into the gas stream. Oxygen is produced subsequently by (catalytically) processing the carbon monoxide downstream. In this paper, we discuss the development of a chemical conversion model of the carbothermal process to predict the rate of production of carbon monoxide.

Author

Carbon Monoxide; Oxygen Production; Metal Oxides; Lunar Rocks; Heat Sources; Continuum Flow; Regolith

20080033126 NASA Langley Research Center, Hampton, VA, USA

Mars Phoenix Entry, Descent, and Landing Simulation Design and Modelling Analysis

Prince, Jill L.; Desai, Prasun N.; Queen, Eric M.; Grover, Myron R.; August 18, 2008; 15 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

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ONLINE: http://hdl.handle.net/2060/20080033126

The 2007 Mars Phoenix Lander was launched in August of 2007 on a ten month cruise to reach the northern plains of Mars in May 2008. Its mission continues NASA s pursuit to find evidence of water on Mars. Phoenix carries upon it a slew of science instruments to study soil and ice samples from the northern region of the planet, an area previously undiscovered by robotic landers. In order for these science instruments to be useful, it was necessary for Phoenix to perform a safe entry, descent, and landing (EDL) onto the surface of Mars. The EDL design was defined through simulation and analysis of the various phases of the descent. An overview of the simulation and various models developed to characterize the EDL performance is provided. Monte Carlo statistical analysis was performed to assess the performance and robustness of the Phoenix EDL system and are presented in this paper. Using these simulation and modelling tools throughout the design and into the operations phase, the Mars Phoenix EDL was a success on May 25, 2008.

Author

Landing Simulation; Mars Landing; Mars Surface; Soil Sampling; Computerized Simulation

20080033677 NASA Langley Research Center, Hampton, VA, USA

Uncertainty Analysis of Air Radiation for Lunar Return Shock Layers

Kleb, Bil; Johnston, Christopher O.; August 18, 2008; 15 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

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ONLINE: http://hdl.handle.net/2060/20080033677

By leveraging a new uncertainty markup technique, two risk analysis methods are used to compute the uncertainty of lunar-return shock layer radiation predicted by the High temperature Aerothermodynamic Radiation Algorithm (HARA). The effects of epistemic uncertainty, or uncertainty due to a lack of knowledge, is considered for the following modeling parameters: atomic line oscillator strengths, atomic line Stark broadening widths, atomic photoionization cross sections, negative ion photodetachment cross sections, molecular bands oscillator strengths, and electron impact excitation rates. First, a simplified shock layer problem consisting of two constant-property equilibrium layers is considered. The results of this simplified problem show that the atomic nitrogen oscillator strengths and Stark broadening widths in both the vacuum ultraviolet and infrared spectral regions, along with the negative ion continuum, are the dominant uncertainty contributors. Next, three variable property stagnation-line shock layer cases are analyzed: a typical lunar return case and two Fire II cases. For the near-equilibrium lunar return and Fire 1643-second cases, the resulting uncertainties are very similar to the simplified case. Conversely, the relatively nonequilibrium 1636-second case shows significantly larger influence from electron impact excitation rates of both atoms and molecules. For all cases, the total uncertainty in radiative heat flux to the wall due to epistemic uncertainty in modeling parameters is 30% as opposed to the erroneously-small uncertainty levels (plus or minus 6%) found when treating model parameter uncertainties as aleatory (due to chance) instead of epistemic (due to lack of knowledge).

Author

Aerothermodynamics; Algorithms; Radiance; Shock Layers

20080033969 NASA Glenn Research Center, Cleveland, OH, USA

Sensor Technologies for Particulate Detection and Characterization

Greenberg, Paul S.; March 03, 2008; 8 pp.; In English; Original contains color and black and white illustrations

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ONLINE: http://hdl.handle.net/2060/20080033969

Planned Lunar missions have resulted in renewed attention to problems attributable to fine particulates. While the difficulties experienced during the sequence of Apollo missions did not prove critical in all cases, the comparatively long duration of impending missions may present a different situation. This situation creates the need for a spectrum of particulate sensing technologies. From a fundamental perspective, an improved understanding of the properties of the dust fraction is required. Described here is laboratory-based reference instrumentation for the measurement of fundamental particle size distribution (PSD) functions from 2.5 nanometers to 20 micrometers. Concomitant efforts for separating samples into

fractional size bins are also presented. A requirement also exists for developing mission compatible sensors. Examples include provisions for air quality monitoring in spacecraft and remote habitation modules. Required sensor attributes such as low mass, volume, and power consumption, autonomy of operation, and extended reliability cannot be accommodated by existing technologies.
Author
Particulates; Particle Size Distribution; Detection; Characterization; Distribution Functions; Air Quality

