



**National Aeronautics and
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Langley Research Center**

**Scientific and Technical
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Scientific and Technical Aerospace Reports

STAIR

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Introduction

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

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

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- NASA, NASA contractor, and NASA grantee reports
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The NASA STI Program

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

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NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

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National Technical Information Service (NTIS)

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

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

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[Subject Term Index](#)

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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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.

20070037469 Naval Postgraduate School, Monterey, CA USA

Exploring Naval Tactics with UAVs in an Island Complex Using Agent-Based Simulation

Lalis, Vasileios; Jun 2007; 87 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471061; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471061>

The benefits of Unmanned Aerial Vehicles (UAV) at sea are undisputed. The amount and speed of the incoming information from a UAV, combined with its maneuverability and time-on-task capability, are assets to any navy. For the Greek Navy, the main local operation area is the Aegean and Ionian Sea. As Greece lies between three continents (Europe, Asia, Africa), there is a great deal of sea traffic and potential illegal activities, such as smuggling, exploitation of illegal immigrants, and possible terrorist activity. The scope of this study is to explore naval tactics with UAVs in an island complex using Agent-Based Simulation. MANA (Map Aware Non-uniform Automata) software, used in this study, provides a visual and realistic background to conduct simulations of real operations involving many different entities. This thesis demonstrates that this type of software can rapidly produce, explore and check simulated naval tactics before actual implementation. It also shows how the UAV's technology plays a key role in a search and detection operation, whereas the enemy must rely mostly on his tactics.

DTIC

Drone Vehicles; Islands; Maneuverability; Military Operations; Simulation; Tactics

20070037525 Lockheed Martin Aeronautics Co., Fort Worth, TX USA

Pulsed Injection Flow Control for Throttling in Supersonic Nozzles - A Computational Fluid Dynamics Based Performance Correlation (Preprint)

Domel, Neal D; Baruzzini, Dan; Miller, Daniel N; May 14, 2007; 16 pp.; In English

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

Report No.(s): AD-A471149; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471149>

A vehicle propelled by an engine with a variable geometry nozzle allows the nozzle expansion ratio to vary with altitude and flight condition, thereby optimizing vehicle performance. Rockets are examples of vehicles with high nozzle pressure ratios (NPRs), which operate over a large altitude range. Active flow control offers a method of reducing the effective aerodynamic throat of a rocket nozzle in a geometrically fixed structure. Throttling the mass flow rate through the nozzle throat controls the effective throat area, subsequently controlling the effective expansion ratio of the overall nozzle. This paper presents findings from the Pulsed Injection for Rocket Flow Control Technology (PIRFCT) program, which was funded by the Defense Advanced Research Projects Agency (DARPA), and managed by the Air Force Research Laboratory (AFRL). PIRFCT evaluated potential gains in the overall performance of a rocket using active flow control at the throat for throttling. Lockheed Martin Aeronautics Company used Computational Fluid Dynamics (CFD) to simulate a high NPR rocket nozzle with active flow control. Simulations were performed with steady and pulsed flow control jets which were oriented near the throat and directed upstream at a 45-degree angle against the primary flow, and various injection conditions were modeled. All simulations were performed with the perfect gas assumption with the specific heat ratio (γ) held constant at the value corresponding to the throat temperature. However, during the course of the program, a correlation was developed which

predicts the reduction in discharge coefficient as a function of time-averaged mass flux, momentum flux and energy flux. The correlation was very general and was valid for steady and pulsed cases of various conditions.

DTIC

Active Control; Computational Fluid Dynamics; Flow Distribution; Injection; Nozzle Flow; Supersonic Nozzles; Throttling

20070037878 Defence Science and Technology Organisation, Edinburgh, Australia

Assessment of TEM Cells for Whole Aircraft EMV Testing

Walters, Andrew J; Leat, Chris; May 2007; 77 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471568; DSTO-RR-0149; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Transverse Electromagnetic (TEM) cells offer one solution to the problem of electromagnetic vulnerability (EMV) testing of whole vehicles at lower frequencies. Combined with a reverberation chamber (RC) TEM cells offer an attractive solution to a EMV testing facility which could operate in the frequency range of 10 kHz to 18 GHz. In order to move toward a hybrid RC/TEM facility the non-uniform transition region between TEM and RC operation (i.e. 17 MHz to 30 MHz) must be addressed. This report discusses computational electromagnetics (CEM) modelling used to characterize the DSTO scale TEM cell. The cell was built with the aim of integrating a full scale version into the DSTO RC. The CEM model of the TEM cell was validated using measurements, which showed good agreement. It was then assessed for applicability for aircraft EMV testing by comparing a simulated aircraft in the cell against an aircraft on an Open Area Test Site (OATS) and in free space. The work highlighted the need for resonance suppression in the transition region. We introduce a novel way of active resonance suppression and demonstrate its effectiveness when applied to the first TE resonance. Finally the feasibility of integrating a TEM cell into the DSTO RC is discussed including costs for major items

DTIC

Avionics; Electromagnetic Compatibility

20070037881 Air Force Research Lab., Eglin AFB, FL USA

Design of the Air Force Research Laboratory Micro Aerial Vehicle Research Configuration

Stewart, Kelly; Wagener, Jeffrey; Abate, Gregg; Salichon, Max; Aug 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A471575; AFRL-MN-EG-TP-2007-7413; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force Research Laboratory Munitions Directorate (AFRL/MN) is presently involved in many aspects of micro aerial vehicle (MAV) research. Among these are: advanced modeling and simulation models for MAVs, aero-structural interaction, advanced guidance techniques, hardware-in-the-loop simulations, and vehicle integration. In order to optimize collaboration within AFRL and also with outside research organizations, it was decided that a common MAV configuration be designed that would serve as a reference for current and future research. This paper describes a generic micro air vehicle that will serve as a 'baseline' configuration. The MAV design incorporates a circular fuselage, a thin cambered wing, and a conventional tail. The MAV has a wingspan of 24 inches and a fuselage length of 17 inches. This paper will also detail the rationale behind the design as well as provide initial aerodynamic properties and flight performance characteristics of the AFRL Generic MAV, herein called 'GENMAV.'

DTIC

Aerodynamics; Drone Aircraft; Military Technology; Miniaturization; Research and Development; Research Vehicles

20070038100 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Experimental Investigation of Oblique Wing Aerodynamics at Low Speed

Dillsaver, Matthew J; Mar 2007; 104 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471422; AFIT/GAE/ENY/07-M10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In an effort to increase the range of missiles and guided bombs, the USAF is looking at options for new wing configurations. One such configuration being considered is oblique wings. An oblique wing is a wing that pivots about a point on the aircraft fuselage thereby having one side swept forward and the other swept aft. Additional interest is looking at a wing only configuration that also rotates with one wing tip forward of the other. Studies have shown that this configuration can provide less drag for a given lift at both supersonic cruise and subsonic loiter conditions. This experiment focused on the low speed performance of a missile model with an oblique wing. The wing was tested at seven different sweep angles and at two

different speeds. In order to simulate the missile dropping from an aircraft the model was inverted over a stationary ground plane in the tunnel and tested at the same wing obliquity angles. Stalling was found at certain conditions including sweep angles of 0, 15, and 30 deg. The ground plane was shown to result in an increase in lift as well as an increase in drag. The ground plane was also shown to add more longitudinal stability, thus making the missile better performing when dropped from an aircraft.

DTIC

Aerodynamics; Ground Effect (Aerodynamics); Low Speed; Oblique Wings

20070038187 Massachusetts Inst. of Tech., Cambridge, MA USA

Parametric Reduced-Order Models for Probabilistic Analysis of Unsteady Aerodynamic Applications

Bui-Thanh, T; Wilcox, K; Ghattas, O; Jan 2007; 16 pp.; In English

Contract(s)/Grant(s): FA9550-06-0271; CNS-0540372

Report No.(s): AD-A471232; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471232>

Methodology is presented to derive reduced-order models for large-scale parametric applications in unsteady aerodynamics. The specific case considered in this paper is a computational fluid dynamic (CFD) model with parametric dependence that arises from geometric shape variations. The first key contribution of the methodology is the derivation of a linearized model that permits the effects of geometry variations to be represented with an explicit affine function. The second key contribution is an adaptive sampling method that utilizes an optimization formulation to derive a reduced basis that spans the space of geometric input parameters. The method is applied to derive efficient reduced-order models for probabilistic analysis of the effects of blade geometry variation for a two-dimensional model problem governed by the Euler equations. Reduced-order models that achieve three orders of magnitude reduction in the number of states are shown to accurately reproduce CFD Monte Carlo simulation results at a fraction of the computational cost.

DTIC

Unsteady Aerodynamics; Two Dimensional Models; Differential Equations

20070038336 NASA Langley Research Center, Hampton, VA, USA

Time-Accurate Computations of Isolated Circular Synthetic Jets in Crossflow

Rumsey, C. L.; Schaeffler, N. W.; Milanovic, I. M.; Zaman, K. B. M. Q.; [2007]; 27 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): 581581.02.08; Copyright; Avail.: CASI: [A03](#), Hardcopy

Results from unsteady Reynolds-averaged Navier-Stokes computations are described for two different synthetic jet flows issuing into a turbulent boundary layer crossflow through a circular orifice. In one case the jet effect is mostly contained within the boundary layer, while in the other case the jet effect extends beyond the boundary layer edge. Both cases have momentum flux ratios less than 2. Several numerical parameters are investigated, and some lessons learned regarding the CFD methods for computing these types of flow fields are summarized. Results in both cases are compared to experiment.

Author

Flow Distribution; Cross Flow; Boundary Layers; Air Jets; Reynolds Averaging; Navier-Stokes Equation; Computational Fluid Dynamics

20070038339 NASA Langley Research Center, Hampton, VA, USA

Convergence Acceleration of Runge-Kutta Schemes for Solving the Navier-Stokes Equations

Swanson, Roy C., Jr.; Turkel, Eli; Rossow, C.-C.; [2007]; 29 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08; Copyright; Avail.: CASI: [A03](#), Hardcopy

The convergence of a Runge-Kutta (RK) scheme with multigrid is accelerated by preconditioning with a fully implicit operator. With the extended stability of the Runge-Kutta scheme, CFL numbers as high as 1000 can be used. The implicit preconditioner addresses the stiffness in the discrete equations associated with stretched meshes. This RK/implicit scheme is used as a smoother for multigrid. Fourier analysis is applied to determine damping properties. Numerical dissipation operators based on the Roe scheme, a matrix dissipation, and the CUSP scheme are considered in evaluating the RK/implicit scheme. In addition, the effect of the number of RK stages is examined. Both the numerical and computational efficiency of the scheme with the different dissipation operators are discussed. The RK/implicit scheme is used to solve the two-dimensional (2-D) and three-dimensional (3-D) compressible, Reynolds-averaged Navier-Stokes equations. Turbulent flows over an airfoil and wing at subsonic and transonic conditions are computed. The effects of the cell aspect ratio on convergence are investigated for

Reynolds numbers between 5.7×10^6 and 100×10^6 . It is demonstrated that the implicit preconditioner can reduce the computational time of a well-tuned standard RK scheme by a factor between four and ten.

Author

Computational Grids; Runge-Kutta Method; Stability; Stiffness; Fourier Analysis; Aspect Ratio; Reynolds Averaging

20070038581 Air Force Flight Test Center, Edwards AFB, CA USA

A Limited Evaluation of Full Scale Control Surface Deflection Drag (Have FUN)

Reinhardt, R B; Celi, Sean A; Geraghty, Jeffrey T; Stahl, James W; Glover, Victor J; Bowman, Geoffrey G; Jun 2007; 75 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-M07C

Report No.(s): AD-A471838; AFFTC-TIM-07-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Have FUN (FULL Scale Numbers) Test Management Project was conducted at the request of the USAF TPS as an investigation into the drag caused by control surface deflection during dynamic soaring techniques. Forty-three test sorties were performed from 6-23 March 2007 under Job Order Number (JON) M07C0200. The six member Have FUN test team from TPS Class 06B performed the testing at the North Base facilities of Edwards AFB. Flight testing gathered sailplane decelerations during control surface deflections and energy height data during the performance of Dynamic Soaring maneuvers and straight glides. Coefficients of drag for each control surface were determined from minimum sink to maneuvering airspeed of the L-23 Super Blanik.

DTIC

Control Surfaces; Deflection; Drag; Gliders

20070038676 Cobalt Solutions, LLC, Springfield, OH USA

Computational Methods for Feedback Controllers for Aerodynamics Flow Applications

Siegel, Stefan G; Seidel, Juergen J; McLaughlin, Thomas E; Cohen, Kelly; Aradag, Selin; Forsythe, James R; Strang, William Z; Aug 15, 2007; 135 pp.; In English

Contract(s)/Grant(s): FA9550-05-C-0048

Report No.(s): AD-A472029; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report covers the final results of the STTR: 'Computational Methods for Feedback Controllers for Aerodynamics Flow Applications.' It is intended to be a comprehensive summary of the project. The goal of the project was to provide a robust, easy to use computational tool for developing feedback controllers for aerodynamic flow applications - i.e. a tool to develop closed loop flow control methods. The two major partners of the STTR were the USAF Academy's Department of Aeronautics, and Cobalt Solutions, LLC (CSLLC).

DTIC

Aerodynamic Characteristics; Aerodynamics; Computational Fluid Dynamics; Controllers; Feedback

20070038942 NASA Glenn Research Center, Cleveland, OH, USA

Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition

LaGraff, John E., Editor; March 2007; 556 pp.; In English; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition, 15-18 Aug. 1993, Mountain Lake, NY, USA; See also 20070038943 - 20070038974; Original contains black and white illustrations

Contract(s)/Grant(s): NAG3-621; WBS 561581.02.08.03.21.02

Report No.(s): NASA/CP-2007-214667; E-15781; Copyright; Avail.: CASI: [A24](#), Hardcopy

This volume contains materials presented at the Minnowbrook I-1993 Workshop on End-Stage Boundary Layer Transition, held at the Syracuse University Minnowbrook Conference Center, New York, from August 15 to 18, 1993. This volume was previously published as a Syracuse University report edited by John E. LaGraff. The workshop organizers were John E. LaGraff (Syracuse University), Terry V. Jones (Oxford University), and J. Paul Gostelow (University of Technology, Sydney). The workshop focused on physical understanding of the late stages of transition from laminar to turbulent flows, with the specific goal of contributing to improving engineering design of turbomachinery and wing airfoils. The workshop participants included academic researchers from the USA and abroad, and representatives from the gas-turbine industry and U.S. government laboratories. To improve interaction and discussions among the participants, no formal papers were required. The physical mechanisms discussed were related to natural and bypass transition, wake-induced transition, effects of freestream turbulence, turbulent spots, hairpin vortices, nonlinear instabilities and breakdown, instability wave interactions, intermittency, turbulence, numerical simulation and modeling of transition, heat transfer in boundary-layer transition,

transition in separated flows, laminarization, transition in turbomachinery compressors and turbines, hypersonic boundary-layer transition, and other related topics. This volume contains abstracts and copies of the viewgraphs presented, organized according to the workshop sessions. The workshop summary and the plenary discussion transcript clearly outline future research needs.

Author

Turbomachinery; Boundary Layer Transition; Turbulent Flow; Turbulence Effects; Transition Flow; Separated Flow; Heat Transfer; Compressors; Turbines

20070038943 Case Western Reserve Univ., Cleveland, OH, USA

Transition Zone Modeling

Reshotko, Eli; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 431-471; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

This lecture reviews current practice as well as new modeling ideas for the calculation of at least skin friction and heat transfer between the onset and end of transition.

Derived from text

Mathematical Models; Boundary Layer Transition; Skin Friction; Turbulent Heat Transfer

20070038944 Ohio State Univ., Columbus, OH, USA

Simulations of Boundary-Layer Transition

Herbert, Thorwald; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 473-487; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

For incompressible benchmark flows, we have demonstrated the capability of the parabolized stability equations (PSE) to simulate the transition process in excellent agreement with microscopic experiments and direct Navier-Stokes simulations at modest computational cost. Encouraged by these results, we have developed the PSE methodology of three-dimensional boundary-layers in general curvilinear coordinates for the range from low to hypersonic speeds, and for both linear and nonlinear problems. For given initial and boundary conditions, the approach permits simulations from receptivity through linear and secondary instabilities into the late stages of transition where significant changes in skin friction and heat transfer coefficients occur. We have performed transition simulations for a variety of two- and three-dimensional similarity solutions and for realistic flows over swept wings at subsonic and supersonic speeds, the pressure and suction side of turbine blades at low and medium turbulence levels, and over a blunt cone at Mach number $Ma = 8$. We present selected results for different transition mechanisms with emphasis on the late stage of transition and the evolution of wall-shear stress and heat transfer.

Author

Boundary Layer Transition; Simulation; Incompressible Flow; Flow Stability

20070038945 Queen Mary and Westfield Coll., London, UK

Numerical Simulations of the Late Stages of Transition to Turbulence

Sandham, N. D.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 489-493; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

This viewgraph presentation reviews direct numerical simulation in the late stages of the transition process to turbulence.

CASI

Direct Numerical Simulation; Turbulence; Boundary Layer Transition; Three Dimensional Flow

20070038946 Manchester Univ., UK

Intermittent Turbulence in the Attachment Line Flow Formed on an Infinite Swept Wing

Poll, Ian; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 327-337; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The transition process which takes place in the attachment-line boundary layer in the presence of gross contamination is an issue of considerable interest to wing designers. It is well known that this flow is very sensitive to the presence of isolated roughness and that transition can be initiated at a very low value of the local medium thickness Reynolds number. Moreover, once the attachment line is turbulent, the flow over the whole wing chords, top and bottom surface, will be turbulent and this has major implications for wind drag.

Author

Boundary Layers; Surface Roughness; Swept Wings; Turbulent Flow; Contamination; Drag; Wings

20070038947 California State Univ., Long Beach, CA, USA

The Role of Separation Bubbles on the Aerodynamic Characteristics of Airfoils, Including Stall and Post-Stall, at Low Reynolds Numbers

Chen, Hsun H.; Cebeci, Tuncer; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 339-356; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Airfoils at high Reynolds numbers, in general, have small separation bubbles that are usually confined to the leading edge. Since the Reynolds number is large, the turbulence model for the transition region between the laminar and turbulent flow is not important. Furthermore, the onset of transition occurs either at separation or prior to separation and can be predicted satisfactorily by empirical correlations when the incident angle is small and can be assumed to correspond to laminar separation when the correlations do not apply, i.e., at high incidence angles.

Author

Bubbles; Aerodynamic Characteristics; Laminar Flow; Transition Flow; Leading Edges; Correlation; Low Reynolds Number; Airfoils

20070038948 Wright Lab., Wright-Patterson AFB, OH, USA

Late Stage Hypersonic Boundary Layer Transition

Kimmel, Roger; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 357-369; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Our knowledge of late-stage hypersonic boundary layer transition is very limited, since most theoretical and experimental work has concentrated on the linear disturbance amplification regime. Although experiments show linear higher harmonics beginning at approximately one-half the transition Reynolds number, there is no experimental evidence for subharmonics, in contrast to subsonic boundary layer transition. A practical definition of transition is the location where mean surface heat transfer first begins to rise above laminar values. Hot wire spectra show that prior to transition, spectral dispersion occurs, with second mode energy decreasing, and energy at neighboring frequencies increasing. Near the transition point, disturbance energy begins to spread from the critical layer toward the wall. Greater emphasis on the breakdown region is planned for future experiments.