20080034464 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Comparison of Major and Minor Species in Io's Exosphere
Burger, M. H.; Schneider, N.; Delamere, P.; October 08, 2007; 2 pp.; In English
Contract(s)/Grant(s): NNG04GQ85G
Report No.(s): Presentation 03.03; Copyright; Avail.: Other Sources; Abstract Only

The atmosphere of the volcanically active moon Io is continuously stripped away through interactions with Jupiter's magnetic field and replenished by volcanically supplied gas. Io's exosphere, the low density region consisting of bound and escaping, non-interacting neutrals, is dominated by oxygen and sulfur atoms formed from the dissociation of SO2. The radial distributions of oxygen and sulfur emissions exhibit an asymmetry between the intensity over Io's leading and trailing hemispheres (Wolven et al. 2001). Sodium, a minor but well studied exospheric component, shows a different asymmetry: the sub-Jupiter exosphere is denser than the anti-Jupiter exosphere (Burger et al. 2001). In addition, the sodium density decreases much faster with distance than the intensities of the oxygen and sulfur emissions. We explore possible sources for these. One possibility is the dependence of the observed emissions lines on plasma flowing through the exosphere. Variations in the electrons affect the excitation rates of the transitions, while leaving the resonantly scattered sodium emission unaffected. The observations may also point to differences in the loss mechanisms from Io's atmosphere: sodium is believed to be sputtered from the atmosphere and surface by high energy ions in the magnetosphere (reviewed Johnson et al 2004; Thomas et al. 2004). It is unclear whether oxygen and sulfur are lost in the same manner, or instead by the dissociation of SO2 near or above the exobase, which would produce a significantly different energy distribution than sputtering, producing the observed differences.
Author
Exosphere; Io; Planetary Atmospheres

20080034478 NASA Langley Research Center, Hampton, VA, USA
NASA's Planned Return to the Moon: Global Access and Anytime Return Requirement Implications on the Lunar Orbit Insertion Burns
Garn, Michelle; Qu, Min; Chrone, Jonathan; Su, Philip; Karlgaard, Chris; August 18, 2008; 20 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 604746.02.24.02.01.01.04; Copyright; Avail.: CASI: A03, Hardcopy

Lunar orbit insertion LOI is a critical maneuver for any mission going to the Moon. Optimizing the geometry of this maneuver is crucial to the success of the architecture designed to return humans to the Moon. LOI burns necessary to meet current NASA Exploration Constellation architecture requirements for the lunar sortie missions are driven mainly by the requirement for global access and 'anytime' return from the lunar surface. This paper begins by describing the Earth-Moon geometry which creates the worst case (delta)V for both the LOI and the translunar injection (TLI) maneuvers over the full metonic cycle. The trajectory which optimizes the overall (delta)V performance of the mission is identified, trade studies results covering the entire lunar globe are mapped onto the contour plots, and the effects of loitering in low lunar orbit as a means of reducing the insertion (delta)V are described. Finally, the lighting conditions on the lunar surface are combined with the LOI and TLI analyses to identify geometries with ideal lighting conditions at sites of interest which minimize the mission (delta)V.
Author
Lunar Orbits; Illuminating; Trajectories; Orbit Insertion; Constellations; Translunar Injection

20080034507 NASA Langley Research Center, Hampton, VA, USA

Ground Plane and Near-Surface Thermal Analysis for NASA's Constellation Program

Gasbarre, Joseph F.; Amundsen, Ruth M.; Scola, Salvatore; Leahy, Frank F.; Sharp, John R.; August 18, 2008; 13 pp.; In English; 2008 Thermal Fluids and Analysis Workshop, 18-22 Aug. 2008, San Jose, CA, USA; Original contains color illustrations

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ONLINE: http://hdl.handle.net/2060/20080034507

Most spacecraft thermal analysis tools assume that the spacecraft is in orbit around a planet and are designed to calculate solar and planetary fluxes, as well as radiation to space. On NASA Constellation projects, thermal analysts are also building models of vehicles in their pre-launch condition on the surface of a planet. This process entails making some modifications in the building and execution of a thermal model such that the radiation from the planet, both reflected albedo and infrared, is calculated correctly. Also important in the calculation of pre-launch vehicle temperatures are the natural environments at the vehicle site, including air and ground temperatures, sky radiative background temperature, solar flux, and optical properties of the ground around the vehicle. A group of Constellation projects have collaborated on developing a cohesive, integrated set of natural environments that accurately capture worst-case thermal scenarios for the pre-launch and launch phases of these vehicles. The paper will discuss the standardization of methods for local planet modeling across Constellation projects, as well as the collection and consolidation of natural environments for launch sites. Methods for Earth as well as lunar sites will be discussed.
Author

Constellation Program; Launch Vehicles; Planetary Surfaces; Surface Temperature; Thermal Analysis; Optical Properties; NASA Programs; Infrared Radiation

20080034522 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Ion Temperature Control of the Io Plasma Torus

Delamere, P. A.; Schneider, N. M.; Steffl, A. J.; Robbins, S. J.; September 08, 2005; 2 pp.; In English

Contract(s)/Grant(s): NNG04GQ85G
Report No.(s): Poster 60.13; Copyright; Avail.: Other Sources; Abstract Only

We report on observational and theoretical studies of ion temperature in the Io plasma torus. Ion temperature is a critical factor for two reasons. First, ions are a major supplier of energy to the torus electrons which power the intense EUV emissions. Second, ion temperature determines the vertical extent of plasma along field lines. Higher temperatures spread plasma out, lowers the density and slows reaction rates. The combined effects can play a controlling role in torus energetics and chemistry. An unexpected tool for the study of ion temperature is the longitudinal structure in the plasma torus which often manifests itself as periodic brightness variations. Opposite sides of the torus (especially magnetic longitudes 20 and 200 degrees) have been observed on numerous occasions to have dramatically different brightness, density, composition, ionization state, electron temperature and ion temperature. These asymmetries must ultimately be driven by different energy flows on the opposite sides, presenting an opportunity to observe key torus processes operating under different conditions. The most comprehensive dataset for the study of longitudinal variations was obtained by the Cassini UVIS instrument during its Jupiter flyby. Steffl (Ph.D. thesis, 2005) identified longitudinal variations in all the quantities listed above wit the exception of ion temperature. We extend his work by undertaking the first search for such variation in the UVIS dataset. We also report on a 'square centimeter' model of the torus which extend the traditional 'cubic centimeter' models by including the controlling effects of ion temperature more completely.
Author

Io; Toroidal Plasmas; Ion Temperature; Plasma Control; Plasma Composition; Plasma Density; Plasma Chemistry

20080034645 NASA Langley Research Center, Hampton, VA, USA

Entry, Descent, and Landing Performance of the Mars Phoenix Lander

Desai, Prasun N.; Prince, Jill L.; Wueen, Eric M.; Cruz, Juan R.; Grover, Myron R.; August 18, 2008; 13 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

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Report No.(s): AIAA 2008-7346; No Copyright; Avail.: CASI: A03, Hardcopy
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On May 25, 2008, the Mars Phoenix Lander successfully landed on the northern arctic plains of Mars. An overview of a preliminary reconstruction analysis performed on each entry, descent, and landing phase to assess the performance of Phoenix as it descended is presented and a comparison to pre-entry predictions is provided. The landing occurred 21 km

further downrange than the predicted landing location. Analysis of the flight data revealed that the primary cause of Phoenix s downrange landing was a higher trim total angle of attack during the hypersonic phase of the entry, which resulted in Phoenix flying a slightly lifting trajectory. The cause of this higher trim attitude is not known at this time. Parachute deployment was 6.4 s later than prediction. This later deployment time was within the variations expected and is consistent with a lifting trajectory. The parachute deployment and inflation process occurred as expected with no anomalies identified. The subsequent parachute descent and powered terminal landing also behaved as expected. A preliminary reconstruction of the landing day atmospheric density profile was found to be lower than the best apriori prediction, ranging from a few percent less to a maximum of 8%. A comparison of the flight reconstructed trajectory parameters shows that the actual Phoenix entry, descent, and landing was close to pre-entry predictions. This reconstruction investigation is currently ongoing and the results to date are in the process of being refined.
Author
Descent; Mars Surface; General Overviews; Phoenix Mars Lander; Atmospheric Entry

20080034648 NASA Langley Research Center, Hampton, VA, USA
Aerodynamics for the Mars Phoenix Entry Capsule
Edquist, Karl T.; Desai, Prasun N.; Schoenenberger, Mark; August 18, 2008; 18 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 439654.02.07.01
Report No.(s): AIAA Paper 2008-7219; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080034648