Author

Hypersonic Boundary Layer; Boundary Layer Transition; Laminar Heat Transfer; Reynolds Number; Transition Points; Amplification; Harmonics

20070038949 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Boundary Layer Receptivity to Weak Freestream Turbulence

Kendall, J. M.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 31-37; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

The experimental configuration is shown. The tunnel is about 8 ft. long by 2 ft. square. In most cases the wind speed is set to 11.6 m/s. Three different plates are used. Each is a quarter-inch thick, extends wall-to-wall, and has a semi-elliptical leading edge. The two extremes in bluntness are shown, being half a 14:1 ellipse and half a 5:1 ellipse. The plate surface pressure is uniform to better than 0.01 q, except near the leading edge, or whenever a condition of lift is intentionally applied to the plate. Turbulence is created in the setting chamber by means of eight 1/16-inch hypodermic tubes stretched normal to the flow and pressurized at any controlled value up to 6 psi. Each has twenty-one 0.006-inch holes spaced at 1-inch intervals along its mid-section of length, and directed upwind. The tubes are spaced vertically at 1.25-inch intervals. The turbulence so created is carried to the test section, where it is found to be spatially uniform over a suitably large cross-sectional area and axial length. Fig. 2 presents spectra of the steam turbulence in the empty tunnel for jet-array pressures of 1 psi to 6 psi. The T-S range extends between 80 and 150 Hz, approximately, for the present conditions. The primary method of fluctuation measurement is by use of microphones installed on the reverse side of the plate. A description of the method and its advantages has been given in AIAA 90-1504. Mean and fluctuating flow measurements are also made by means of various hot-wire probes and rakes carried on a computer-controlled x-y-z traverse mechanism. Fig. 3 shows the layout of a four-foot plate carrying 64 microphoned, the outputs of which are digitized simultaneously. The location of a single driver used for creating controlled T-S packets is also indicated.

Derived from text

Boundary Layers; Turbulence; Free Flow; Waveforms; Receiving

20070038950 Texas Univ., Austin, TX, USA

Turbulence Modeling for the Simulation of Transition in Wall Shear Flows

Crawford, Michael E.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 495-514; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Our research involves study of the behavior of k-epsilon turbulence models for simulation of bypass-level transition over flat surfaces and turbine blades. One facet of the research has been to assess the performance of a multitude of k-epsilon models in what we call 'natural transition', i.e. no modifications to the k-e models. The study has been to ascertain what features in the dynamics of the model affect the start and end of the transition. Some of the findings are in keeping with those reported by others (e.g. ERCOFTAC). A second facet of the research has been to develop and benchmark a new multi-time scale k-epsilon model (MTS) for use in simulating bypass-level transition. This model has certain features of the published MTS models by Hanjalic, Launder, and Schiestel, and by Kim and his coworkers. The major new feature of our MTS model is that it can be used to compute wall shear flows as a low-turbulence Reynolds number type of model, i.e. there is no required partition with patching a one-equation k model in the near-wall region to a two-equation k-epsilon model in the outer part of the flow. Our MTS model has been studied extensively to understand its dynamics in predicting the onset of transition and the end-stage of the transition. Results to date indicate that it far superior to the standard unmodified k-epsilon models. The effects of protracted pressure gradients on the model behavior are currently being investigated.

Author

K-Epsilon Turbulence Model; Shear Flow; Simulation; Transition Flow; Turbulence Models; Wall Flow

20070038951 University of Southern California, Los Angeles, CA, USA

Initiation of Turbulent Spots in a Laminar Boundary Layer by Rigid Falling Particulates

Blackwelder, R. F.; Browand, F. K.; Fisher, C.; Tanaguichi, P.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 23-30; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

A transitional laminar boundary layer is developed on a 1m wide km long flat plate in a 0.6m deep water channel with a freestream velocity of 15-50 cm/s. A particulate dispenser under computer control ejects individual particles having diameters of $1/3 \delta$ into the free stream. The particulates are introduced with an initial velocity of $U(\text{sub infinity})$ in the direction of the free stream. They have differing specific gravities of 1.03-2.7 which introduces an additional non-dimensional parameter relating the time taken to traverse the boundary layer to the convective time scale. The particulates produce a wake in the upper region of the boundary layer as they sink towards the wall. Visualization data taken over the range $5 \times 10(\text{exp } 4)$ less than $Re(\text{sub } x)$ less than $5 \times 10(\text{exp } 5)$ indicate that turbulent spots are produced by the disturbances due to the wake rather than by the particulates themselves. This suggests that the spot formation process in this case may be inviscid in nature and may not be strongly influenced by the presence of the wall.

Author

Laminar Boundary Layer; Particulates; Turbulence; Falling Spheres

20070038952 Illinois Inst. of Tech., Chicago, IL, USA

Role of Detuning in the Final Stage of Subharmonic Mode Transition in Boundary Layers

Corke, Thomas C.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 61-67; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

This work involves mechanisms for transition to turbulence in a Blasius boundary layer through resonant interactions between a plane Tollmien-Schlichting Wave and pairs of oblique waves with equal-but-opposite wave angles. When the frequency of the TS wave is exactly twice that of the oblique waves, we have a 'tuned' subharmonic resonance. This leads to the enhanced growth of the oblique modes. Following this, other nonlinear interactions lead to the growth of other 3-D modes which are harmonically based, along with a 3-D mean flow distortion. In the final stage of this process, a gradual spectral filling occurs which we have traced to the growth of fundamental and subharmonic side-band modes. To simulate this with controlled inputs, we introduced the oblique wave pairs at the same conditions, but shifted the frequency of the plane TS mode (by as much as 12 percent) so that it was not exactly twice that of the 3-D modes. These 'detuned' conditions also lead to the enhanced growth of the oblique modes, as well as discrete side-band modes which come about through sum and difference interactions. Other interactions quickly lead to a broad band of discrete modes. Of particular importance is the lowest difference frequency which produces a low frequency modulation similar to what has been seen in past experiments with natural 3-D mode input. Cross-bispectral analysis of time series allows us to trace the origin and development of the different modes. Following these leads to a scenario which we believe is more relevant to conditions of 'natural' transitions,

where low amplitude background disturbances either lead to the gradual detuning of exact fundamental/subharmonic resonance, or in which 3-D mode resonance is detuned from the onset. The results contrast the two conditions, and document the propensity of the 2-D/3-D mode interactions to become detuned.

Author

Boundary Layers; Flow Distortion; Turbulence; Resonance; Plane Waves; Tollmien-Schlichting Waves

20070038953 Oxford Univ., Oxford, UK

Turbulent-Spot Growth Characteristics: Wind-Tunnel and Flight Measurements of Natural Transition at High Reynolds and Mach Numbers

Clark, J. P.; Jones, T. V.; LaGraff, J. E.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 319-325; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.:

CASI: [A02](#), Hardcopy

A series of experiments are described which examine the growth of turbulent spots on a flat plate at Reynolds and Mach numbers typical of gas-turbine blading. A short-duration piston tunnel is employed and rapid-response miniature surface-heat-transfer gauges are used to assess the state of the boundary layer. The leading- and trailing-edge velocities of spots are reported for different external pressure gradients and Mach numbers. Also, the lateral spreading angle is determined from the heat-transfer signals which demonstrate dramatically the reduction in spot growth associated with favorable pressure gradients. An associated experiment on the development of turbulent wedges is also reported where liquid-crystal heat-transfer techniques are employed in low-speed wind tunnel to visualize and measure the wedge characteristics. Finally, both liquid crystal techniques and hot-film measurements from flight tests at Mach number of 0.6 are presented.

Author

Heat Transfer; Boundary Layers; High Reynolds Number; Mach Number; Pressure Gradients; Flat Plates; Flight Tests; Liquid Crystals

20070038954 NASA Langley Research Center, Hampton, VA, USA

Hairpin Vortices and the Final Stages of Transition

Singer, Bart A.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 91-114; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

A spatially developing direct numerical simulation has been performed for flow over a flat plate that is subjected to a one-time fluid injection through an elongated slit in the wall. The flow parameters have been chosen to closely approximate the experimental conditions of Haidari, Taylow, and Smith (AIAA-89-0964). A hairpin vortex quickly develops near the upstream end of the slit, and a pair of necklace vortices form around the slow-moving injection fluid. As seen in the experiments and reported in Haidari and Smith (in review, JFM), the hairpin vortex spawns both in-line and sidelobe secondary vortices. However, no subsidiary vortices (those formed by the inviscid deformation of a vortex-line bundle) are observed. At later times, a set of three different types of vortices are identified: hairpin vortex structures with heads that rise away from the wall horseshoe-shaped vortices that do not rise out of the boundary layer, and quasi-streamwise vortices. These structures interact with each other and with the wall layer to generate new vortices that are similar in structure to those mentioned above, although a particular parent vortex may have an offspring that more nearly resembles another member of the set. Perturbation velocity and vertical vorticity contours reveal an arrowhead shape of the highly disturbed region that is reminiscent of a turbulent spot. Spatially averaged velocity profiles in the highly disturbed area are nonlaminar, but as yet do not show typical low-of-the-wall behavior.

Author

Horseshoe Vortices; Direct Numerical Simulation; Boundary Layer Transition; Flow Characteristics

20070038955 Lehigh Univ., Bethlehem, PA, USA

Development of Hairpin Vortices in Turbulent Spots and End-Wall Transition

Smith, Charles R.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 79-89; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The end-stage phase of boundary layer transition is characterized by the development of hairpin-like vortices which evolve rapidly into patches of turbulent behavior. In general, the characteristics of the evolution from this hairpin stage to the turbulent stage is poorly understood, which has prompted the present experimental examination of hairpin vortex development and growth processes. Two topics of particular relevance to the workshop focus will be covered: 1) the growth of turbulent spots through the generation and amalgamation of hairpin-like vortices, and 2) the development of hairpin vortices during

transition in an end-wall junction flow. Brief summaries of these studies are described below. Using controlled generation of hairpin vortices by surface injection in a critical laminar boundary layer, detailed flow visualization studies have been done of the phases of growth of single hairpin vortices, from the initial hairpin generation, through the systematic generation of secondary hairpin-like flow structures, culminating in the evolution to a turbulent spot. The key to the growth process is strong vortex-surface interactions, which give rise to strong eruptive events adjacent to the surface, which results in the generation of subsequent hairpin vortex structures due to inviscid-viscous interactions between the eruptive events and the free steam fluid. The general process of vortex-surface fluid interaction, coupled with subsequent interactions and amalgamation of the generated multiple hairpin-type vortices, is demonstrated as a physical mechanism for the growth and development of turbulent spots. When a boundary layer flow along a surface encounters a bluff body obstruction extending from the surface (such as cylinder or wing), the strong adverse pressure gradients generated by these types of flows result in the concentration of the impinging vorticity into a system of discrete vortices near the end-wall juncture of the obstruction, with the extensions of the vortices engirdling the obstruction to form 'necklace' or 'horseshoe' vortices. Recent hydrogen bubble and particle image visualization have shown that as Reynolds number is increased for a laminar approach flow, the flow will become critical, and a destabilization of the necklace vortices results in the development of an azimuthal waviness, or 'kinks', in the vortices. These vortex kinks are accentuated by Biot-Savart effects, causing portions of a distorted necklace vortex to make a rapid approach to the surface, precipitating processes of localized, three-dimensional surface interactions. These interactions result in the rapid generation, focussing, and ejection of thin tongues of surface fluid, which rapidly roll-over and appear as hairpin vortices in the junction region. Subsequent amalgamation of these hairpin vortices with the necklace vortices produces a complex transitional-type flow. A presentation of key results from both these studies will be done, emphasizing both the ubiquity of such hairpin-type flow structures in manifold transitional-type flows, and the importance of vortex-surface interactions in the development of hairpin vortices.

Author

Horseshoe Vortices; Turbulence; Wall Flow; Flow Visualization; Boundary Layer Transition; Secondary Flow

20070038956 General Electric Co., Cincinnati, OH, USA

Characteristics of Boundary Layer Transition in a Multi-Stage Low-Pressure Turbine

Wisler, Dave; Halstead, David E.; Okiishi, Ted; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 1-2; In English; See also [20070038942](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

An experimental investigation of boundary layer transition in a multi-stage turbine has been completed using surface-mounted hot-film sensors. Tests were carried out using the two-stage Low Speed Research Turbine of the Aerodynamics Research Laboratory of GE Aircraft Engines. Blading in this facility models current, state-of-the-art low pressure turbine configurations. The instrumentation technique involved arrays of densely-packed hot-film sensors on the surfaces of second stage rotor and nozzle blades. The arrays were located at mid-span on both the suction and pressure surfaces. Boundary layer measurements were acquired over a complete range of relevant Reynolds numbers. Data acquisition capabilities provided means for detailed data interrogation in both time and frequency domains. Data indicate that significant regions of laminar and transitional boundary layer flow exist on the rotor and nozzle suction surfaces. Evidence of relaminarization both near the leading edge of the suction surface and along much of the pressure surface was observed. Measurements also reveal the nature of the turbulent bursts occurring within and between the wake segments convecting through the blade row. The complex character of boundary layer transition resulting from flow unsteadiness due to nozzle/nozzle, rotor/nozzle, and nozzle/rotor wake interactions are elucidated using these data. These measurements underscore the need to provide turbomachinery designers with models of boundary layer transition to facilitate accurate prediction of aerodynamic loss and heat transfer.

Author

Boundary Layer Transition; Low Pressure; Turbomachinery; Aerodynamic Characteristics

20070038957 University Coll., London, UK

Nonlinear Theory and Breakdown

Smith, Frank; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 69-78; In English; See also [20070038942](#); Copyright; Avail.: CASI: [A01](#), Hardcopy

The main points of recent theoretical and computational studies on boundary-layer transition and turbulence are to be highlighted. The work is based on high Reynolds numbers and attention is drawn to nonlinear interactions, breakdowns and scales. The research focuses in particular on truly nonlinear theories, i.e. those for which the mean-flow profile is completely altered from its original state. There appear to be three such theories dealing with unsteady nonlinear pressure-displacement interactions (I), with vortex/wave interactions (II), and with Euler-scale flows (III). Specific recent findings noted for these

three, and in quantitative agreement with experiments, are the following. Nonlinear finite-time break-ups occur in I, leading to sublayer eruption and vortex formation; here the theory agrees with experiments (Nishioka) regarding the first spike. II gives rise to finite-distance blowup of displacement thickness, then interaction and break-up as above; this theory agrees with experiments (Klebanoff, Nishioka) on the formation of three-dimensional streaks. III leads to the prediction of turbulent boundary-layer micro-scale, displacement-and stress-sublayer-thicknesses.

Author

Nonlinearity; Boundary Layer Transition; Numerical Analysis; Vortex Breakdown

20070038958 Rolls-Royce Plc, Bristol, UK

Intermittency Models and Spot Measurements

Ashworth, D. A.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 149-162; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Experimental work at the University of Oxford Osney Lab has demonstrated characteristics of the late-stage transition process by the use of thin-film heat transfer gauges. The development of turbulent spots has been observed in a range of environments, including flat plates, turbine blade cascade tests and wake-passing experiments. These results were taken at Mach/Reynolds numbers and gas-to-wall temperature ratios representative of gas turbines. Analyses of the spot characteristics are consistent with measurements taken in low speed experiments, and support the Schubauer and Klebanoff type of turbulent spots. The addition of simulated wakes from upstream stages has been observed to be primarily superpositional for these tests.

Author

Heat Transfer; Turbulence; Thin Films; Reynolds Number; Mach Number; Gas Turbines

20070038959 Tasmania Univ., Hobart, Australia

Boundary Layer Transition on an Axial Compressor Stator Blade-Wake Passing and Freestream Turbulence Effects

Walker, G. J.; Solomon, W. J.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 163-173; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Quantitative observations of transitional boundary layers in regions of strong flow deceleration on an axial compressor stator blade are reported. Measurements are obtained at a fixed chordwise position, and the blade incidence was varied by changing the compressor throughflow so as to move the transition region relative to the stationary probe. It was thus possible to observe typical boundary layer behavior at various stages of transition in the turbomachine environment. The range of observations covers separating laminar flow at transition onset, and reattachment of intermittently turbulent periodically separated shear layers.

Author

Boundary Layer Transition; Turbocompressors; Turbulence Effects; Laminar Flow; Deceleration; Stator Blades

20070038960 Clemson Univ., SC, USA

Fluid Mechanics and Heat Transfer in Transitional Boundary Layers

Wang, Ting; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 175-205; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Experiments have been performed to investigate the effects of elevated free-stream turbulence and streamwise acceleration on flow and thermal structures in transitional boundary layers. The free-stream turbulence ranges from 0.5 to 6.4% and the streamwise acceleration ranges from $K = 0$ to 0.8×10^{-6} . The onset of transition, transition length and the turbulent spot formation rate are determined. The statistical results and conditionally sampled results of the streamwise and cross-stream velocity fluctuations, temperature fluctuations, Reynolds stress and Reynolds heat fluxes are presented.

Author

Boundary Layers; Heat Transfer; Temperature Distribution; Turbulence Effects; Heat Flux; Reynolds Stress

20070038961 Princeton Univ., Princeton, NJ, USA

Active Control of Transition Using the Lorentz Force

Nosenchuck, Daniel; Brown, Garry; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 51-59; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

A new concept and technique has been developed to directly control boundary-layer transition and turbulence. Near-wall

vertical motions are directly suppressed through the application of Lorentz force. Current (j) and magnetic (b) fields are applied parallel to the boundary and normal to each other to produce a Lorentz force ($j \times B$) normal to the boundary. This approach is called magnetic turbulence control (MTC). Experiments have been performed on flat-plate transitional and turbulent boundary layers in water seeded with a weak electrolyte.

Author

Boundary Layer Transition; Turbulent Boundary Layer; Magnetic Control; Lorentz Force; Active Control; Magnetic Fields

20070038962 Illinois Inst. of Tech., Chicago, IL, USA

From Disturbances to Instabilities, to Breakdown to Turbulence: The Physics of Transition in Boundary Layers

Morkovia, Mark V.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 11-21; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

In order to understand the end-stages of boundary layer transition in low as well as high disturbance environments it is desirable to establish a unified view of the sequences of physico-mathematical phenomena that lead from laminar flow to self-sustained 'bursting' in wall turbulence. The dominant driving disturbances: oncoming free turbulence, unsteady pressure fields, inhomogeneous density fields, inhomogeneities in wall geometry, all force disturbed motions within the boundary layer via multiple competitive receptivity mechanisms. For small disturbances, a sequence of instabilities then leads to sporadic local bursting very near the wall which can sustain turbulence. The local seeds of turbulence then somehow propagate to engulf quite rapidly the surrounding disturbed but still laminar regions.

Author

Boundary Layer Transition; Turbulence; Pressure Distribution; Laminar Flow; Stability

20070038963 Cambridge Univ., Cambridge, UK

Aspects of Transition in Turbomachines

Hodson, H. P.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 115-132; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

This talk provides a description of several types of transition encountered in turbomachines. It is based largely on personal experience of the detection of transition in turbomachines. Examples are taken from axial compressors, axial turbines and radial turbines. The illustrations are concerned with transition in steady and unsteady boundary layers that develop under the influence of two-dimensional and three-dimensional flow fields.

Author

Turbomachinery; Axial Flow Turbines; Transition; Boundary Layers; Flow Distribution

20070038964 NASA Lewis Research Center, Cleveland, OH, USA

A Research Program for Improving Heat Transfer Prediction Capability for the Laminar to Turbulent Transition Region of Turbine Vanes/Blades

Simon, Frederick F.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 235-267; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

A program sponsored by the National Aeronautics and Space Administration (NASA) for the investigation of the heat transfer in the transition region of turbine vanes and blades with the object of improving the capability for predicting heat transfer is described. The accurate prediction of gas-side heat transfer is important to the determination of turbine longevity, engine performance and developmental costs. The need for accurate predictions will become greater as the operating temperatures and stage loading levels of advanced turbine engines increase. The present methods for predicting transition shear stress and heat transfer on turbine blades are based on incomplete knowledge and are largely empirical. To meet the objectives of the NASA program, a team approach consisting of researchers from government, universities, a research institute, and a small business is presented. The research is divided into areas of experimentation, direct numerical simulation (DNS) and turbulence modeling. A summary of the results to date is given for the above research areas in a high-disturbance environment (bypass transition) with a discussion of the model development necessary for use in numerical codes.