Pre-flight aerodynamics data for the Mars Phoenix entry capsule are presented. The aerodynamic coefficients were generated as a function of total angle-of-attack and either Knudsen number, velocity, or Mach number, depending on the flight regime. The database was constructed using continuum flowfield computations and data from the Mars Exploration Rover and Viking programs. Hypersonic and supersonic static coefficients were derived from Navier-Stokes solutions on a pre-flight design trajectory. High-altitude data (free-molecular and transitional regimes) and dynamic pitch damping characteristics were taken from Mars Exploration Rover analysis and testing. Transonic static coefficients from Viking wind tunnel tests were used for capsule aerodynamics under the parachute. Static instabilities were predicted at two points along the reference trajectory and were verified by reconstructed flight data. During the hypersonic instability, the capsule was predicted to trim at angles as high as 2.5 deg with an on-axis center-of-gravity. Trim angles were predicted for off-nominal pitching moment (4.2 deg peak) and a 5 mm off-axis center-ofgravity (4.8 deg peak). Finally, hypersonic static coefficient sensitivities to atmospheric density were predicted to be within uncertainty bounds.
Author
Aerodynamics; Wind Tunnel Tests; Phoenix Mars Lander; Atmospheric Entry; Space Capsules; Viking Mars Program

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20080032724 NASA Marshall Space Flight Center, Huntsville, AL, USA; National Space Science and Technology Center, Huntsville, AL, USA
The Foggy EUV Corona and Coronal Heating by MHD Waves from Explosive Reconnection Events
Moore, Ron L.; Cirtain, Jonathan W.; Falconer, David A.; May 26, 2008; 12 pp.; In English; Joint American Geophysical Union (AGU)/AAS Solar Physics Division Meeting, 26-31 May 2008, Fort Lauderdale, FL, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In 0.5 arcsec/pixel TRACE coronal EUV images, the corona rooted in active regions that are at the limb and are not flaring is seen to consist of (1) a complex array of discrete loops and plumes embedded in (2) a diffuse ambient component that shows no fine structure and gradually fades with height. For each of two not-flaring active regions, found that the diffuse component is (1) approximately isothermal and hydrostatic and (2) emits well over half of the total EUV luminosity of the active-region corona. Here, from a TRACE Fe XII coronal image of another not-flaring active region, the large sunspot active region AR 10652 when it was at the west limb on 30 July 2004, we separate the diffuse component from the discrete loop component by spatial filtering, and find that the diffuse component has about 60% of the total luminosity. If under much higher spatial resolution than that of TRACE (e. g., the 0.1 arcsec/pixel resolution of the Hi-C sounding-rocket experiment proposed by J. W. Cirtain et al), most of the diffuse component remains diffuse rather being resolved into very narrow loops and plumes, this

will raise the possibility that the EUV corona in active regions consists of two basically different but comparably luminous components: one being the set of discrete bright loops and plumes and the other being a truly diffuse component filling the space between the discrete loops and plumes. This dichotomy would imply that there are two different but comparably powerful coronal heating mechanisms operating in active regions, one for the distinct loops and plumes and another for the diffuse component. We present a scenario in which (1) each discrete bright loop or plume is a flux tube that was recently reconnected in a burst of reconnection, and (2) the diffuse component is heated by MHD waves that are generated by these reconnection events and by other fine-scale explosive reconnection events, most of which occur in and below the base of the corona where they are seen as UV explosive events, EUV blinkers, and type II spicules. These MHD waves propagate across field lines and dissipate, heating the plasma in the field between the bright loops and plumes.
Author
Extreme Ultraviolet Radiation; Magnetic Field Reconnection; Magnetohydrodynamic Waves; Sunspots; Solar Corona; Solar Magnetic Field; Magnetohydrodynamics

20080032771 NASA Glenn Research Center, Cleveland, OH, USA
The Effect of Reaction Control System Thruster Plume Impingement on Orion Service Module Solar Array Power Production
Bury, Kristen M.; Kerslake, Thomas W.; June 2008; 33 pp.; In English; Sixth International Energy Conversion Engineering Conference (IECEC), 28-20 Jul. 2008, Cleveland, OH, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 644423.06.32.03.05.03
Report No.(s): NASA/TM-2008-215423; AIAA Paper 2008-5753; E-16593; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032771

NASA's new Orion Crew Exploration Vehicle has geometry that orients the reaction control system (RCS) thrusters such that they can impinge upon the surface of Orion's solar array wings (SAW). Plume impingement can cause Paschen discharge, chemical contamination, thermal loading, erosion, and force loading on the SAW surface, especially when the SAWs are in a worst-case orientation (pointed 45 towards the aft end of the vehicle). Preliminary plume impingement assessment methods were needed to determine whether in-depth, timeconsuming calculations were required to assess power loss. Simple methods for assessing power loss as a result of these anomalies were developed to determine whether plume impingement induced power losses were below the assumed contamination loss budget of 2 percent. This paper details the methods that were developed and applies them to Orion's worst-case orientation.
Author
Plumes; Service Modules; Solar Arrays; Crew Exploration Vehicle; Reaction Control; Impingement