Author

Heat Transfer; Turbine Blades; Turbine Engines; Turbulence; Laminar Heat Transfer; Turbulent Heat Transfer

20070038965 Rensselaer Polytechnic Inst., Troy, NY, USA

Transition in Separating-Reattaching Boundary Layer Flows

Malkiel, Ed; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 421-429; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

Experimental work with leading edge separation bubbles is presented to clarify the issues regarding transition in separated regions. Hot-wire measurements, in the form of oscilloscope traces, turbulence intermittency and conditionally sampled velocity distributions are given. The resulting points of transition onset and spot production rates are compared to existing correlations.

Author

Boundary Layer Flow; Transition; Velocity Distribution; Oscilloscopes; Leading Edges; Bubbles

20070038966 Cambridge Univ., Cambridge, UK

The Evolution of Modulated Wavetrains Into Turbulent Spots

Gaster, M.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 39-49; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Experiment are being carried out to study the process by which th almost periodic disturbance waves generated naturally by the freestream evolve into turbulence. The boundary layer on a flat plate has been used for this study. The novelty of the approach is in the form of artificial excitation that is used. In this work the flow is excited artificially by deterministic white noise. The weak T-S wave created develops down stream, becomes nonlinear and blows up locally onto a highly distorted flow. These large local distortions of the mean flow allow very high frequency disturbances to grow and form into small turbulent spots. The spots arise from the excitation, and if the same noise sequence is repeated a spot will form at the same position and time instant relative to the excitation.

Author

Excitation; High Frequencies; Turbulence; White Noise; S Waves; Free Flow; Flat Plates

20070038967 Abertay Univ., Dundee, UK

Transition Models for Engineering Calculations

Fraser, C. J.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 133-148; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

While future theoretical and conceptual developments may promote a better understanding of the physical processes involved in the latter stages of boundary layer transition, the designers of rotodynamic machinery and other fluid dynamic devices need effective transition models now. This presentation will therefore center around the development of of some transition models which have been developed as design aids to improve the prediction codes used in the performance evaluation of gas turbine blading. All models are based on Narasimha's concentrated breakdown and spot growth.

Author

Boundary Layer Transition; Performance Tests; Gas Turbines

20070038968 Sydney Univ., Australia

Some Scenarios for Transition on Turbomachinery Blading

Gostelow, J. P.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 311-318; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

Measurements on transition under different levels of adverse pressure gradient and free-stream turbulence level are described. This extensive series of investigations, which was predicated on intermittency measurement techniques, has resulted in correlations for transition length and turbulent spot formation rate. These correlations rae intended to be used in conjunction with boundary layer prediction methods and examples are given of such predictions. More effective predictions of the transition region, especially under conditions of variable pressure gradient, are dependent on a more comprehensive understanding of transition and spot behavior. It is expected that this will result in improved transition modeling.

Author

Boundary Layers; Prediction Analysis Techniques; Free Flow; Pressure Gradients; Correlation; Turbulence

20070038969 Indian Inst. of Science, Bangalore, India

The Many Worlds of Transition Research.

Narasimha, R.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 3-10; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

The transition from laminar to turbulent flow in a boundary layer is a complex phenomenon that may take different routes,

each involving distinct stages governed by different, often not-yet unraveled dynamical principles. There are, surprisingly, questions concerning virtually every stage in the process, beginning with receptivity to external disturbances, the linear stability of spatially developing flows, different possible nonlinear end games, the formation and propagation of turbulent spots and the emergence of fully developed turbulent flow. There seems no doubt that the flow has to be seen as a forced, nonlinear spatio-temporal system, but the system is so complex that to extract simple insights is still very difficult.

Author

Boundary Layers; Laminar Flow; Turbulent Flow; Extraction; Turbulence; Transition Flow

20070038970 Minnesota Univ., Minneapolis, MN, USA

Experiments in Transitional Boundary Layers With Emphasis on High Free-Stream Disturbance Level, Surface Concave Curvature and Strong Favorable Streamwise Pressure Gradient Effects

Simon, T. W.; Volino, R. J.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 373-388; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Experiments on boundary layer transition with flat, concave and convex walls and various levels of free-stream disturbance and with zero and strong streamwise acceleration have been conducted. Measurements of both fluid mechanics and heat transfer processes were taken. Examples are profiles of mean velocity and temperature; Reynolds normal and shear stresses; turbulent streamwise and cross-stream heat fluxed; turbulent Prandtl number; and streamwise variations of wall skin friction and heat transfer coefficient values. Free-stream turbulence levels were varied over the range from about 0.3 percent to about 8 percent. The effects of curvature on the onset of transition under low disturbance conditions are clear; concave curvature leads to an earlier and more rapid transition and the opposite is true for convex curvature. This was previously known but little documentation of the transport processes in the flow was available.

Author

Boundary Layer Transition; Curvature; Fluid Mechanics; Heat Transfer Coefficients; Pressure Gradients; Convexity

20070038971 Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv, Israel

On the Evolution of Localized Disturbances and their Spanwise Interactions Leading to Breakdown

Seifert, Avi; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 390-419; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Localized disturbances in a laminar boundary layer represent a more realistic model of transition than the extensively studied, two or quasi three-dimensional perturbations regardless of the fact if they evolve in a linear manner or not. Localized disturbances can originate by surface imperfections, insects or dust. The disturbances can be harmonic (i.e. containing a single frequency and a complete set of spanwise wave numbers) or Pulsed (i.e. containing a band of streamwise and spanwise wave numbers). At sufficiently low amplitudes localized disturbances behave according to a linear stability model. It is highly probable that in a natural transition process such localized disturbances will overlap and interact. These interactions could either delay transition because of a partial wave cancellation resulting in an attenuation of the disturbance, or adversely enhance it by promoting nonlinear interactions. The nonlinearity could be simply amplitude dependent or cause a triad resonance. Nonlinear processes in a wave packet lead to breakdown and to the formation of turbulent spots. When the amplitude of the harmonic disturbance saturates, nonlinear processes widen the band of the lower amplified frequencies adjacent to the frequency of excitation. Experimental results describing the spanwise interactions of harmonic and pulsed localized disturbances leading to breakdown will be presented and discussed. A comparison to the evolution and breakdown of a single localized disturbance will be provided.

Author

Laminar Boundary Layer; Boundary Layer Transition; Perturbation; Width; Turbulence; Concavity; Walls; Shear Stress; Boundary Layer Flow

20070038972 Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv, Israel

Stability of the Boundary Layer and the Spot

Wynagnanski, I.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 285-309; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The similarity among turbulent spots observed in various transition experiments, and the rate in which they contaminate the surrounding laminar boundary layer is only cursory. The shape of the spot depends on the Reynolds number of the surrounding boundary layer and on the pressure gradient to which it and the surrounding laminar flow are exposed. The

propagation speeds of the spot boundaries depend, in addition, on the location from which the spot originated and do not simply scale with the local free stream velocity. The understanding of the manner in which the turbulent manner in which the turbulent spot destabilizes the surrounding, vortical fluid is a key to the understanding of the transition process. We therefore turned to detailed observations near the spot boundaries in general and near the spanwise tip of the spot in particular.

Author

Boundary Layers; Pressure Gradients; Stability; Turbulence; Reynolds Number; Laminar Flow; Laminar Boundary Layer

20070038973 Naval Postgraduate School, Monterey, CA, USA

On the Prediction of Separation Bubbles Using a Modified Chen-Thysson Model

Platzer, Max F.; Ekaterinaris, John A.; Chandrasekhara, M. S.; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 269-281; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The prediction of separation bubbles on NACA 65-213 and NACA 0012 using a modified Chen-Thysson transition model is presented. The contents include: 1) Background; 2) Analysis of NACA 65-213 separation bubble using cebeci's viscous-inviscid interaction method; 3) Analysis of NACA 0012 separation bubble using navier-stokes method; and 4) Comparison with experiment.

CASI

Bubbles; Separation; Mathematical Models; Predictions

20070038974 Iowa State Univ., IA, USA

Boundary Layer Development on a Turbine Blade in a Linear Cascade

Halstead, Dave; Okiishi, Ted; Wisler, Dave; Minnowbrook I: 1993 Workshop on End-Stage Boundary Layer Transition; March 2007, pp. 207-232; In English; See also [20070038942](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Several different boundary-layer development patterns for flow over the suction surface of a turbine airfoil in a linear cascade were studied and documented using a sliding surface hot-film sensor. The state of the boundary layer, whether laminar, transitional or turbulent, was determined at numerous locations along the airfoil suction surface from leading to trailing edge. Boundary-layer transition from laminar to turbulent flow through laminar separation and turbulent reattachment, or through a combination of bypass transition and strong and weak separation and turbulent reattachment, or through solely bypass transition without separation, was observed and benchmark data were recorded. Surface flow visualization and numerical boundary-layer analysis results are consistent with the hot-film data. Flow and geometry information necessary for numerical code operation is available.

Author

Cascade Flow; Turbine Blades; Linearity; Boundary Layer Flow; Test Facilities

20070039007 NASA, Washington, DC, USA

The Wind and Beyond: A Documentary Journey into the History of Aerodynamics in America, Volume 2, Reinventing the Airplane

Hansen, James R., Editor; Kinney, Jeremy, Editor; Taylor, D. Bryan, Editor; Prickett, Molly, Editor; Lee, J. Lawrence, Editor; 2007; 565 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/SP-2007-4409/VOL2; Copyright; Avail.: CASI: [EA7](#), Hardcopy

Airplane travel is surely one of the most significant technological achievements of the last century. The impact of the airplane goes far beyond the realm of the history of technology and touches upon virtually every aspect of society from economics to politics to engineering and science. While space exploration often claims more public glory than aeronautics research, many more individuals have been able to fly within the Earth's atmosphere than above it. Thus aeronautics and air travel have had an enormous practical impact on many more individuals. The first two volumes in the Wind and Beyond series and the succeeding four now in preparation all cover the impact of aerodynamic development on the evolution of the airplane in America. As the six-volume series will ultimately demonstrate, just as the airplane is a defining technology of the twentieth century, aerodynamics has been the defining element of the airplane. The forthcoming volumes will proceed roughly in chronological order, covering such developments as the advent of commercial airliners, flying boats, rotary aircraft, supersonic flight, and hypersonic flight. This series is designed as an aeronautics companion to the Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program (NASA SP-4407) series of books. As with Exploring the Unknown, the documents collected during this research project were assembled from diverse public and private sources. A major

repository of primary source materials relative to the history of the civil space program is the NASA Historical Reference Collection in the NASA History Division. Historical materials housed at NASA Field Centers, academic institutions, and Presidential libraries were other sources of documents considered for inclusion, as were papers in the archives of private individuals and corporations. The format of this volume also is very similar to that of the Exploring the Unknown volumes. Each section in the present volume is introduced by an overview essay that is intended to introduce and complement the documents in the section and to place them in a chronological and substantive context. Each essay contains references to the documents in the section it introduces, and many also contain references to documents in other sections of the collection. These introductory essays are the responsibility of Dr. Hansen, the series author and chief editor, and the views and conclusions contained therein do not necessarily represent the opinions of either Auburn University or NASA.

Derived from text

Aerodynamics; Air Transportation; Commercial Aircraft; Hypersonic Flight; Supersonic Flight; Aeroquatic Vehicles

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.

20070037493 Air Force Research Lab., Edwards AFB, CA USA

Thrust Efficiency, Energy Efficiency, and the Role of VDF in Hall Thruster Performance Analysis (Preprint)

Larson, C W; Hargus, William A; Brown, Daniel L; May 29, 2007; 19 pp.; In English

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

Report No.(s): AD-A471100; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471100>

A rocket power efficiency equation was written to explicitly account for the effect of the velocity distribution function (VDF) of the propellant jet on the conversion of anode electrical energy to jet kinetic energy. This enabled a mathematically rigorous distinction to be made between thrust efficiency and energy efficiency. In this approach anode thrust efficiency, the commonly reported figure of merit for Hall thrusters, is the product of three utilization efficiencies: (1) propellant utilization efficiency, (2) voltage utilization efficiency, and (3) current utilization efficiency, which are less than unity under all real operating conditions. Unit propellant utilization is characterized by 100 percent ionization to a single ionic species whose thrust vectors are all directed along the same thrust axis. Anode voltage utilization efficiency is unity when ion species are created at the anode and accelerated through the entire anode potential. Current utilization efficiency is the fraction of cathode electron flow utilized in neutralization of accelerated positive ions. It can never be unity because a portion of the electron flow must be recycled back to the anode to provide energy to ionize neutral propellant. The architecture of the efficiency analysis is such that energy efficiency becomes naturally expressed as a product of voltage and current utilization efficiencies, and is rigorously separated from propellant utilization efficiency. Thus, thrust efficiency is the product of propellant utilization efficiency and energy efficiency. The methodology is applied to analysis of data from systematic low and high power (0.2 to 50 kW) Hall thruster performance studies published in the open literature. The cited data includes measurement of thrust, propellant mass flow rate, anode voltage, and anode current coupled with various electrical and optical diagnosis that provide information about the VDF and thermodynamic state of the propellant jet.

DTIC

Distribution Functions; Energy Conservation; Hall Thrusters; Propellants; Reliability Analysis; Thrust

20070037523 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Breakaway: A Look at the Integration of Aerial Refueling and Unmanned Aircraft Systems in Future Operations

Basom, Robert R; Jun 15, 2007; 94 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471147>

Unmanned aircraft are rapidly becoming the platform of choice for military and governmental leaders. In recent years, the USA Government has expressed great interest in Unmanned Aircraft Systems (UAS) for military and other governmental agencies. With an almost insatiable appetite to gain information immediately, commanders want a persistent, responsive platform at their beck and call. However, the demand greatly outnumbers the availability of platforms, so leaders are looking

at the possibility of air refueling unmanned platforms that will prolong their loiter time. Because of the senior leader pressure to get a persistent presence of unmanned aircraft through air refueling, they might have waived the 'sanity check' for this, or overlooked a better way to achieve the goal. The future force of 2025 will undoubtedly include many unmanned aircraft and manned aircraft. This thesis investigates how aerial refueling and unmanned aircraft will interact in the future. The author concludes that tanker aircraft modified with multiple drogue refueling points, flying in an anchor orbit, or using track refueling would best augment future unmanned aircraft operations.

DTIC

Air to Air Refueling; Pilotless Aircraft; Refueling; Remotely Piloted Vehicles; Tanker Aircraft; Unmanned Aircraft Systems

20070037549 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Everyone has an Unmanned Aircraft: The Control, Deconfliction and Coordination of Unmanned Aircraft in the Future Battlespace

Callaghan, Donald C; Jun 2007; 105 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471208; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471208>

Unmanned aircraft (UA) today are among the most rapidly growing weapons systems in the Department of Defense (DoD). Over the past decade, technology has enabled the inherent advantages of the UA to be brought to the battlespace. Successful employment of UA across the spectrum of military operations with multiple roles and missions have left little doubt as to their value to military forces. Their success has spurred numerous efforts to continue to increase its military capabilities. This process has brought about a significant rise in the types and numbers of UA. While the increase is intended to assist military forces, the sheer numbers of existing and programmed UA assets could render military airspace chaotic and potentially dangerous. The growth of the UA is arguably outpacing the doctrinal and procedural efforts to manage them. Joint and Service doctrine and procedures provide the architecture within which joint forces will control, deconflict, and coordinate these assets. The UA is an extremely important element in current and future military operations, but they must be managed properly to ensure their safe and effective employment. Anything less will adversely affect the military's ability to operate successfully across the spectrum of operations.

DTIC

Aircraft Control; Airspace; Coordination; Drone Vehicles; Pilotless Aircraft

20070037789 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Why They Fly: An Expectancy-Based Analysis of the Factors that Motivate Commissioned Army Aviators to Gain Flying Experience

Marshburn, Todd H; Jun 15, 2007; 84 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471406; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent changes to Army publications have emphasized the importance of gaining flying experience for commissioned Army aviators, particularly in earning a designation as pilot-in-command. Based on these changes, the author evaluated the factors that motivate commissioned Army Aviators to gain flying experience. A sample of 44 aviators participated in the study. It was hypothesized that commissioned Army aviators were more intrinsically motivated (e.g., seeking competence, skill, challenge, and enjoyment) than extrinsically motivated (e.g., seeking a master aviator badge, command selection, recognition from others, and promotion) to gain flying experience. A paired samples t-Test indicated that participants were more intrinsically motivated. Multiple regression analyses, however, indicated that intrinsic motivation did not significantly contribute to the prediction of either total flight hours or pilot-in-command hours. Gaining this flying experience is considered a function of an aviator's self-development, and intrinsic motivation is related to participation in self-development programs. The implications of these findings associated with barriers to self-development are discussed, and recommendations for future research are identified.

DTIC

Abilities; Aircraft Pilots; Experience; Flight; Military Personnel; Motivation; Personnel Development; Pilots

20070037796 Secretary of the Air Force, Washington, DC USA

U.S. Air Force Posture Statement 2007

Jan 2007; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471420; No Copyright; Avail.: Defense Technical Information Center (DTIC)

2007 marks the USA Air Force's 60th year as an independent service. The Air Force is engaged every single day in global

operations, fighting the Global War on Terror, defending our homeland, providing strategic deterrence, and giving our nation unparalleled Global Vigilance, Reach, and Power. We are committed to sustaining our position of strength, the asymmetric advantages the Air Force gives our nation America's edge. Our 2007 Posture Statement articulates the major elements required to fulfill our mission. It reaffirms our commitment to focus our energies on the Global War on Terror (GWOT); to develop and care for our Airmen and their families; and to recapitalize and modernize our aging aircraft, spacecraft, and equipment. Our top acquisition priorities include: the KC X Tanker; the CSAR X Combat Search and Rescue Helicopter; space communications, space situational awareness and early warning programs; the F 35A Joint Strike Fighter (JSF); and Next Generation Long Range Strike - a new bomber. Our Posture Statement further reaffirms our commitment to be good stewards of the resources entrusted to us and our resolve to dominate air, space and cyberspace in defense of our Nation now and in the future.

DTIC

Posture

20070038112 Human Systems Wing (311th), Brooks City-Base, TX USA

An Assessment of Thermal Stress Effects on Flight Mishaps That Involve Pilot Human Factors

Miarecki, Sandra C; Constable, Stefan H; Feb 2007; 64 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471405; HSW-PE-BR-TR-2007-0002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In recent years, the designers of the newest DoD fighter aircraft, such as the F-35 and the F-22, have examined the feasibility of new physiological equipment for the pilots such as the full-coverage, temperature-regulated G-suits. A question was posed as to whether there was a correlation between extreme temperatures and current mishap rates in legacy fighters, thereby giving a baseline for the newer fighters to compare their performance. This study was completed to determine if a correlation existed between extreme air temperatures at home station and fighter mishaps involving pilot human factors. The study was completed in 2006, using a comprehensive 10 year review to include the fiscal years 1996-2005. The mishap data were extracted from the Internet-based Aviation Safety Automated System (AVSAS). Three aircraft were used in the study, to include 9 F-15C bases, 5 F-15E bases, and 13 F-16C bases. Flying hours were provided by AF/A3OT at the Pentagon as totals per month, per aircraft type, per base. The air temperature data were provided by the Air Force Combat Climatology Center (AFCCC) in Asheville, NC and included the average high temperature and average low temperature for each month at each base. This study found no significant statistical correlation between extreme surface temperatures at home station and the flight mishap rates due to pilot human factors.

DTIC

Aircraft Accidents; Human Factors Engineering; Pilots; Thermal Stresses

20070038154 Secretary of the Air Force, Washington, DC USA

Air Force Strategic Plan 2006-2008

Jan 2006; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471424; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Strategic Plan codifies the Air Force's strategic Priorities, Goals and Objectives in accordance with the intent of the National Security Personnel System (NSPS) and the President's Management Agenda (PMA). The 2006 Quadrennial Defense Review (QDR) Report provides the strategic context and overarching guidance that direct our planning efforts. We will fully support the Department of Defense (DoD) as it transforms to best address the challenges of this strategic environment. As the foundation of our strategy, we have distilled three specific Air Force priorities as the criteria. Per the QDR, our first and foremost challenge is to win the long war against global terrorism. Second is developing and caring for Airmen and their families. Third is recapitalizing and modernizing. Each of these Air Force priorities flows from the national strategy and directly supports the priorities our DoD senior leaders have defined for DoD as a whole.

DTIC

Management Planning; Military Operations; Defense Program; Warning Systems

20070038361 Nebraska Univ., Omaha, NE, USA

Journal of Air Transportation, Volume 12, No. 1

Bowers, Brent D., Editor; Kabashkin, Igor, Editor; January 2007; ISN 1544-6980; In English; See also 20070038362 - 20070038366

Report No.(s): LC-HE9761.1.J68; Copyright; Avail.: Other Sources

Topics discussed include: a) Data Mining Methods Applied to Flight Operations Quality Assurance Data: A Comparison

to Standard Statistical Methods; b) Financial Comparisons across Different Business Models in the Canadian Airline Industry; c) Carving a Niche for the 'No-Frills' Carrier, Air Arabia, in Oil-Rich Skies; d) Situational Leadership in Air Traffic Control; and e) The Very Light Jet Arrives: Stakeholders and Their Perceptions.

Derived from text

Air Transportation; Airline Operations; Quality Control; Statistical Analysis; Air Traffic Control; Data Mining

20070038362 San Jose State Univ., San Jose, CA, USA

Financial Comparisons across Different Business Models in the Canadian Airline Industry

Flouris, Triant; Walker, Thomas; Journal of Air Transportation, Volume 12, No. 1; January 2007, pp. 25-52; In English; See also [20070038361](#); Copyright; Avail.: Other Sources

This paper examines the accounting and stock price performance of two Canadian airlines, WestJet and Air Canada, over a five year period, taking into account the aftermath of the systemic shock to the airline industry produced by the September 11, 2001 (9-11), terrorist attacks and subsequent events such as the 2002 SARS outbreak, the wars in Afghanistan and Iraq, and the accompanying rise in jet fuel prices. Our study focuses on the viability of low-cost versus conventional-cost business models in Canada under the current business environment and the ability of airlines to withstand and effectively respond to catastrophic industry events. Furthermore, we link the effectiveness of the airlines responses to these events to specific elements of their respective business models. We test our hypothesis through a case study. We focus on WestJet as a typical low-cost airline and compare its accounting and stock performance to Air Canada, a legacy carrier and rival in several business sectors. We find WestJet to be much less affected by catastrophic industry events. By decomposing each airline's return volatility, we observe that WestJet's systematic and unsystematic risk increased only slightly during the industry's post-9-11 turmoil when compared to Air Canada. In addition, we find that both WestJet's accounting and stock performance have been highly superior to those of Air Canada. We argue that WestJet's business model provides the firm with significantly more financial and operational flexibility than its legacy rival, Air Canada. WestJet's lower operating costs, high consumer trust, product offering, corporate structure, workforce and work practices, as well as operational procedures are all factors that appear to contribute to its relative success.

Author

Air Transportation; Airline Operations; Canada; Finance

20070038363 Saint Louis Univ., MO, USA

Data Mining Methods Applied to Flight Operations Quality Assurance Data: A Comparison to Standard Statistical Methods

Stolzer, Alan J.; Halford, Carl; Journal of Air Transportation, Volume 12, No. 1; January 2007, pp. 6-24; In English; See also [20070038361](#); Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

In a previous study, multiple regression techniques were applied to Flight Operations Quality Assurance-derived data to develop parsimonious model(s) for fuel consumption on the Boeing 757 airplane. The present study examined several data mining algorithms, including neural networks, on the fuel consumption problem and compared them to the multiple regression results obtained earlier. Using regression methods, parsimonious models were obtained that explained approximately 85% of the variation in fuel flow. In general data mining methods were more effective in predicting fuel consumption. Classification and Regression Tree methods reported correlation coefficients of .91 to .92, and General Linear Models and Multilayer Perceptron neural networks reported correlation coefficients of about .99. These data mining models show great promise for use in further examining large FOQA databases for operational and safety improvements.

Author

Algorithms; Data Mining; Flight Operations; Statistical Analysis; Air Transportation; Quality Control

20070038364 Jacksonville State Univ., AL, USA

The Very Light Jet Arrives: Stakeholders and Their Perceptions

Cobb, Richard; Thomas, James L.; Cobb, Laura A.; Journal of Air Transportation, Volume 12, No. 1; January 2007, pp. 87-97; In English; See also [20070038361](#); Copyright; Avail.: Other Sources

This article summarizes the initial results of a systematic study that addressed issues related to the direct and indirect market impact of very light jet (VLJ) aircraft. Although reports in the popular press offer wide-ranging estimates of the impact

that these new jets will have on existing air travel, no systematic data exists that may be of use to all potential stakeholders. This introductory study serves to describe potential VLJ users and their perceptions of this new type of aircraft.

Author

Jet Aircraft; Light Aircraft; Aircraft Design; Civil Aviation

20070038365 American Univ., Sharjah, United Arab Emirates

Carving a Niche for the ‘No-Frills’ Carrier, Air Arabia, in Oil-Rich Skies

McKechnie, Donelda S.; Grant, Jim; Fahmi, Mona; Journal of Air Transportation, Volume 12, No. 1; January 2007, pp. 53-66; In English; See also [20070038361](#); Copyright; Avail.: Other Sources

The concept of introducing a no-frills airline to the wealthy Arab region presented its risks. This independent study sought to position the new airline in the marketplace. After three focus groups and 400 self-administered surveys, safety (#1) and price (#2) are low-fare carrier considerations whereas safety (#1), punctuality (#2) and price (#3) apply for full-fare airlines. Recommended ways for the no-frills carrier to reach the market include newspaper ads, travel agent sales, online bookings, and call centers. Additionally, respondents appeared to evaluate this low-fare carrier as if it is a full-service airline.

Author

Airline Operations; Saudi Arabia; Air Transportation; Aircraft Industry

20070038366 Lund Univ., Sweden

Situational Leadership in Air Traffic Control

Arvidsson, Marcus; Johansson, Curt R.; Ek, Asa; Akselsson, Roland; Journal of Air Transportation, Volume 12, No. 1; January 2007, pp. 67-86; In English; See also [20070038361](#); Original contains black and white illustrations; Copyright; Avail.: Other Sources

In high-risk environments such as air traffic control, leadership on different levels plays a certain role in establishing, promoting, and maintaining a good safety culture. The current study aimed to investigate how leadership styles, leadership style adaptability, and over and under task leadership behavior differed across situations, operative conditions, leadership structures, and working tasks in an air traffic control setting. Study locations were two air traffic control centers in Sweden with different operational conditions and leadership structures, and an administrative air traffic management unit. Leadership was measured with a questionnaire based on Leader Effectiveness and Adaptability Description (LEAD; Blanchard, Zigarmi & Zigarmi, 2003; Hersey & Blanchard, 1988). The results showed that the situation had strong impact on the leadership in which the leadership behavior was more relationship oriented in Success and Group situations than in Hardship and Individual situations. The leadership adaptability was further superior in Success and Individual situations compared with Hardship and Group situations. Operational conditions, leadership structures and working tasks were, on the other hand, not associated with leadership behavior.

Author

Air Traffic Control; Air Transportation; Leadership; Situational Awareness

20070038429 Library of Congress, Washington, DC USA

Transportation Security: Issues for the 110th Congress

Peterman, David R; Elias, Bart; Frittelli, John; Aug 3, 2007; 19 pp.; In English; Original contains color illustrations Report No.(s): AD-A471720; CRS-RL33512; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: <http://hdl.handle.net/100.2/ADA471720>

The nation's air, land, and marine transportation systems are designed for accessibility and efficiency, two characteristics that make them highly vulnerable to terrorist attack. While hardening the transportation sector from terrorist attack is difficult, measures can be taken to deter terrorists. The dilemma facing Congress is how best to construct and finance a system of deterrence, protection, and response that effectively reduces the possibility and consequences of another terrorist attack without unduly interfering with travel, commerce, and civil liberties. In the 110th Congress, aviation, rail, and transit security have been a major focus of congressional activity. On January 9, 2007, the House passed the Implementing the 9/11 Commission Recommendations Act of 2007 (H.R. 1), which contains provisions, among others, on aviation and cargo security. On March 13, 2007, the Senate passed the Improving America's Security Act of 2007 (S. 4), which is similar but not identical to H.R. 1. At the end of July 2007, the House and Senate passed a conference agreement on H.R. 1 (H.Rept. 110-259) that was signed into law on August 3, 2007 (P.L. 110-53). Aviation security has been a major focus of transportation security policy following the terrorist attacks of September 11, 2001. In the aftermath of these attacks, the 107th Congress moved quickly to pass the Aviation and Transportation Security Act (ATSA; P.L. 107-71) creating the Transportation Security Administration

(TSA) and mandating a federalized workforce of security screeners to inspect airline passengers and their baggage. A leading issue with regard to securing truck, rail, and waterborne cargo is the desire of government authorities to track a given freight shipment at any time, particularly the tracking of marine containers as they are trucked to and from seaports. Security experts believe this is a particularly vulnerable point in the container supply chain.

DTIC

Airline Operations; Cargo; Commercial Aircraft; Law (Jurisprudence); Marine Transportation; Rail Transportation; Security; Terrorism; Transportation

20070038441 Army Research Lab., Aberdeen Proving Ground, MD USA

Unsteady Flow Computations of a Finned Body in Supersonic Flight

Sahu, Jubaraj; Aug 2007; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471736; ARL-TR-4230; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471736>

This report describes a multidisciplinary computational study undertaken to compute the flight trajectories and simultaneously predict the unsteady free flight aerodynamics of a finned projectile at supersonic speeds with the use of an advanced unstructured time-accurate Navier-Stokes computational technique. Actual flight trajectories are computed with an advanced coupled computational fluid dynamics (CFD)-rigid body dynamics (RBD) technique. In addition, our goal is to be able to extract the aerodynamic coefficients from these fully coupled time-accurate CFD-RBD computations. Computed positions and orientations of the projectile 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 and unstructured grids show the flow field, the extracted aerodynamic forces and moments, and the flight trajectories of the projectile. Aerodynamic coefficients such as the dynamic derivatives have been obtained with a separate unsteady time-accurate CFD approach and have been compared with the extracted aerodynamic coefficients from the fully coupled dynamic simulations.

DTIC

Computational Fluid Dynamics; Finned Bodies; Free Flight; Supersonic Flight; Trajectories; Unsteady Flow

20070038470 Department of the Army, Washington, DC USA

Aviation Flight Regulations

Feb 3, 2006; 95 pp.; In English

Report No.(s): AD-A471817; DA-AR-95-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471817>

This publication is a rapid action revision. The portions affected by this rapid action revision are listed in the summary of change. This regulation covers aircraft operations, crew requirements and flight rules. It also covers Army aviation general provisions, training, standardization, and management of aviation resources. This regulation applies to all Army, Army National Guard/Army National Guard of the USA and U.S. Army Reserve aircraft systems and persons involved in the operation, aviation training, standardization, and maintenance of such aircraft and systems unless otherwise stated. This includes aircraft on loan, lease and bailment to the Army, the Army National Guard, and the U.S. Army Reserve. During mobilization, chapters and policies contained in this regulation may be modified by the Proponent and exception authority. The proponent of this regulation is the Deputy Chief of Staff, G-3/5/7. The Deputy Chief of Staff, G-3/5/7 has the authority to approve exceptions or waivers to this regulation that are consistent with controlling law and regulations. The Deputy Chief of Staff, G-3/5/7 may delegate this approval authority, in writing, to a division chief within the proponent's agency or its direct reporting unit or field operating agency, in the grade of colonel or the civilian equivalent. Activities may request a waiver to this regulation by providing justification that includes a full analysis of the expected benefits and must include formal review by the activity's senior legal officer. All waiver requests will be endorsed by the commander or senior leader of the requesting activity and forwarded through higher headquarters to the policy proponent. Refer to AR 25-30 for specific guidance.

DTIC

Military Operations; Regulations

20070038578 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Air Mobility Command's En Route Support Infrastructure: A Construct of Aircraft Type and Geographic Location Utilized to Assess En Route Aircraft Logistic Support

Polomsky, Robert D; Jun 2007; 163 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471722; AFIT/GIR/ENV/07-J2; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ability of the U.S. Armed Forces to maintain a global presence and rapidly project military power anywhere in the

world are key factors in preserving our freedom. To accomplish the demanding task of global reach support, Air Mobility Command (AMC) employs an en route support infrastructure. These en route locations provide varying levels of command, control, and communications (C3), logistics support, and aerial port functions. The goal of the en route is to minimize delays for AMC mission aircraft. However, these en route locations constitute a small percentage of the locations that AMC aircraft visit. Given the critical demand for rapid air mobility, potential impact of mission delays or cancellations, and the substantial investment of taxpayer dollars, AMC must provide logistical support to off-station aircraft in the most effective manner possible. This research examined a 5-year historical summary of AMC's logistical support process. The resulting data were used to perform a statistical analysis of AMC off-station aircraft logistic support records for AMC's six primary aircraft fleets (C-5, C-17, C-141, C-130, KC-10, and KC-135). The calculated average not mission capable (NMC) time was used to compare overseas en route and non en route locations to assess AMC's en route infrastructure's effectiveness in reducing mission delays due to aircraft maintenance problems. Effectiveness, in the context of this research, was measured in terms of a lower or shorter average NMC time, equating to reduced mission delays. The initial data analysis on OCONUS en route and non en route locations provided a macro-level assessment based on location only. A closer investigation of each of the six primary AMC aircraft fleets returned varying results in terms of reduced averaged NMC time. To determine if a significant difference existed between data groups, parametric and nonparametric statistical testing methods were used.

DTIC

Logistics Management; Maintenance; Mobility; Position (Location); Refueling; Routes; System Effectiveness; Tanker Aircraft; Transport Aircraft

20070038629 Air Command and Staff Coll., Maxwell AFB, AL USA

Using an Intratheater Regional Hub Heuristic in Iraq. An Exploratory Case Study

Charlesworth, Robert L; May 2007; 46 pp.; In English

Report No.(s): AD-A471927; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ongoing casualties inflicted on convoys transgressing dangerous roads highlighted airlift's important role in intratheater logistics operations within Iraq. While airlift can help decrease the number of convoys on the roads in combat zones, the finite number of airlifters must be managed effectively and efficiently to maximize its impact in supporting operations. This research proposes using a regional hub-and-spoke heuristic to design major-theater-war channel systems. The purpose of this research is to recommend a relaxation of the airlift operations? doctrinal definition of the hub-and-spoke concept to allow for inclusion of a regional hub in-theater. To justify this recommendation, a case study methodology is used to compare performance of the intratheater airlift channel system as it existed in Iraq in February 2004 to a model channel system created using a regional hub heuristic. The two channel systems are compared using dependent variables designed to characterize efficiency, effectiveness and adherence to the logistics principle of simplicity. The channel system created using a regional hub heuristic is more efficient by about 8 percent and more effective by 48 percent. Comparisons of adherence to the logistics principle of simplicity are inconclusive.

DTIC

Combat; Heuristic Methods; Iraq; Logistics

20070038689 Library of Congress, Washington, DC USA

Aviation Finance: Federal Aviation Administration (FAA) Reauthorization and Related Issues

Fischer, John W; Aug 27, 2007; 35 pp.; In English

Report No.(s): AD-A472044; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The aviation taxes and fees associated with funding the Federal Aviation Administration's (FAA) operation and oversight of the federal aviation system will expire at the end of FY2007, as will most of the related federal aviation programs. These taxes and fees which are deposited in the airport and airways trust fund (aviation trust fund), pay for the majority of FAA's activities. The FAA and others have expressed concern that the current funding system is inadequate to meet future federal needs for upgrading, expanding, maintaining, and operating the existing federal air navigation system as part of the FAA's Next Generation Air Transportation System (NGATS). This view is disputed by some aviation industry (groups who believe that the existing trust fund based system is adequate for the foreseeable future. Many of these same groups would even argue that overall federal spending on certain federal aviation programs could be increased in new authorization legislation without a new funding system. There is also a third view, which suggests that the current financing system needs to be reexamined because it is potentially unreliable, e.g. events such as September 11 and recessions can have a major and unpredictable impact on annual tax and fee collections.

DTIC

Air Transportation; Finance

20070038877 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Location Optimization of Continental USA Strip Alert Sites Supporting Homeland Defense

Eberlan, Jon A; Mar 2004; 197 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471961; AFIT/GLM/ENS/04-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

With the dissolution of the Warsaw Pact and the fall of the Soviet Union, the number of alert aircraft dwindled to 14 aircraft located at 7 sites on September 11, 2001. After the terrorist attacks on the World Trade Center Towers and the Pentagon, the USA could not continue to endorse an outward looking air defense strategy. Terrorism completely changed the landscape of the air defense mission. This research develops a location optimization model to optimally locate alert sites post-11 September to cover areas of interest in the CONUS. The model finds the minimum number of alert sites, minimum aggregate network distance, and minimized maximum distance given a range of aircraft launch times and speeds. The model is formulated as an Integer Program, and Microsoft Excel's(Registered) Solver(TM) Add-In is used to run the model. This research provides air defense planners a tool to use in formulating an optimal strip alert network. By finding the minimum number of sites and the minimum aggregate distance to cover all areas of interest, duplication of coverage effort, dispersion of resources, and network response time is minimized. The results presented in this research should lead to a more efficient and effective air defense strip alert network to support homeland defense of the USA.

DTIC

Air Defense; Position (Location); United States

20070038906 Defence Science and Technology Organization, Pymont, Australia

Helicopter Operations Simulation (HelOS) and applications

Hammond, David; Watson, Jamie; Oct 1, 2003; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471774; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471774>

HelOS is an object oriented modelling tool which simulates amphibious helicopter operations. It is useful for analysis of: Platform requirements, Scheduling and C2 issues, and SOP development. It is useful for operators as a planning tool.

DTIC

Computerized Simulation; Helicopters; Simulation

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.

20070037898 Federal Aviation Administration, Oklahoma City, OK USA

Prediction and Classification of Operational Errors and Routine Operations Using Sector Characteristics Variables

Pfleiderer, Elaine M; Manning, Carol A; Jul 2007; 20 pp.; In English

Report No.(s): AD-A471597; DOT/FAA/AM-07/18; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study examined prediction and classification of operational errors (OEs) and routine operations (ROs) using sector characteristics variables. Average Control Duration, Aircraft Mix Index, Average Lateral Distance, Average Vertical Distance, Number of Handoffs, Number of Point Outs, Number of Transitioning Aircraft, and Number of Heading Changes were used as predictors in two stepwise logistic regression analyses conducted for the high-altitude and low-altitude sectors. In the high-altitude sample, variables included in the final model (Number of Heading Changes, Number of Transitioning Aircraft, and Average Control Duration) accurately classified OE and RO samples for 80% of the cases. In the low-altitude sample, variables included in the final model (Number of Point Outs, the Number of Handoffs, and the Number of Heading Changes) accurately classified OE and RO samples for 79% of the cases. Although logistic regression cannot be used to determine causation, it effectively identified variables that predicted the occurrence of OEs.

DTIC

Air Traffic Control; Classifications; Error Analysis

20070038141 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Real-Time GPS-Alternative Navigation Using Commodity Hardware

Fletcher, Jordon L; Jun 2007; 129 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471064; AFIT/GCS/ENG/07-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471064>

Modern navigation systems can use the Global Positioning System (GPS) to accurately determine position with precision in some cases bordering on millimeters. Unfortunately, GPS technology is susceptible to jamming, interception, and unavailability indoors or underground. There are several navigation techniques that can be used to navigate during times of GPS unavailability, but there are very few that result in GPS-level precision. One method of achieving high precision navigation without GPS is to fuse data obtained from multiple sensors. This thesis explores the fusion of imaging and inertial sensors and implements them in a real-time system that mimics human navigation. In addition, programmable graphics processing unit technology is leveraged to perform stream-based image processing using a computer's video card. The resulting system can perform complex mathematical computations in a fraction of the time those same operations would take on a CPU-based platform. The resulting system is an adaptable, portable, inexpensive and self-contained software and hardware platform, which paves the way for advances in autonomous navigation, mobile cartography, and artificial intelligence.