20080032779 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Gyroless Safehold Control Law using Angular Momentum as an Inertial Reference Vector
Stoneking, Eric; Lebsock, Ken; August 18, 2008; 12 pp.; In English; AIAA GNC Conference, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080032779

A novel safehold control law was developed for the nadir-pointing Vegetation Canopy Lidar (VCL) spacecraft, necessitated by a challenging combination of constraints. The instrument optics did not have a reclosable cover to protect them from potentially catastrophic damage if they were exposed to direct sunlight. The baseline safehold control law relied on a single-string inertial reference unit. A gyroless safehold law was developed to give a degree of rebustness to gyro failures. Typical safehold solutions were not viable; thermal constraints made spin stabilization unsuitable, and an inertial hold based solely on magnetometer measurements wandered unacceptably during eclipse. The novel approach presented here maintains a momentum bias vector not for gyroscopic stiffness, but to use as an inertial reference direction during eclipse. The control law design is presented. The effect on stability of the rate-deficiency of magnetometer-based rate derivation is assessed. The control law's performance is evaluated by simulation.
Author
Control Theory; Angular Momentum; Canopies (Vegetation); Fiber Optics

20080033206 NASA, Washington, DC, USA
OSL - Orbiting Solar Laboratory: Our Window on the Sun
[1991]; 36 pp.; In English; Original contains color illustrations
Report No.(s): NASA/NP-143; Copyright; Avail.: CASI: A03, Hardcopy

The Sun, the nearest star, is crucial for life on Earth and has always been an object of intense study. Indeed, many of the

fundamental principles of astrophysics, which seek to understand the physical nature of the universe, have been established through study of the Sun. Magnetic activity with the Sun drives powerful events on its surface and in its atmosphere. From the the Earth, these events can be seen as active region with their sunspots and solar flares. But to observe such phenomena in detail require more finely-tuned and powerful instruments, operating in space, across a broader range of the electomagnetic spectrum, than have ever been available in the past. Earth's atmosphere has always blurred the images received by visible-light telescopes on the ground. The atmosphere also acts as a barrier to the ultraviolet, extreme ultraviolet, and x rays that are similarly emitted from the Sun. All these wavelengths need to be captured, at the same moment in time, before the complex interrelationships of solar activity can be truly understood. The Orbiting Solar Laboratory (OSL), the prime NASA solar mission for the 1990's, is uniquely designed to 'see' across the wavelengths and so observe the fine evolving details of a wide range of phenomena on the surface of the Sun. By the turn of the century, OSL will enable scientists to solve mysteries that humankind has sought to unravel for thousands of years.
Author
Solar Observatories; Sun; Solar Physics

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20080032774 NASA Goddard Space Flight Center, Greenbelt, MD, USA
[Overview of the GSFC Effort to Build Microwave Detectors for CMB Polarization]
Chuss, David; December 03, 2007; 1 pp.; In English; Ultra-low-noise Detectors Workshop, 3 Dec. 2007, Cambridge, UK; No Copyright; Avail.: Other Sources; Abstract Only

Filled arrays of bolometers are currently being employed for use in astronomy from the far-infrared through millimeter portion of the electromagnetic spectrum. Because of the large range of wavelengths for which such detectors are applicable, the size of a pixel (p) relative to the wavelength (lambda) will vary according to the specific application of a given available technology. As the pixel size becomes comparable to a wavelength of the absorbed radiation, correlations in the radiation field at the pixel can affect the imaging properties of the system independent of the correlations introduced by the front-end optics. We study the dependence of image fidelity and induced polarization on the size of the pixel by employing a formalism in which diffraction due to the pixel boundary is treated by propagating the second-order statistical correlations of the radiation field through a model optical system. We construct simulated polarized images of square pixels for various ratios of p lambda. For the limit in which few modes are supported by the pixel (p lambda lesssiml), we find that the diffraction due to the pixel edges is non-negligible and hence must be considered along with the telescope diffraction pattern in modeling the ultimate spatial resolution of an imaging system. For the case in which the pixel is over-moded (p lambda ggl), the geometric limit is approached as expected. This technique provides a quantitative approach to understand and optimize the imaging properties of planar detectors in the few-mode limit.
Author
Microwave Radiometers; Detectors; Cosmic Microwave Background Radiation; Polarization; Radio Astronomy

Subject Term Index

Personal Author Index