DTIC

Commodities; Global Positioning System; Interception; Jamming; Real Time Operation

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.

20070037516 European Aeronautic Defence and Space Co., Munich, Germany

Generation of Synthetic SAR Imagery for ATR Development

Seidel, Heiko; Stahl, Christoph; Knappe, Peter; Hurst, Peter; May 1, 2005; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471132; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471132>

No abstract available

Artificial Intelligence; Flight Simulators; Pilots; Radar Imagery; Synthetic Aperture Radar; Target Recognition

20070037540 Library of Congress, Washington, DC USA

F-35 Joint Strike Fighter (JSF) Program: Background, Status, and Issues

Bolkcom, Christopher; Jul 19, 2007; 29 pp.; In English

Report No.(s): AD-A471180; CRS-RL30563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471180>

The Defense Department's F-35 Joint Strike Fighter (JSF) is one of three aircraft programs at the center of current debate over tactical aviation, the others being the Air Force F-22A fighter and the Navy F/A-18E/F fighter/attack plane. In November 1996, the Defense Department selected two major aerospace companies, Boeing and Lockheed Martin, to demonstrate competing designs for the JSF, a joint-service and multi-role fighter/attack plane. Lockheed Martin won this competition, and was selected to develop further and to produce the JSF, a family of conventional take-off and landing (CTOL), carrier-capable (CV), and short take-off vertical landing (STOVL) aircraft for the U.S. Air Force, Navy, and Marine Corps and the UK Royal Navy as well as other allied services. Originally designated the Joint Advanced Strike Technology (JAST) program, the JSF program is a major issue in Congress because of concerns about its cost and budgetary impact, effects on the defense industrial base, and implications for U.S. national security in the early 21st century.

DTIC

Fighter Aircraft; Jet Aircraft

20070037546 Library of Congress, Washington, DC USA

Navy F/A-18E/F Super Hornet and EA-18G Growler Aircraft: Background and Issues for Congress

Bolkcom, Christopher; Jul 23, 2007; 17 pp.; In English

Report No.(s): AD-A471194; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471194>

The F/A-18E/F Super Hornet is the Navy's highest priority aviation modernization program. It is replacing the Navy F/A-18C/D Hornet combat aircraft. The decision to undertake the F/A-18E/F Super Hornet program was made during a period of great turbulence in Navy aviation modernization. During this time frame the Navy struggled to identify and implement the best way to modernize its aging fleet of F-14 fighters and A-6E attack aircraft. The A-12 program (a stealthy replacement to the A-6E) was terminated in January 1991. The AFX program, another proposed replacement for the A-6E, began in 1991, but was also terminated. The principal alternative to the F/A-18E/F was a modest upgrade of the F-14--a large, two-seat fighter designed in the 1960s, with potential air-to-surface attack capabilities. Some observers describe the F/A-18E/F as an upgraded and larger version of the F/A-18C/D, with increased range and payload capacity and more space and weight for future improvements. Others assert that the differences between the baseline Hornet aircraft and the E/F model are so great that they would describe the Super Hornet as an entirely new aircraft. The Department of Defense is currently facing a shortage of radar and communications jamming capability. The Navy and Marine Corps EA-6B Prowlers escort and protect Navy, Marine Corps and Air Force aircraft operating in hostile airspace. The Prowlers, however, are few and rapidly aging. All the Services are evaluating preferred approaches to ameliorating this shortfall. The Navy's approach is to produce a new electronic attack aircraft based on the F/A-18F, called the F/A-18G. The Navy's FY2008 budget proposes to increase the overall purchase of F/A-18E/F aircraft by 22, for a total of 494. It also proposes reducing the overall purchase of FA-18G aircraft by 10, for a total of 80.

DTIC

Attack Aircraft; Fighter Aircraft; Jet Aircraft; Military Aircraft; Navy

20070037801 LyTec, LLC, Tullahoma, TN USA

HVEPS Scramjet-Driven MHD Power Demonstration Test Results (Preprint)

Lineberry, J T; Begg, L; Castro, J H; Litchford, Ron J; Donohue, J M; Jun 2007; 32 pp.; In English

Contract(s)/Grant(s): F33615-01-D-2109-0008; Proj-3145

Report No.(s): AD-A471429; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force sponsored Hypersonic Vehicle Electric Power System (HVEPS) program was a research program to develop scramjet driven magnetohydrodynamic (MHD) power for an advanced high power, airborne electric power system. This program has been active for the past five years with various technical tasks being addressed that have encompassed engineering investigations of a myriad of technical issues related to airborne hypersonic MHD power system integration and operation. The integrated scramjet-driven MHD power demonstration ground test program was successfully accomplished in December 2006. The MHD power demonstration tests were conducted in the UTRC scramjet test cell wherein modifications to the test cell were made to install an in-line, direct fired MHD generator test article downstream of the facility's scramjet combustor.

DTIC

Hypersonic Vehicles; Magnetohydrodynamic Generators; Magnetohydrodynamics; Supersonic Combustion Ramjet Engines

20070037811 Atomic Energy Research Inst., Budapest, Hungary

Non-Destructive Measurement Methods (Neutron-, X-ray Radiography, Vibration Diagnostics and Ultrasound) in the Inspection of Helicopter Rotor Blades

Balasko, M; Endrocz, G; Tarnai, Gy; Veres, I; Molnar, Gy; Svab, E; Apr 1, 2005; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471443; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Diagnosis; Neutron Radiography; Radiography; Rotary Wings; Ultrasonics; Vibration; X Ray Inspection; X Rays

20070037852 Army Command and General Staff Coll., Fort Leavenworth, KS USA

The Effects of Consolidating F-16 Phase and Cannibalization Aircraft on Key Maintenance Indicators

Powell, Matthew J; Jun 15, 2007; 113 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471512; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study investigates the potential improvement in aircraft fleet health resulting from consolidating phase and

cannibalization aircraft in the 388th Equipment Maintenance Squadron at Hill AFB, Utah. Never before have these programs been consolidated into one centrally managed facility. The focus of the study is to determine if the impact of consolidating F-16 phase and cannibalization aircraft on key maintenance indicators warrants program implementation Air Force wide. The key maintenance metrics of the 388th Fighter Wing's F-16 aircraft fleet prior to the start of the program are compared to the same metrics following program implementation. These metrics are then similarly compared to those of the other active duty F-16 fighter wings throughout Air Combat Command to assess measurable differences in performance. The secondary and tertiary benefits of implementation are also discussed to lend additional support to the program. The study identifies the critical factors leading to this program initiative, the benefits gained, and the sufficiency of the program in today's operational environment. This study promotes this program as an Air Force Smart Operations for the 21st Century initiative. The adoption of the program is recommended to improve the overall fleet health and operational readiness of the Air Force's aircraft inventory.

DTIC

Consolidation; F-16 Aircraft; Fighter Aircraft; Maintenance

20070038171 NASA Dryden Flight Research Center, Edwards, CA, USA

The Road to Mach 10: A History of the X-43A Hypersonic Flight Test Program at NASA Dryden -- Origins to First Flight

Peebles, Curtis; [2006]; 13 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The NASA Dryden Flight Research Center, in partnership with the NASA Langley Research Center and industrial contractors, conducted the first flight tests of a supersonic combustion ramjet (scramjet) in 2004. This was a revolutionary airbreathing engine able to operate at speeds above Mach 5, which carries potential for both high-speed atmospheric flight and as a space launcher. For the Dryden engineers, the X-43 program was the culmination of a nearly 60-year history of flight research, going back to the early days of supersonic flight, and to rocket planes such as the X-1, D-558-II Skyrocket, and the X-15. For the propulsion community, it marked a turning point in a quest that had taken nearly as long. The scramjet engine did not arise from the work of a single individual or from a single technological breakthrough. It evolved instead from work under way on ramjets in the early 1950s, and from research programs at the National Advisory Committee for Aeronautics (NACA) Lewis Research Center, at the U.S. Army Aberdeen Proving Ground, and by the U.S. Navy. Studies developed in the course of these disparate projects raised the possibility of supersonic combustion. Many researchers had considered the notion impractical due to the difficulty of stabilizing a flame front in a supersonic airflow. NACA researchers at Lewis attempted to test the idea's feasibility by burning aluminum borohydride in a supersonic wind tunnel. Sustained burning was believed to have been observed at Mach 1.5, Mach 2, and Mach 3 for as long as two seconds.

Derived from text

Flight Tests; Hypersonic Flight; Hypersonic Speed; Supersonic Combustion Ramjet Engines; X-43 Vehicle

20070038172 Analytical Services and Materials, Inc., Edwards, CA, USA

The Road to Mach 10: A History of the X-43A Hypersonic Flight Test Program at NASA Dryden...Toward the Future, Part II

Peebles, Curtis; Quest Magazine; [2007]; Volume 14, Issue 1; 12 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

In terms of technology, the X-43A/Hyper-X represented a singular milestone. After nearly a half century of high hopes, studies, wind tunnel tests, proposals, and canceled projects, a scramjet-powered vehicle had flown. The performance of the engine qualified the scramjet design tools and scaling laws. In turn, the theoretical calculations and ground testing could be used to design more advanced engine concepts. Just as important, both the scramjet and vehicle systems had successfully operated in the variable temperatures and densities of the atmosphere. The X-43A systems were able to maintain the exact flight conditions necessary for the scramjet to operate properly. Control deflections to correct the engine-induced moments were close to pre-flight predictions. When the unexpected occurred, such as when the vehicle pitched up during the cowl opening on the second flight, the control system was sufficiently designed to correct the situation. The airframe and wing structure, the thermal protection material, and the internal conditions of the X-43A performed largely as predicted. The HXLV thermal anomaly during the ascent on the third flight and 'the Mach 8 unpleasantness' during the descent indicated that the HXLV and X-43A were not as resilient to aerodynamic heating as expected. The X-43A's airframe drag and lift both were slightly higher than predicted, but still within preflight uncertainty predictions. The stability and control were as predicted, as was the boundary layer transition. The biggest aerodynamic worry before the flight was the separation of the HXLV and the X-43A. After all was said and done, this went exactly as predicted, proving that non-symmetrical/high-dynamic pressure stage

separations could be performed. This in turn meant that two-stage-to-orbit vehicles employing this technology were feasible. The Hyper-X program also served as a training ground for a new generation of scramjet and hypersonic researchers. This included both NASA and contractor personnel, providing them with experience in ground testing and component development; vehicle design, construction, integration, system checkout, and, ultimately, flight testing and data analysis. Additionally, researchers learned the practical details of running a project within finite budget and time limits, about the ambiguousness of risk assessment, and about the need to spend a significant amount of time and effort dealing with engineering problems, such as those with the FAS, that have nothing to do with the project's research goals. Finally, all those who worked on the X-43A project now know what it is like to spend years transforming an idea into a functional vehicle, only for it to be lost in a matter of seconds. And then to go through years of work to correct the problems, to face the possibility that still more might exist, and finally to savor the triumph of two successful flights. For those who will work on the hypersonic projects that emerge in coming years, these experiences may prove to be the most valuable of all.

Derived from text

Engine Design; Flight Tests; Hypersonic Flight; Supersonic Combustion Ramjet Engines; X-43 Vehicle; Hypersonic Aircraft

20070038376 Air Force Academy, Colorado Springs, CO USA

Unmanned Aerial Vehicle Camera Integration

Sward, Ricky E; Cooper, Stephen D; Nov 2004; 20 pp.; In English

Report No.(s): AD-A470778; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA470778>

In recent years, Unmanned Aerial Vehicles (UAVs) have provided a bird's eye view of the battlefield with onboard video cameras feeding video images back to a ground control station. This paper reports on a project conducted by members of the Air Force Academy's UAV Research Group to purchase equipment and build an integrated video capture system for a small UAV. The project was funded by a grant from the Institute for Information Technology Applications (IITA). The UAV Research Group (UAVRG) at the Air Force Academy currently consists of over 25 members from 11 different academic departments. Over the past 3 years, they have gained experience in small UAVs such as the Desert Hawk UAV, designed by Lockheed Martin, and the Silver Fox UAV, developed by Advanced Ceramics Research (ACR). They have continued to expand their expertise with these UAVs and have developed a flying test bed that can be used to test UAV applications using real UAVs. The group is using aircraft in the test bed that are less expensive than the operational UAVs, but still based on the Piccolo autopilot module, the same autopilot used in the Silver Fox. Using the grant from IITA, the UAVRG has purchased equipment to capture video from an airborne UAV. The purpose of this project was to learn more about the limitations and benefits of video cameras, video capture hardware and software, and digital storage capacities. The paper serves as the final report for this project. It describes the equipment that the UAVRG purchased and the integration of this equipment into a video capture system. It also describes how the camera was physically mounted onto the UAV and the limitations the group encountered in accomplishing that. The paper also reports on experiments that the cadets in the Software Engineering class conducted to compare the different video compression and storage algorithms available for the system.

DTIC

Aerial Photography; Cameras; Data Recording; Digital Systems; Drone Vehicles; Evaluation; Pilotless Aircraft; System Effectiveness

20070038406 Defence Science and Technology Organisation, Edinburgh, Australia

Integrating the Joint Strike Fighter into the Australian Defence Force

Rigopoulos, John; Bramley, Kelvin; Brown, Rod; Chandran, Arvind; Graham, David; Hanlon, Brian; Kemister, Gary; Maguire, Peter; Marlow, David; McIlroy, David; Jul 2003; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471664; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471664>

NEW AIR COMBAT CAPABILITY (NACC) PROJECT: In June 2002, Australia decided to join JSF development phase. Proposed replacement of the Air Combat and Strike capabilities provided by F/A-18 Hornet and F-111. Replacement required next decade. NACC Project: Provide S&T advice to support JSF acquisition approval. Large scale participation across Government, Defence and Industry. Focus of presentation is on Operational Analysis activities.

DTIC

Australia; Fighter Aircraft; Warfare

20070038622 Air Force Research Lab., Eglin AFB, FL USA

A C++ Architecture for Unmanned Aerial Vehicle Simulations

Zipfel, Peter H; Sep 2007; 32 pp.; In English

Contract(s)/Grant(s): Proj-2068

Report No.(s): AD-A471916; AFRL-MN-EG-TP-2007-7415; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The C++ computer language is well suited to model multi-vehicle engagements. Its prowess is exemplified by the conversion of a unmanned aerial vehicle simulation from FORTRAN to C++. The new architecture accommodates besides UAVs and moving targets also targeting satellites. Its class structure is outlined, and the communication bus between the encapsulated vehicle-objects is discussed. A generic UAV model with five degrees-of-freedom fidelity is used to demonstrate the interactive features of the simulation. Our experience has shown that C++ is the programming environment of choice for networked simulations.

DTIC

C (Programming Language); C++ (Programming Language); Computerized Simulation; Drone Vehicles; Pilotless Aircraft; Simulation

20070038627 Office of Naval Research, Arlington, VA USA

Fleet Protection Using a Small UAV Based IR Sensor

Buss, James R; Ax, Jr, George R; May 1, 2005; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471925; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Aerial Reconnaissance; Drone Vehicles; Infrared Detectors; Protection; Security; Surveillance

20070038633 Army Communications-Electronics Command, Fort Belvoir, VA USA

Application of Small Unmanned Air Vehicles in Network Centric Warfare

Wright, Richard; Klager, Gene; Herbst, Frank; May 1, 2005; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471933; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Drone Vehicles; Networks; Optical Measuring Instruments; Pilotless Aircraft; Reconnaissance; Surveillance; Target Acquisition; Warfare

20070038640 Office of the Deputy Inspector General for Auditing, Arlington, VA USA

Acquisition Management: Source Selection Procedures for the C-5 Avionics Modernization Program

Granetto, Paul J; Neville, Douglas P; Mathews, Amy L; Thompson, Lashonda M; Burger, Michael T; Anderson, Lamar; Hepler, Michael T; Borrero, Karen M; Hart, Erin S; Feb 28, 2006; 27 pp.; In English

Contract(s)/Grant(s): Proj-D2005-D000FP-0174.000

Report No.(s): AD-A471956; IG/DOD-D-2006-058; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Civilians and uniformed officers who are involved in the Air Force acquisition decision-making process should read this report because it identifies issues related to the source selection procedures used by the Air Force in the acquisition of the C-5 Avionics Modernization Program. In November 2004, the Acting Under Secretary of Defense (Acquisition, Technology, and Logistics) commissioned a study to review acquisition-related actions taken by the former Principal Deputy Assistant Secretary of the Air Force for Acquisition and Management (Principal Deputy). As a result of that study, the Acting Under Secretary of Defense (Acquisition, Technology, and Logistics) identified eight actions for further investigation and requested that the Department of Defense Inspector General review them. This audit focuses on one of these actions relating to the award of the C-5 Avionics Modernization Program contract to Lockheed Martin Aeronautical Systems on January 22, 1999. Air Force personnel did not adequately document the decision process used to award the C-5 Avionics Modernization Program contract to Lockheed Martin Aeronautical Systems. Specifically, the Source Selection Advisory Council and the Source Selection Authority did not document their rationale for the initial selection evaluation results and subsequent changes to those results, and the Air Force did not provide the oversight needed to ensure the decisions were documented. As a result, the C-5 Avionics Modernization Program solicitation and contract award were unnecessarily vulnerable to manipulation. Identifying the source selection process as a high risk area and establishing a review process that tests the effectiveness of the controls over the

process will provide the oversight needed to reduce the likelihood of manipulation. We also reviewed the managers' internal control program as it related to the source selection oversight process.

DTIC

Acquisition; Avionics; Contract Management; Selection; Transport Aircraft

20070038641 Royal Military Academy, Brussels, Belgium

A Challenge for Micro and Mini UAV: The Sensor Problem

Hermans, Davy; Decuypere, Roland; May 1, 2005; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Attitude Control; Attitude Indicators; Cameras; Detectors; Drone Vehicles; Miniaturization; Navigation Instruments

20070038643 Air Force Academy, Colorado Springs, CO USA

Air Force Digital Technical Orders: Technologies and Applications for the Future

Fiebig, Ellen M; Martinez, Anthony S; Dec 2002; 35 pp.; In English

Report No.(s): AD-A471968; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This twelve-month research study was a small part of a larger Air Force study to fulfill Department of Defense directives to transition to a digital environment for acquisition programs by the end of 2002. (Appendix A) The research study, which involved over 200 active and reserve jet engine aircraft maintenance troops at installations nationwide, was designed to support the Air Force strategy of 'Global Technology Deployment' by providing and testing jet engine maintenance technical order manuals in digital form, and integrating the correct technology to utilize the digital application. In addition, it speaks to the cultural issues associated with incorporating a dramatic technological change. Participants were sent the latest version of the F-16 interactive electronic technical manual (IETM) software to use for a few months prior to testing 'ruggedized' hardware. They were also sent a research survey, which measured the utility of the combination of software and ruggedized hardware. Finally, depot/vendor sponsored training on the software and hardware was provided at various installations. The study demonstrated the feasibility, using 'ruggedized' hardware and advanced software combinations and the potential of expanding the use of other technologies into other areas of military logistics. Initial recruitment of participants was facilitated by the Air Force-wide deployment of IETM software to all F-16 Jet Engine Propulsion Maintenance Shops. The research survey and interviews proved to be useful for data collection, which allowed jet engine maintenance troops to express views and opinions on issues relevant to the overall Air Force Project. Of those participants that completed the survey, 90% indicated they agreed or strongly agreed that this was an effective method of maintenance. The research concludes with recommendations for developing and conducting future logistics technology research for the military.

DTIC

Computers; Jet Engines; Maintenance; Manuals; Readers

20070038644 McGill Univ., Montreal, Quebec Canada

A Comparative Study of All-Accelerometer Strapdowns for UAV INS

Cardou, Philippe; Angeles, Jorge; May 1, 2005; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471970; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Accelerometers; Drone Vehicles; Inertial Navigation

20070038645 Physics and Electronics Lab. TNO, The Hague, Netherlands

FM-CW Based Miniature SAR Systems for Small UAVs

Hoogeboom, Peter; Wit, Jacco de; Meta, Adriano; Figueras, Jordi; May 1, 2005; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471972; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Continuous Radiation; Drone Vehicles; Frequency Modulation; Miniaturization; Pilotless Aircraft; Synthetic Aperture Radar

20070038647 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Airborne Multi-Spectral Minefield Survey
de Lange, Dirk-Jan; den Breejen, Eric; May 1, 2005; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471974; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Aerial Reconnaissance; Image Correlators; Surveys

20070038648 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Development of a Small Phased Array SAR-MTI System for Tactical UAV
van Rossum, W L; Grooters, R; van Halsema, D; Lorga, J F; Otten, M P; Vermeulen, B C; Vlothuizen, W J; May 1, 2005;
13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471975; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Drone Vehicles; Moving Target Indicators; Phased Arrays; Synthetic Aperture Radar

20070038649 Societe d'Applications Generales d'Electricite et de Mecanique, Paris, France
Data & Image Fusion for Multisensor UAV Payload
Echard, Paul; Lamarre, Herve; Gosselin, Patrick; May 1, 2005; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471976; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Drone Vehicles; Multisensor Fusion; Payloads

20070038650 Instituto Superior de Engenharia de Lisboa, Lisbon, Portugal
A UAV-Friendly Strategy for Moving Targets Processing Using SAR
Marques, Paulo A; Dias, Jose M; May 1, 2005; 11 pp.; In English
Report No.(s): AD-A471977; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Algorithms; Independent Variables; Synthetic Aperture Radar; Targets; Trajectories

20070038654 Air Force Academy, Colorado Springs, CO USA
A Collaboration Network for Unmanned Aerial Vehicle Operation, Research and Education
White, Al; May 2005; 27 pp.; In English
Report No.(s): AD-A471992; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The type and number of Unmanned Aerial Vehicles (UAVs) is increasing rapidly. However, operational UAVs are a high-demand, low-density asset and access is extremely limited due to higher priority taskings of these systems. Researchers and developers of UAV related systems, operations, and training rarely have access to an operational quality UAV and must resort to building their own systems. The effort required in developing a fully functional UAV system coupled with the logistics of airspace, operator training, and other flight related activities is a major undertaking. The objective of a UAV Collaboration Network (UCN) is to extend the USAFA UAV flight and simulator capability using common Internet Information Technologies to local and remote users to reduce the barriers of engaging in UAV related education, research, and operations. Typical scenarios for use of the UCN include classroom observation and control of both actual and simulated UAVs. Other uses include enabling other researchers or system developers to observe a UAV flight test of their designs from a remote location. Emergency first responders may also be able to log on to a UAV that is being operated on their behalf and observe the video and telemetry being provided. Users of UAV data such as GIS applications can develop their applications by easily accessing actual real-time UAV data being distributed over the UCN. In short, the purpose of the UCN is to increase the accessibility to UAVs to accelerate the development of educational, operational, and training research activity in the UAV systems domain.

DTIC

Drone Vehicles; Education; Networks; Pilotless Aircraft

20070038659 Air Force Research Lab., Wright-Patterson AFB, OH USA

Polarimetric Imaging Laser Radar (PILAR) Program

Richmond, Richard D; Evans, Bruno J; May 1, 2005; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A472002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

High Resolution; Imaging Radar; Laser Range Finders; Optical Radar; Polarimetry

20070038660 Air Force Research Lab., Kirkland AFB, NM USA

A 3.5 to 12 Micron 'Dualband' Spectrometer for Generic UAVs

LeVan, Paul D; May 1, 2005; 48 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Drone Vehicles; Imagery; Spectrometers

20070038669 Office of the Deputy Inspector General for Auditing, Arlington, VA USA

Logistics: H-60 Seahawk Performance-Based Logistics Program

Scott, Wanda A; Prinzbach, II, Robert F; Bartoszek, Thomas S; Needham, Nancee K; Bohinski, Walter S; Galloway, Michael J; Nova, Michael R; Charlton, Beverly J; Roberts, Jeana N; Alvarado Rivera, Mayra Y; Aug 1, 2006; 36 pp.; In English
Contract(s)/Grant(s): Proj-D2005-D000LD-0113

Report No.(s): AD-A472020; IG/DOD-D-2006-103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

DoD civil service personnel, uniformed officers, and Government contractors responsible for implementing performance-based logistics should read this report. This report discusses the H-60 SeaHawk performance-based logistics program. The Program Office and Naval Inventory Control Point identified and documented a sound process for preparing and developing H-60 SeaHawk Business Case Analysis and performance-based logistics strategies. Because the Navy aggressively adopted and implemented the H-60 SeaHawk Performance-Based Logistics strategy, the Program Office realized benefits from the strategy, which included reported increases in availability and reliability, training opportunities, Navy depot workload, and product improvements. However, the Program Office and Naval Inventory Control Point were unable to document their effectiveness in managing the performance-based logistics contracts. We reviewed the management control program as it related to the audit objectives. As a result, the Naval Inventory Control Point could not demonstrate whether H-60 SeaHawk Performance-Based Logistics contract incentive payments were accurate and could not determine if any H-60 SeaHawk Performance-Based Logistics efforts reduced total ownership costs. The Commander, Naval Supply Systems Command needed to establish oversight procedures to verify and document contractor performance, establish time frames for reconciliations and contract modifications, and update the Business Case Analysis. The Commander, Naval Inventory Control Point needed to establish management controls for contract-required reconciliations. Revising the contractor oversight process would provide DoD the needed assurance that the oversight effectively supports DoD management goals. Recommendations in this report, if implemented, will correct the weakness identified and will improve NAVICP administration of performance-based logistics contracts.

DTIC

Contract Management; H-60 Helicopter; Helicopters; Logistics; Military Helicopters; Navy

20070038870 Office of the Deputy Inspector General for Auditing, Arlington, VA USA

Acquisition: Procurement Procedures Used for C-17 Globemaster III Sustainment Partnership Total System Support

Jolliffe, Richard B; Carros, Deborah L; Schaefer, Beth K; Palmer, Kevin A; Chun, Judy M; Milner, Jillisa H; Jul 21, 2006; 33 pp.; In English

Report No.(s): AD-A472024; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The C-17 is a jet-powered strategic airlifter with a cabin offering large volume capacity and a rear-loading assembly to accommodate wheeled or tracked vehicles. The aircraft was designed to airlift and airdrop loads, including armored vehicles, directly into a combat zone. The C-17 Globemaster III was developed by McDonnell Douglas Corporation, a wholly owned subsidiary of The Boeing Company (Boeing). On October 1, 2003, the Air Force awarded McDonnell Douglas a letter contract (contract no. FA8614-04-C-2004) to provide sustainment for the C-17 through December 31, 2003, for an amount not to exceed \$259 million. The long-term sustainment contract was definitized on July 22, 2004, for \$871 million for FY 2004, and a potential value of almost \$5 billion (base year and four priced annual options). The contract, including the base year, four

priced annual options, and three unpriced options, runs from FY 2004 through FY 2011. The Aeronautical Systems Center at Wright Patterson Air Force Base is the contracting activity.

DTIC

Acquisition; Government Procurement; Procurement; Transport Aircraft

20070038916 Department of the Air Force, Washington, DC USA

Air Force Roadmap 2006-2025

Jun 2006; 81 pp.; In English

Report No.(s): AD-A471948; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Air Force Roadmap is a capability-based force structure plan that conveys the planned recapitalization and modernization of the Air Force through 2025. It articulates the strategic foundations of the force and the distinctive air and space power capabilities this force structure provides. The end result is a powerful force structure that will dominate adversaries in air, space, and cyberspace across the spectrum of conflict, now through 2025. For presentation, the Air Force Roadmap organizes current and future force structure under six distinctive capabilities: air and space superiority, information superiority, global attack, precision engagement, rapid global mobility, and agile combat support. Clearly, individual weapon systems operate across multiple capabilities; however, in this Roadmap, weapon systems are generally depicted in a given section based on the capability predominantly provided by that weapon system. Additionally, the Air Force provides specialized air power through Air Force Special Operations Command. While these specialized capabilities could be described using these same six distinctive capabilities, they are included as a separate section to emphasize the unique nature of special operations.

DTIC

Management Planning; Military Operations

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.

20070038164 National Center for Atmospheric Research, Boulder, CO, USA

NIRSS Upgrades: Final Report

Politovich, Marcia K.; November 2007; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS3-00145; WBS 609866.0207.03.04

Report No.(s): NASA/CR-2007-215011; E-16187; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038164>

This year we were able to further the NIRSS program by re-writing the data ingest and display code from LabVIEW to C++ and Java. This was leveraged by a University of Colorado Computer Science Department Senior Project. The upgrade made the display more portable and upgradeable. Comparisons with research aircraft flights conducted during AIRS-2 were also done and demonstrate reasonable skill in determining cloud altitudes and liquid water distribution. Improvements can still be made to the cloud and liquid logic. The icing hazard index was not evaluated here since that represents work in progress and needs to be made compatible with the new CIP-Severity algorithm. CIP is the Current Icing Potential product that uses a combination decision tree/fuzzy logic algorithm to combine numerical weather model output with operational sensor data (NEXRAD, GOES, METARs and voice pilot reports) to produce an hourly icing diagnosis across the CONUS. The new severity algorithm seeks to diagnose liquid water production through rising, cooling air, and depletion by ice processes. The information used by CIP is very different from that ingested by NIRSS but some common ground does exist. Additionally, the role of NIRSS and the information it both needs and provides needs to be determined in context of the Next Generation Air Traffic System (NGATS). The Weather Integrated Products Team has a plan for an Initial Operating Capability (IOC) to take place in 2012. NIRSS is not explicitly a part of that IOC but should be considered as a follow-on as part of the development path to a 2025 full capability.

Author

Remote Sensing; Ice Formation; Meteorological Radar; Computer Programs; Clouds (Meteorology)

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.

20070038167 NASA Glenn Research Center, Cleveland, OH, USA

Concepts for Distributed Engine Control

Culley, Dennis E.; Thomas, Randy; Saus, Joseph; November 2007; 19 pp.; In English; 43rd Joint Propulsion Conference and Exhibit, 8-11 Jul. 2007, Cincinnati, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.17.03

Report No.(s): NASA/TM-2007-214994; AIAA Paper 2007-5709; E-16194; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038167>

Gas turbine engines for aero-propulsion systems are found to be highly optimized machines after over 70 years of development. Still, additional performance improvements are sought while reduction in the overall cost is increasingly a driving factor. Control systems play a vitally important part in these metrics but are severely constrained by the operating environment and the consequences of system failure. The considerable challenges facing future engine control system design have been investigated. A preliminary analysis has been conducted of the potential benefits of distributed control architecture when applied to aero-engines. In particular, reductions in size, weight, and cost of the control system are possible. NASA is conducting research to further explore these benefits, with emphasis on the particular benefits enabled by high temperature electronics and an open-systems approach to standardized communications interfaces.

Author

Distributed Parameter Systems; Control Systems Design; Active Control; Aircraft Engines; Gas Turbine Engines; Engine Design

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.

20070038136 Naval Postgraduate School, Monterey, CA USA

Control of a System in the Presence of Flexible Modes

Manos, Eleftherios; Jun 2007; 65 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471098; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471098>

The primary research objective is to investigate the control of flexible space structures -- mobile satellite communication systems in particular. Solar-powered satellites require a high level of accuracy in attitude stabilization and large-angle maneuvering. Furthermore, they have to be least sensitive to disturbances affecting the structure, possibly coming from several sources, such as mechanical vibrations due to flexible panels appended to the spacecraft. In this thesis, we address the problem of robust adaptive disturbance rejection in a control system of a flexible structure. The intent is to guarantee stability and maximum rejection of the disturbances. For the achievement of this purpose, a Linear Quadratic Gaussian (LQG) controller is designed using Loop Transfer Recovery (LTR) in order to increase the robustness of the system. A second approach is to design a nonminimum-phase structural filter and to examine its effect on the system's stability.

DTIC

Attitude Control; Systems Engineering; Modes; Flexible Spacecraft

RESEARCH AND SUPPORT FACILITIES (AIR)

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

20070036800 NASA Dryden Flight Research Center, Edwards, CA, USA

Dryden Flight Research Center Overview

Meyer, Robert R., Jr.; [2007]; 35 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070036800>

This viewgraph document presents an overview of the Dryden Flight Research Center's facilities. Dryden's mission is to advance technology and science through flight. The mission elements are: perform flight research and technology integration to revolutionize aviation and pioneer aerospace technology, validate space exploration concepts, conduct airborne remote sensing and science observations, and support operations of the Space Shuttle and the ISS for NASA and the Nation. It reviews some of the recent research projects that Dryden has been involved in, such as autonomous aerial refueling, the 'Quiet Spike' demonstration on supersonic F-15, intelligent flight controls, high angle of attack research on blended wing body configuration, and Orion launch abort tests.

CASI

Research Facilities; Research Aircraft; Flight Test Vehicles; Test Facilities

20070038397 Task Consulting, Tucson, AZ USA

FAA Air Traffic Control Tower Cab Glass Evaluation, Specification and Assessment with Respect to Optical-Visual Characteristics

Task, H L; Pinkus, Alan R; Aug 2007; 43 pp.; In English

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A471651; MIPR6JAFRN0195; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471651>

The objective of this FAA-funded effort was to determine appropriate optical/visual parameter requirements for FAA tower cab glazing. Provided are recommended values and measurement procedures that include a recommended list of relevant optical parameters, a summary of existing and proposed specifications, recommendations with rationale for the desired minimum (or maximum, as the case may be) allowed value, recommended standard test procedures, the impact on visual capability, and a summary of the sample glazing and shading tests.

DTIC

Air Traffic Control; Airport Towers; Glass; Optical Properties; Terminal Facilities; Towers

20070038444 Army Engineer Research and Development Center, Vicksburg, MS USA

Laboratory and Field Investigations of Small Crater Repair Technologies

Priddy, Lucy P; Tingle, Jeb S; McCaffrey, Timothy J; Rollings, Ray S; Sep 2007; 217 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471743; ERDC/GSL-TR-07-27; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471743>

In support of the U.S. Air Force Air Combat Command, the U.S. Army Engineer Research and Development Center (ERDC) was tasked to develop and test innovative techniques, materials, and equipment for expedient and sustainment repairs of small bomb craters in airfield pavements. This airfield damage repair (ADR) investigation consisted of laboratory testing of selected crater fill and capping materials, as well as full-scale field testing of small crater repairs to evaluate field mixing methods, installation procedures, and repair performance. After 3 hr of cure, each crater was trafficked under controlled traffic conditions to determine the ability of the repairs to support the gross load of an F-15E aircraft. Results of the traffic tests identified multiple repair materials that can be used for expedient and sustainment repairs of concrete airfield pavements. Both the laboratory and full-scale traffic tests were conducted at the ERDC in Vicksburg, MS, from February to November 2006. Experimental results were used to develop ADR criteria for rapidly repairing small craters.

DTIC

Bombs (Ordnance); Craters; Impact Damage; Landing Sites; Maintenance

20070038639 Library of Congress, Washington, DC USA

Environmental Impacts of Airport Operations, Maintenance, and Expansion

Luther, Linda; Sep 5, 2007; 24 pp.; In English

Report No.(s): AD-A471944; CRS-RL33949; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Funding authorization for Federal Aviation Administration (FAA) programs set forth in the Vision 100 -- Century of Aviation Reauthorization Act (P.L. 108-176, referred to as 'Vision 100') is set to expire at the end of FY2007. During the current reauthorization process, methods to address the environmental impacts associated with airport operations and expansion are being debated. This issue is important to various stakeholders, particularly those whose health, property values, and quality of life may be affected by such impacts. The concerns of community members and local, state, and tribal agencies regarding environmental impacts have led to the delay and cancellation of some airport expansion projects. To address these concerns, airports may be required to implement projects that would minimize the environmental impacts of their operations. Some of these projects qualify for federal funding. For example, in its FY2008 budget, the FAA requested \$354 million to meet its 'Environmental Stewardship' goals. Projects funded under this category address the environmental impacts of airports, primarily to abate airport noise. Among other uses, funds may be spent on projects to minimize water quality impacts (e.g., funding projects that would control the discharge of deicing chemicals) and to reduce airport-controllable air emissions (e.g., purchasing alternative fuel ground services vehicles). Funds also are authorized for researching new aircraft technology that would reduce noise and air emissions. The most significant issues include changes to EPA standards applicable to deicing operations and oil spill prevention procedures, as well as state and local agency directives to monitor and control toxic air pollutants. This report provides an overview of noise, water quality, and air quality issues associated with airport operations. It also discusses the environmental review requirements of the National Environmental Policy Act of 1969 (NEPA).

DTIC

Air Pollution; Airports; Environmental Surveys; Federal Budgets; Maintenance; Noise Pollution; Pollution Control; Water Pollution

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*.

20070037470 Engineering Research and Consulting, Inc., Edwards AFB, CA USA

Reduced Cost Fabrication of Large Composite Aerospace Structures Through Nanoparticle Modification of Thermoplastics (Preprint)

Yandek, Gregory R; Marchant, Darrell; Mabry, Joseph M; Gruber, Mark B; Lamontia, Mark; Cope, Sandra; May 8, 2007; 15 pp.; In English

Contract(s)/Grant(s): FA9300-06-C-0023; Proj-33SP

Report No.(s): AD-A471062; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471062>

To achieve superior mechanical properties and environmental durability in semi-crystalline engineering thermoplastic composites an intermediate degree of molecular ordering is required. While many thermoplastics achieve their potential crystallinities with autoclave processing, only a fraction of that which is desired is developed with lower cost manufacturing processes, viz. automated fiber placement and tape laying featuring polymer chilling from the melt in seconds. Implementation of such processes for the manufacture of large composite aerospace structures is therefore rooted in material selection and the minimization of cycle times. Polyetheretherketone (PEEK) has demonstrated utility in composite structures due to its processing behavior. The cost-driven replacement of PEEK with other materials depends whether desired laminate crystallinities may be attained avoiding costly annealing steps. Polyetherketoneketone (PEKK) represents an alternative but suffers from reduced crystallization rates. The use of nucleating agents presents a route towards enhancing the ordering phenomena in polymers. A study has been undertaken to evaluate the effectiveness of utilizing silicon-based nanoparticles in improving the crystallization kinetics of PEKK. Relevant findings including the impact of the addition of such nanoparticles on other properties will be discussed.

DTIC

Aerospace Systems; Aircraft Structures; Composite Structures; Cost Reduction; Fabrication; Nanoparticles; Thermoplastic Resins; Thermoplasticity

20070037814 Auburn Univ., AL USA

Helium Breakdown Characteristics Under 100 kHz Range Pulsed Voltages in Partial Vacuum for Point-to-Point Electrode Geometry (Postprint)

Koppisetty, Kalyan; Sozer, Esin B; Kirkici, Hulya; Schweickart, Daniel L; May 2006; 6 pp.; In English

Contract(s)/Grant(s): F33615-02-D-2299-0024; Proj-3145

Report No.(s): AD-A471449; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper we present our work on breakdown studies conducted in helium at partial vacuum conditions for a point-to-point electrode setup. A high frequency pulsed voltage signal is applied across the electrodes and the voltage-current characteristics are observed. The applied signal consists of a train of square pulses in the frequency range of 50 to 200 kHz with 50% duty cycle and rise/fall times in the range of 20-30 ns. These studies were conducted to understand and compare the role of the pulse repetition rate in electrical breakdown initiation in low pressure conditions. Preliminary data of voltage and current waveforms, along with the light emission data are presented. The optical data collected by a PMT (Photo Multiplier Tube) as a function of the time is presented in comparison to the varying voltage.

DTIC

Electric Potential; Electrodes; Helium; Photomultiplier Tubes; Vacuum

20070037858 Army War Coll., Carlisle Barracks, PA USA

USA in Outer Space: Security Assurance and Preservation

Graham, Richard V; Apr 30, 2007; 29 pp.; In English

Report No.(s): AD-A471528; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Free access to-and-use of space assets by all nations in today's highly interdependent globalize society has been the long-standing policy of the USA dating back to the Eisenhower Administration. This point is espoused in the recent National Space Policy (2006) which commits to the 'use of outer space by all nations for peaceful purposes and...benefit of all humanity...' Yet the new policy also postures a unilateral tone and position that opposes the development of either new legal regimes or other restrictions that '...prohibit or limit US access to or use of space.' Those restrictions include international arms control legislation, treaties, or resolutions that limit space weapon technology. This paper will first show how the current Space Policy is flawed by excluding multilateral diplomatic space-arms-initiatives, international cooperation, and ignores 'common security' of other states. This one dimensional and self-fulfilling policy may increase asymmetrical threats to US space assets. The second part of this paper will use the recent Chinese anti-satellite test to constructively propose a basis for 'non-armament treaties' using as examples the Incidents as Sea Agreements, the Bunn Initiative, and the Antarctic Treaty to forge non-threatening, transparent, confidence-building alliances that would address each state's security concerns, allow for the continuation of the USA' defensive ballistic missile defenses, and maintain for all mankind the use of outer space for peaceful purposes.

DTIC

Aerospace Systems; Policies; Preserving; Security; United States

20070038630 Air Univ., Maxwell AFB, AL USA

Challenges in the Multipolar Space-Power Environment

Schmunk, Matthew M; Sheets, Michael R; Jul 2007; 76 pp.; In English

Report No.(s): AD-A471928; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA embraces space to satisfy its strategic goals for domestic, national-security, and military purposes -- augmenting each with international agreements. Distinct in policies, economics, doctrine, and supporting infrastructure, these elements define different spectra in the space-power continuum. The USA is no longer alone, however. More nations than ever before are turning to space to satisfy their own strategic goals. By examining foreign developments and strategies, one can paint in broad strokes a portrait of the space strategic environment for which the USA must prepare. The purpose of this analysis is twofold. First, by examining the domestic, national-security, military, and international efforts of emerging space powers, the authors implicitly conclude that space's strategic importance is rapidly expanding. Second, they discuss the nature of the space environment and identify complexities current and future leaders will face. Ultimately, because the environment is increasingly multipolar, international engagement in many forms will be a necessary prerequisite to achieve and maintain space power now and in the future.

DTIC

Aerospace Engineering; Aerospace Environments; Aerospace Systems; China; Competition; India; Space Programs; United States

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)*.

20070038666 Department of Defense, Arlington, VA USA

Information Technology Management: Review of the Information Security Operational Controls of the Defense Logistics Agency's Business Systems Modernization-Energy

Apr 24, 2006; 50 pp.; In English

Contract(s)/Grant(s): Proj-D2005-D000AL-0158.000

Report No.(s): AD-A472014; DOD-IG-D-2006-079; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report discusses how Business Systems Modernization-Energy (Fuels Automated System) is managed and controlled by the Defense Logistics Agency and how it is used at the base level by the Military Services. The Defense Logistics Agency (DLA) supplies the nation's military services and several civilian agencies with the critical resources they need. The Defense Energy Support Center (DESC) is the component of DLA assigned responsibility for providing the DoD and other government agencies with comprehensive energy solutions in the most effective and economical manner possible. The Business Systems Modernization-Energy (BSM-E) is responsible for managing all DoD fuels. BSM-E (FAS) supports the DESC and the Military Services in performing their responsibilities in fuel management and distribution. The BSM-E (FAS) is considered a multi-functional automated information system that provides point of sale data collection, inventory control, finance and accounting, procurement, and facilities management. The information security operational controls related to the Business Systems Modernization-Energy (Fuels Automated System) should operate effectively and provide an appropriate level of information assurance. This report was prepared in response to the annual reporting requirements of the Federal Information Security Management Act of 2002.

DTIC

Commerce; Fuels; Information Systems; Logistics; Logistics Management; Security

20070038922 Test Squadron (0746th), Holloman AFB, NM USA

Central Inertial and GPS Test Facility (CIGTF) Customer Handbook

Aug 2007; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471913; XC-746 TSS; No Copyright; Avail.: Defense Technical Information Center (DTIC)

746h Test Squadron operates the Central Inertial and Global Positioning System Test Facility (CIGTF), Holloman AFB NM, the U.S. Air Force center of excellence for guidance and navigation testing or developmental and operational weapon systems. The 746 TS provides expert test and evaluation of INS and UPS equipment and embedded UPS/INS (501) navigation and guidance systems. CIGTF performs trade studies, technical oversight consultation services and analysis for UPS platform integration. The 746 TS gives its customers independent and unbiased test and evaluation of various navigation systems and guidance components. Military and non-defense related test items are treated with the same professional methodology which has marked the 746 TS as the mainstay of the guidance and navigation community for almost 50 years. This document is directed primarily to potential 746 TS customers from the government and industry. All technical information and capabilities specifications included in this handbook are accurate at the date of release.

DTIC

Global Positioning System; Handbooks; Inertial Navigation; Test Facilities

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*.

20070037454 NASA Marshall Space Flight Center, Huntsville, AL, USA

Launching to the Moon, Mars, and Beyond

Kynard, Michael H.; September 20, 2007; 20 pp.; In English; Original contains color illustrations; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070037454>

This presentation presents the goals of the Vision for Space Exploration. It gives a general overview of the Ares I and Ares

V launch vehicles and shows how they enable NASA's lunar exploration missions. It explains how space exploration can inspire the next generation of explorers.

Author

Ares 5 Cargo Launch Vehicle; Ares 1 Launch Vehicle; Space Exploration; Launch Vehicles; Lunar Exploration

20070037457 NASA Marshall Space Flight Center, Huntsville, AL, USA

Ares Projects Office Progress Update

Vanhooser, Teresa; September 18, 2007; 11 pp.; In English; AIAA Space 2007, 18-20 Sep. 2007, Long Beach, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070037457>

NASA's Vision for Exploration requires a safe, reliable, affordable launch infrastructure capable of replacing the Space Shuttle for low Earth orbit transportation, as well as supporting the goal of returning humans to the moon. This presentation provides an overview of NASA's Constellation program and the Ares I and Ares V launch vehicles, including accomplishments and future work.

Author

Ares 5 Cargo Launch Vehicle; Ares 1 Launch Vehicle; Constellation Program; Launch Vehicles; Spacecraft Orbits; Space Shuttles

20070037458 Mainthia Technologies, Inc., Cleveland, OH, USA

Ares I Upper Stage Overview

Simmons, Alisha M.; September 18, 2007; 15 pp.; In English; AIAA Space 2007 Conference, 18-20 Sep. 2007, Long Beach, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): NAS8-02002; NNM05AB50C; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070037458>

The Upper Stage Element of NASA's Ares I Crew Launch Vehicle (CLV) is a 'clean-sheet' approach that is being designed and developed in-house, with Element management at MSFC. The Upper Stage Element concept is a self-supporting cylindrical structure, approximately 84' long and 18' in diameter. While the First Stage Solid Rocket Booster (SRB) design has changed since the CLV inception, the Upper Stage Element design has remained essentially a clean-sheet design approach. A clean-sheet upper stage design does offer many advantages: a design for increased reliability; built-in evolvability to allow for commonality/growth without major redesign; incorporation of state-of-the-art materials and hardware; and incorporation of design, fabrication, and test techniques and processes to facilitate a more operable system.

Author

Ares 1 Launch Vehicle; Ares 1 Upper Stage; Space Shuttle Boosters; Fabrication

20070037473 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Controller Design for Accurate Antenna Pointing Onboard a Spacecraft

Barba, Victor M; Jun 2007; 111 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471066; AFIT/GAE/ENG/07-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471066>

Controller design for a spacecraft mounted flexible antenna is considered. The antenna plant model has a certain degree of uncertainty. Additionally, disturbances from the host spacecraft are transmitted to the antenna and need to be attenuated. The design concept explored herein entails feedforward control to slew the antenna. Feedback control is then used to compensate for plant uncertainty and to reject the disturbance signals. A tight control loop is designed to meet performance specifications while minimizing the control gains. Simulations are conducted to show that the integration of feedforward control action and feedback compensation produces better responses than the implementation of either individual control system. Integration results in lower gains and still meets the performance specifications. Critical plant parameters are varied to simulate the uncertainty in the nominal plant. The control system is then exercised on several variations of the nominal plant. A worst case plant is produced as a combination of the variations to the nominal plant. Simulations show that when the controller is implemented on the worst case plant, specifications are exceeded. The controller gains are reduced and the simulations are repeated so that the specifications are met but not exceeded; thus, proving that a reduction of plant uncertainty allows the reduction of the control gains.

DTIC

Control; Controllers; Feedback; Spacecraft Antennas

20070037538 Air Force Research Lab., Edwards AFB, CA USA

Spacecraft Interaction Test Results of the High Performance Hall System SPT-140 (Postprint)

Fife, J M; Hargus Jr, W A; Jaworske, D A; Sarmiento, C; Mason, L; Jankovsky, R; Snyder, J S; Malone, S; Haas, J; Gallimore, A; Jul 17, 2000; 11 pp.; In English

Contract(s)/Grant(s): F04611-97-C-0064; Proj-4373

Report No.(s): AD-A471175; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471175>

Ground tests were performed to help characterize modes of interaction between the SPT-140 Hall thruster and spacecraft components. The experiments were performed at NASA Glenn Research Center and at the University of Michigan. Measurements were made of thruster plume current density, electromagnetic interference (EMI), and surface sputtering and contamination. Diagnostics included Faraday probes, collimated sputter/deposition targets, and radio-frequency detectors. Ion current density measurements showed exponential decay with off-axis angle up to approximately 30 degrees. At off-axis angles greater than 30 degrees, results varied with chamber background pressure, presumably due to ambient charge exchange plasma. Sputter rates of solar cell coverglass, Kapton, and RTV were accurately measured in from the thruster exit for off-axis angles less than 60 degrees. At off-axis angles greater than 60 degrees, the sputter rate was on the order of the measurement uncertainty. EMI tests found very little emission in the traditional RF communication bands. At the lowest frequencies, one band of E-field emission (10kHz to 20MHz) was detected which exceeded the MIL-STD-461C specification by up to 53dB.

DTIC

Electromagnetic Interference; Hall Thrusters; Spacecraft Components

20070037542 National Academy of Sciences - National Research Council, Washington, DC USA

A Review of USA Air Force and Department of Defense Aerospace Propulsion Needs

Jan 2006; 290 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0269

Report No.(s): AD-A471183; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471183>

Because rocket and air-breathing propulsion systems are the foundation on which planning for future aerospace systems rests, the Deputy Assistant Secretary of the Air Force for Science, Technology, and Engineering (SAF/AQR), with support from the Director, Defense Research and Engineering (DDR&E), asked the Air Force Studies Board (AFSB) of the National Research Council (NRC) to review and comment on the planning for propulsion development that is under way at the Department of Defense (DoD) and the commercial technical base for these air-breathing and rocket engines that allow access to space and for in-space propulsion systems (see Box 1-1 for the study's statement of task). This full-spectrum propulsion study assesses the existing technical base in these areas and examines the future Air Force capabilities the base will be expected to support; it also defines gaps and recommends where future warfighter capabilities not yet fully defined could be met by current science and technology (S&T) development plans. The recommendations in this report may shape DoD engine development planning for the next 15 years and, possibly, military capabilities beyond that.

DTIC

Defense Program; Propulsion; Propulsion System Configurations; Propulsion System Performance; Spacecraft Propulsion; United States

20070037770 Air Univ., Maxwell AFB, AL USA

The Strategic Nature of the Tactical Satellite. Part 2

Tomme, Edward B; Aug 13, 2006; 67 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471372; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using General Jumper's metric of 'effects on the ground,' the difficulties in tactical satellites actually being tactical become apparent. Continued funding of the tactical satellite program under the misguided notion that they can provide tactical effects on the ground only serves to drain scarce budgetary resources from other programs that could provide these desired effects. The myth of the tactical satellite is that they are tactical. Accordingly, this paper will present the tactical satellite program in the best light possible to show that even if all systems work better than advertised, the projected tactical satellite program still fails to provide required tactical effects on the ground. These generous programmatic assumptions will demonstrate that the failure to provide effects is not due to engineering shortfalls, where more money might solve the problem, but instead is due to physical limitations that cannot be overcome until the satellites become inexpensive enough to field constellations of hundreds simultaneously. The purpose of this paper is as much to educate the tactical satellite proponent on

what the warfighter needs as it is to educate the warrior on what tactical satellites can offer. The tactical satellite program needs a change of name and a change of focus as the effects it can provide lie much closer to the strategic end of the spectrum of conflict. Such a change of focus would allow operationally responsive launch to compete in the strategic arena where it actually has a great deal of utility. As it stands, the money the program receives comes from money intended to support tactical warfighters on the ground, support it cannot provide.

DTIC

Military Spacecraft; System Effectiveness; Warfare

20070037771 Air Univ., Maxwell AFB, AL USA

The Strategic Nature of the Tactical Satellite. Part 1

Tomme, Edward B; Aug 13, 2006; 61 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471373; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using General Jumper's metric of 'effects on the ground,' the difficulties in tactical satellites actually being tactical become apparent. Continued funding of the tactical satellite program under the misguided notion that they can provide tactical effects on the ground only serves to drain scarce budgetary resources from other programs that could provide these desired effects. The myth of the tactical satellite is that they are tactical. Accordingly, this paper will present the tactical satellite program in the best light possible to show that even if all systems work better than advertised, the projected tactical satellite program still fails to provide required tactical effects on the ground. These generous programmatic assumptions will demonstrate that the failure to provide effects is not due to engineering shortfalls, where more money might solve the problem, but instead is due to physical limitations that cannot be overcome until the satellites become inexpensive enough to field constellations of hundreds simultaneously. The purpose of this paper is as much to educate the tactical satellite proponent on what the warfighter needs as it is to educate the warrior on what tactical satellites can offer. The tactical satellite program needs a change of name and a change of focus as the effects it can provide lie much closer to the strategic end of the spectrum of conflict. Such a change of focus would allow operationally responsive launch to compete in the strategic arena where it actually has a great deal of utility. As it stands, the money the program receives comes from money intended to support tactical warfighters on the ground, support it cannot provide.

DTIC

Military Spacecraft; System Effectiveness; Warfare

20070037785 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Electronic Combat in Space: Examining the Legality of Fielding a Space-Based Disruptive Electromagnetic Jamming System

Schendzielos, Kurt M; Jun 15, 2007; 106 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471399; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Significant debate surrounds the concept of 'peaceful use of space' as it is delineated in various international treaties and in USA Space Policy. The U.S. interpretation of that concept allows for military space applications. Within this context, the author explores the following question: What are the legal limits concerning the fielding of a nonlethal electronic countermeasures capability in space? The potentially aggressive yet nonpersistent effect of electromagnetic jamming (EM jamming) blurs the lines between military support and military weapons. This thesis examines the various international and domestic treaties, laws, and policies to determine whether restrictions to fielding EM jamming in space exist. Other topics that are examined are as follows: What is the majority interpretation of 'peaceful use of space'?; Where does outer space begin?; What is a weapon?; Does EM jamming qualify as a weapon?; and, Are all weapons prohibited from being placed in space? A legal determination regarding the fielding of a space-based EM jamming system is a necessary step towards developing and employing such a capability for the U.S. military.

DTIC

Combat; Electromagnetic Interference; International Law; Jamming; Law (Jurisprudence); Military Technology; Policies; United States

20070037795 Innovative Scientific Solutions, Inc., Dayton, OH USA

Partial Discharge Detection for Evaluation of Insulation Integrity in Aerospace Electric Power System Wiring and Components (Postprint)

Schweickart, D L; Grosjean, D F; Liu, X; Kasten, D G; Sebo, S A; May 2006; 7 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-2485; Proj-3005

Report No.(s): AD-A471419; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report was developed under a SBIR contract. The paper describes the importance of partial discharge (PD) detection

for aerospace electric power system wiring and components in low pressure environment. The relationships between recorded discharge pulse current waveforms and PD electrical characteristics are explained and discussed. Features of a new PD analyzer for low pressure applications are reviewed.

DTIC

Aerospace Environments; Aerospace Systems; Detection; Electric Discharges; Electrical Insulation; Insulation; Wiring

20070037813 Air Force Research Lab., Hanscom AFB, MA USA

Thermospheric Space Weather Modeling

Marcos, Frank A; Burke, William J; Lai, Shu T; Jun 2007; 13 pp.; In English

Contract(s)/Grant(s): Proj-5021

Report No.(s): AD-A471447; AFRL-VS-HA-TR-2007-1069; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We review impacts of satellite drag and describe past, current and future capabilities designed to meet evolving operational requirements. Historically, thermospheric research has been data starved. Thus, from the early space age to the end of the 20th century little progress was made in satellite-drag modeling. This condition improved greatly with the development of empirical assimilative models and recent availability of comprehensive drag measurements. With the new Jacchia-Bowman 2006 model the status of empirical modeling improved significantly. It builds on the expanded satellite drag database and incorporates improved estimates of solar flux changes as well as semi-annual and local time variations of the thermosphere. However, magnetic storm representations of Jacchia-Bowman 2006 are similar to those used in other current models. Satellite-borne accelerometers and optical sensors now provide complementary spatial and temporal capabilities that permit monitoring of the thermosphere over a wide range of altitudes under most solar and geomagnetic conditions. Long-standing shortfalls during periods of high geomagnetic activity are now being attacked with these data and through new analyses of solar wind and IMF measurements, correlations with magnetosphere-based magnetic indices and emerging theoretical tools. These advances in understanding thermospheric coupling during magnetic storms will be incorporated into empirical model upgrades. The analyses of new data sets joined with on-going research on physical thermosphere-ionosphere-magnetosphere coupling processes support the pursuit of our ultimate goal, an assimilative and predictive operational model of thermospheric neutral densities.

DTIC

Artificial Satellites; Atmospheric Density; Magnetic Storms; Models; Satellite Drag; Space Weather; Thermosphere

20070037896 Aerospace Corp., El Segundo, CA USA

Tribochemistry and Wear Life Improvement in Liquid-Lubricated H-DLC-Coated Bearings

Lince, J R; Kim, H I; Bertrand, P A; Eryilmaz, O L; Erdemir, A; Jul 25, 2007; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8802-04-C-0001

Report No.(s): AD-A471592; AC-TR-2007(8565)-2; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In contrast to typical DLC coatings, hydrogenated DLC (H-DLC) coatings exhibit extremely low friction in vacuum and dry atmospheres, suggesting their potential importance for spacecraft applications. We have conducted a study of H-DLC coated steel thrust bearings, lubricated with a multiply-alkylated cyclopentane oil, either unformulated, or formulated with lead naphthenate or an aryl phosphate ester mixture. Data on uncoated steel thrust bearings were obtained for comparison. The surface chemistry of the additives on worn H-DLC surfaces was evaluated along with chemical analysis of the residual lubricant. In contrast with results on uncoated steel bearings, minimal additive-based tribofilm formation was detected on the surfaces of the H-DLC coatings in the wear tracks. The results indicate that additives optimized for steels may not be appropriate for H-DLC coatings. Although there were indications that H-DLC coatings increase endurance, the high roughness of the bearings contributed to statistical uncertainty. Future studies are planned with higher quality bearings.

DTIC

Ball Bearings; Carbon; Coatings; Diamonds; Lubricants; Wear

20070037903 Missouri Univ., Rolla, MO USA

Design, Fabrication and Test of a Formation of Two Satellites Connected by a Tether

Pernicka, Henry J; Aug 3, 2007; 22 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0305; Proj-2305/IX

Report No.(s): AD-A471603; No Copyright; Avail.: Defense Technical Information Center (DTIC)

MR and MRS SAT are now in the flight vehicle construction/integration/test phase. Constraints have been clearly defined

for each subsystem and efforts have shifted to integrated component testing. Subsystem timelines have been formed and are integrated into a master schedule. In-depth research for each subsystem is being documented, and relationships with mentors from a variety of companies are continuing to flourish. Bench testing of individual components (i.e. solar arrays, communication hardware), is ongoing and has led to the integration and testing of the initial MR/MRS SAT prototypes. The successful design, production, and launch of MR/MRS SAT will be of great value to the University of Missouri-Rolla and the aerospace community. UMR SAT students will benefit from the hands-on experience of designing and building a satellite, while the aerospace community will benefit from the engineering and scientific return obtained at a modest cost.

DTIC

Artificial Satellites; Fabrication; Spacecraft Components; Tethering

20070038138 Naval Postgraduate School, Monterey, CA USA

Conflict Resolution and Optimization of Multiple-Satellite Systems (CROMSAT)

Laboo, Brett N; Jun 2007; 86 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471068; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471068>

This thesis produces models of satellite constellations using finite state automata (FSA) or finite automata (FA) and optimizes the sequence of targets for two missions. Two simplified FSA models of satellite constellations with one ground control station (GCS) are developed. The first model is of a single spacecraft and the second includes two spacecraft. Based upon the language states and state transitions of each model the author transforms the FA into a network and enumerates the shortest paths for indicative lists of meta-tasks from each model. The first model is provisionally implemented in MATLAB. The author finds two separate optimal target selection sequences for randomly generated sample target sets using commercial off-the-shelf optimization software. Although stochastically fabricated the sample target sets reflect valid scenarios for a satellite imagery mission. The first sequence a traveling salesman problem minimizes the time required for processing all targets given a multiple orbit mission. For a representative sample target set this is 2.34 orbits. The second sequence a prize collecting traveling salesman problem maximizes the number of targets processed given a dual orbit mission. For the same sample target set two orbits permit the processing of seven targets.

DTIC

Satellite Constellations; Automata Theory; Optimization; Fabrication

20070038183 American Inst. of Aeronautics and Astronautics, Reston, VA, USA

Conversations with Dan Dumbacher. Interview by Frank Sietzen, Jr.

Aerospace America; August 2007; ISSN 0740-722X; Volume 45, No. 8, pp. 14-17; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

This is an interview of Dan Dumbacher, the head of the Engineering Directorate at NASA Marshall Space Flight Center. It addresses the status of the Ares I launch vehicle, the use of a boilerplate Crew Exploration Vehicle for the test launch and other tests of the Ares launch vehicle, the effect of budget on the planned launch date, and where the tests of the Ares I and the V engine will take place. It also addresses the use of experts from the VonBraun and Apollo era.

CASI

Ares I Launch Vehicle; Rocket Engines; Launch Vehicles

20070038286 NASA Marshall Space Flight Center, Huntsville, AL, USA

The MSFC Systems Engineering Guide: An Overview and Plan

Shelby, Jerry A.; Thomas, L. Dale; September 24, 2007; 1 pp.; In English; International Astronautical Federation, 24-28 Sep. 2007, Hyderabad, India; No Copyright; Avail.: Other Sources; Abstract Only

As systems and subsystems requirements become more complex in the pursuit of the exploration of space, advanced technology will demand and require an integrated approach to the design and development of safe and successful space vehicles and their products. System engineers play a vital and key role in transforming mission needs into vehicle requirements that can be verified and validated. This will result in a safe and cost effective design that will satisfy the mission schedule. A key to successful vehicle design within systems engineering is communication. Communication, through a systems engineering infrastructure, will not only ensure that customers and stakeholders are satisfied but will also assist in identifying vehicle requirements; i.e. identification, integration and management. This vehicle design will produce a system that is verifiable, traceable, and effectively satisfies cost, schedule, performance, and risk throughout the life-cycle of the product. A communication infrastructure will bring about the integration of different engineering disciplines within vehicle

design. A system utilizing these aspects will enhance system engineering performance and improve upon required activities such as Development of Requirements, Requirements Management, Functional Analysis, Test, Synthesis, Trade Studies, Documentation, and Lessons Learned to produce a successful final product. This paper will describe the guiding vision, progress to date and the plan forward for development of the Marshall Space Flight Center (MSFC) Systems Engineering Guide (SEG), a virtual systems engineering handbook and archive that will describe the system engineering processes that are used by MSFC in the development of complex systems such as the Ares launch vehicle. It is the intent of this website to be a 'One Stop Shop' for our systems engineers that will provide tutorial information, an overview of processes and procedures and links to assist system engineering with guidance and references, and provide an archive of systems engineering artifacts produced by the many NASA projects developed and managed by MSFC over the years.

Author

Systems Engineering; General Overviews; NASA Programs; Systems Integration; Mission Planning

20070038433 Science Applications International Corp., San Diego, CA USA

Plasma Interactions with Spacecraft

Davis, V A; Mandell, M J; Huston, S L; Kuharski, R A; Gardner, B M; Mar 16, 2007; 79 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8718-05-C-0001; Proj-1010

Report No.(s): AD-A471726; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471726>

The objective of this contract is to develop, incorporate, test, and validate new algorithms for Nascap-2k that are needed to self-consistently compute plasma transport and to model electromagnetic radiation in the near-to mid-field from VLF (3 kHz to 30 kHz) antennas. The plasma flow models can be used to address various plasma engineering concerns including surface discharges due to meteoroid impact and spacecraft contamination due to electric propulsion plasma plume effects. The goal of this effort is to provide a plasma engineering capability to the spacecraft community. During the first two years of this contract, progress was made on Nascap-2k development, particularly charging with time-dependent bias values, macroparticle splitting and injection, and algorithm development of charging with tabular spectra generated by magnetospheric models.

DTIC

Algorithms; Computer Programming; Magnetohydrodynamic Flow; Plasma Interactions; Software Engineering; Spacecraft Antennas

20070038479 Dayton Univ. Research Inst., OH USA

Development of Improved and Novel Thermal Control Coatings (Preprint)

Davis, Amber I; Cerbus, Clifford A; Johnson, Joel A; May 2007; 13 pp.; In English

Contract(s)/Grant(s): FA8650-05-D-5050; Proj-4347

Report No.(s): AD-A471835; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471835>

Thermal control coatings (TCCs) play a critical role in the thermal management of space assets through the reflection of incident solar energy and emittance of infrared heat. The development of new thermal control coatings with improved solar energy reflection, infrared emittance, and reduced weight are essential to the design of future space assets that will reside in harsh environments and have increasing constraints on weight. Optimization of pigment particle size and type can play an important role in the development of improved coatings. Recent improvements in the synthesis and particle size control of zinc orthotitanate pigment for silicate binder coatings have resulted in performance improvements over prior coatings of this type as well as the current zinc oxide based coatings. In addition, a novel pigment concept based on hollow silica particles is continuing to be explored as an extremely space durable and lightweight option for passive thermal control coatings.

DTIC

Coatings; Pigments; Temperature Control; Thermal Control Coatings

20070038635 Air Command and Staff Coll., Maxwell AFB, AL USA

Transformational Satellite (TSAT) Communications Systems. Falling Short on Delivering Advanced Capabilities and Bandwidth to Ground-Based Users

McKinney, Maurice M; Jul 2007; 36 pp.; In English

Report No.(s): AD-A471938; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Transformational Communications Office's (TCO) 17 December 2003 report states, 'The current SATCOM and data

relay systems are unable to meet future bandwidth demands. They lack capacity, in both aggregate data rate and the number of users they can support.... Furthermore, the life expectancies of the existing space segments and much of their associated terminal and management segments do not extend beyond the 2010-2015 time frame.' These shortfalls and the military's insatiable demand for bandwidth led to the creation of the Department of Defense's (DOD) TSAT. TSAT's five-satellite constellation will be capable of delivering advanced capabilities to the war fighter via 8,000 radio frequency (RF) links and between 20 and 50 laser communication (lasercom) links. These advanced capabilities will deliver significant communications bandwidth by incorporating advanced laser and RF technologies, software-configurable terminals, packet switching, network management, and interface standards. All of these technologies will rely on Internet protocol (IP) interoperability as the enabling technology for connecting the war fighter. The thesis of this paper is that the advanced capabilities provided by TSAT are limited and will not be sufficient to serve the ground-based portion of the communications network supporting network-centric warfare (NCW). To validate this proposition, this study will start by identifying space-based systems that will enable NCW, discuss the requirements for ground-based NCW, and finally determine the combination of spaced-based systems sufficient to deliver advanced capabilities to the war fighter.

DTIC

Bandwidth; Communication Satellites; Satellite Communication

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*.

20070037452 NASA Marshall Space Flight Center, Huntsville, AL, USA

Ablation Modeling of Ares-I Upper State Thermal Protection System Using Thermal Desktop

Sharp, John R.; Page, Arthur T.; September 10, 2007; 25 pp.; In English; Thermal/Fluids Analysis Workshop (TFAWS), 10-14 Sep. 2007, Cleveland, OH, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070037452>

The thermal protection system (TPS) for the Ares-I Upper Stage will be based on Space Transportation System External Tank (ET) and Solid Rocket Booster (SRB) heritage materials. These TPS materials were qualified via hot gas testing that simulated ascent and re-entry aerothermodynamic convective heating environments. From this data, the recession rates due to ablation were characterized and used in thermal modeling for sizing the thickness required to maintain structural substrate temperatures. At Marshall Space Flight Center (MSFC), the in-house code ABL is currently used to predict TPS ablation and substrate temperatures as a FORTRAN application integrated within SINDA/G. This paper describes a comparison of the new ablation utility in Thermal Desktop and SINDA/FLUINT with the heritage ABL code and empirical test data which serves as the validation of the Thermal Desktop software for use on the design of the Ares-I Upper Stage project.

Author

Thermal Protection; Ares 1 Upper Stage; Space Transportation System; External Tanks; Reentry Effects; Space Shuttle Boosters; Ablation; Aerothermodynamics; Thermal Analysis

20070038313 American Inst. of Aeronautics and Astronautics, Reston, VA, USA

Space Tourism Race Speeds Up

Butterworth-Hayes, Philip; Aerospace America; August 2007; ISSN 0740-722X; Volume 45, No. 8, pp. 4-6; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

This article reviews the commercial market for the space tourist. Several companies are attempting to move the idea of space tourism into reality.

CASI

Space Tourism; Space Commercialization; Space Transportation; Aerospace Industry; Aerospace Vehicles

20070038938 NASA Johnson Space Center, Houston, TX, USA

Orbital Debris Quarterly News, Vol. 11, No. 3

July 12, 2007; 10 pp.; In English; See also 20070038939 - 20070038941; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038938>

Topics discussed include: a) Investigation of MMOD Impact on STS-115 Shuttle Payload Bay Door; b) Optical Observations of GEO Debris with Two Telescopes; and c) Optical Measurement Center Status.

Derived from text

Space Debris; Telescopes; Space Shuttle Payloads; Optical Measurement; Space Transportation System

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*.

20070036796 NASA Goddard Space Flight Center, Greenbelt, MD, USA

[Interview Questions]

Smith, Dan; May 24, 2007; 5 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

The Goddard Mission Services Evolution Center, or GMSEC, was started in 2001 to create a new standard approach for managing GSFC missions. Standardized approaches in the past involved selecting and then integrating the most appropriate set of functional tools. Assumptions were made that 'one size fits all' and that tool changes would not be necessary for many years. GMSEC took a very different approach and has proven to be very successful. The core of the GMSEC architecture consists of a publish/subscribe message bus, standardized message formats, and an Applications Programming Interface (API). The API supports multiple operating systems, programming languages and messaging middleware products. We use a GMSEC-developed free middleware for low-cost development. A high capacity, robust middleware is used for operations and a messaging system with a very small memory footprint is used for on-board flight software. Software components can use the standard message formats or develop adapters to convert from their native formats to the GMSEC formats. We do not want vendors to modify their core products. Over 50 software components are now available for use with the GMSEC architecture. Most available commercial telemetry and command systems, including the GMV Hifly Satellite Control System, have been adapted to run in the GMSEC labs.

Derived from text

Applications Programs (Computers); Computer Programs; Standardization; Specifications; Spacecraft Control; Satellite Control

20070038151 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Efficient GPS Position Determination Algorithms

Nguyen, Thao Q; Jun 2007; 115 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471521; AFIT/DS/ENG/07-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research is aimed at improving the state of the art of GPS algorithms, namely, the development of a closed-form positioning algorithm for a standalone user and the development of a novel differential GPS algorithm for a network of users. The stand-alone user GPS algorithm is a direct, closed-form, and efficient new position determination algorithm that exploits the closed-form solution of the GPS trilateration equations and works in the presence of pseudorange measurement noise for an arbitrary number of satellites in view. A two-step GPS position determination algorithm is derived which entails the solution of a linear regression and updates the solution based on one nonlinear measurement equation. In this algorithm, only two or three iterations are required as opposed to five iterations that are normally required in the standard Iterative Least Squares (ILS) algorithm currently used. The mathematically derived stochastic model-based solution algorithm for the GPS pseudorange equations is also assessed and compared to the conventional ILS algorithm. Good estimation performance is achieved, even under high Geometric Dilution of Precision (GDOP) conditions. The novel differential GPS algorithm for a network of users that has been developed in this research uses a Kinematic Differential Global Positioning System (KDGPS) approach. A network of mobile receivers is considered, one of which will be designated the 'reference station' which will have known position and velocity information at the beginning of the time interval being examined. The measurement situation on hand is properly modeled, and a centralized estimation algorithm processing several epochs of data is developed. The effect

of uncertainty in the reference receiver's position and the level of the receiver noise are investigated. Monte Carlo simulations are performed to examine the ability of the algorithm to correctly estimate the non-reference mobile users' position and velocity.

DTIC

Algorithms; Global Positioning System; Kinematics

20070038982 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

SCPS-TP: A Satellite-Enhanced TCP

Scott, Keith; Torgerson, Leigh; September 30, 2004; 31 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40565>

This viewgraph presentation reviews the Space Communications Protocol Standard Transport Protocol (SCPS-TP) which is a satellite enhanced Transport Control Protocol (TCP). The contents include: 1) Purpose; 2) Background; 3) Stressed Communication Environments; 4) SCPS-TP Features; 5) SCPS-TP Performance; 6) Performance Enhancing Proxies (PEPs); and 7) Ongoing and Future SCPS-TP Work.

CASI

Protocol (Computers); Computer Systems Programs; Satellite Communication; Data Transmission; Communication Networks

18

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

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

20070036798 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Mars Exploration Rover: Launch, Cruise, Entry, Descent, and Landing

Manning, Robert M.; Adler, Mark; Erickson, James; October 6, 2004; 16 pp.; In English; 55th International Astronautical Congress, 6 Oct. 2004, Vancouver, Canada; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40484>

This viewgraph presentation reviews the launch, cruise, entry, descent and landing of the Mars Exploration Rovers that occurred in 2003.

CASI

Mars Exploration; Mars Landing; Roving Vehicles; Interplanetary Flight; Spacecraft Guidance

20070037462 NASA Marshall Space Flight Center, Huntsville, AL, USA

Status of Solar Sail Propulsion: Moving Toward an Interstellar Probe

Johnson, Les; Young, Roy M.; Montgomery, Edward E., IV; August 13, 2006; 43 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070037462>

NASA's In-Space Propulsion Technology Program has developed the first-generation of solar sail propulsion systems sufficient to accomplish inner solar system science and exploration missions. These first-generation solar sails, when operational, will range in size from 40 meters to well over 100 meters in diameter and have an areal density of less than 13 grams-per-square meter. A rigorous, multiyear technology development effort culminated last year in the testing of two different 20-meter solar sail systems under thermal vacuum conditions. This effort provided a number of significant insights into the optimal design and expected performance of solar sails as well as an understanding of the methods and costs of building and using them. In a separate effort, solar sail orbital analysis tools for mission design were developed and tested. Laboratory simulations of the effects of long-term space radiation exposure were also conducted on two candidate solar sail materials. Detailed radiation and charging environments were defined for mission trajectories outside the protection of the earth's magnetosphere, in the solar wind environment. These were used in other analytical tools to prove the adequacy of sail design features for accommodating the harsh space environment. Preceding, and in conjunction with these technology efforts, NASA sponsored several mission application studies for solar sails, including one that would use an evolved sail capability to support humanity's first mission into nearby interstellar space. The proposed mission is called the Interstellar Probe. The

Interstellar Probe might be accomplished in several ways. A 200-meter sail, with an areal density approaching 1 gram-per-square meter, could accelerate a robotic probe to the very edge of the solar system in just under 20 years from launch. A sail using the technology just demonstrated could make the same mission, but take significantly longer. Conventional chemical propulsion systems would require even longer flight times. Spinner sails of the type being explored by the Japanese may also be a good option, but the level of maturity in that technology is not clear. While the technology to support a 200-meter, ultralightweight sail mission is not yet in hand, the recent NASA investments in solar sail technology are an essential first step toward making it a reality. This paper will describe the status of solar sail propulsion within NASA, near-term solar sail mission applications, and the plan to advance the technology to the point where the Interstellar Probe mission can be flown.

Author

Solar Sails; Mission Planning; Propulsion System Configurations; Space Exploration; Aerospace Environments

20070038260 NASA Marshall Space Flight Center, Huntsville, AL, USA

Space Shuttle and Launch Pad Lift-Off Debris Transport Analysis: SRB Plume-Driven

West, Jeff; Strutzenberg, Louis; Dougherty, Sam; Radke, Jerry; Liever, Peter; September 10, 2007; 20 pp.; In English; NASA 18th Thermal and Fluid Dynamics Workshop 2008, 10-14 Sep. 2007, Cleveland, OH, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper discusses the Space Shuttle Lift-Off model developed for potential Lift-Off Debris transport. A critical Lift-Off portion of the flight is defined from approximately 1.5 sec after SRB Ignition up to 'Tower Clear', where exhaust plume interactions with the Launch Pad occur. A CFD model containing the Space Shuttle and Launch Pad geometry has been constructed and executed. The CFD model works in conjunction with a debris particle transport model and a debris particle impact damage tolerance model. These models have been used to assess the effects of the Space Shuttle plumes, the wind environment, their interactions with the Launch Pad, and their ultimate effect on potential debris during Lift-Off. Emphasis in this paper is on potential debris that might be caught by the SRB plumes.

Author

Aerospace Environments; Spacecraft Models; Space Shuttles; Computational Fluid Dynamics; Debris; Impact Damage

20070038261 BAE Systems, Huntsville, AL, USA

Development of Multifunctional Radiation Shielding Materials for Long Duration Human Exploration Beyond the Low Earth Orbit

Sen, S.; Bhattacharya, M.; Schofield, E.; Carranza, S.; O'Dell, S.; September 24, 2007; 1 pp.; In English; 58th International Astronautical Congress, 24-28 Sep. 2007, Hyderabad, India

Contract(s)/Grant(s): NAS8-02096; Copyright; Avail.: Other Sources; Abstract Only

One of the major challenges for long duration human exploration beyond the low Earth orbit and sustained human presence on planetary surfaces would be development of materials that would help minimize the radiation exposure to crew and equipment from the interplanetary radiation environment. This radiation environment consists primarily of a continuous flux of galactic cosmic rays (GCR) and transient but intense fluxes of solar energetic particles (SEP). The potential for biological damage by the relatively low percentage of high-energy heavy-ions in the GCR spectrum far outweighs that due to lighter particles because of their ionizing-power and the quality of the resulting biological damage. Although the SEP spectrum does not contain heavy ions and their energy range is much lower than that for GCRs, they however pose serious risks to astronaut health particularly in the event of a bad solar storm. The primary purpose of this paper is to discuss our recent efforts in development and evaluation of materials for minimizing the hazards from the interplanetary radiation environment. Traditionally, addition of shielding materials to spacecrafts has invariably resulted in paying a penalty in terms of additional weight. It would therefore be of great benefit if materials could be developed not only with superior shielding effectiveness but also sufficient structural integrity. Such a multifunctional material could then be considered as an integral part of spacecraft structures. Any proposed radiation shielding material for use in outer space should be composed of nuclei that maximize the likelihood of projectile fragmentation while producing the minimum number of target fragments. A modeling based approach will be presented to show that composite materials using hydrogen-rich epoxy matrices reinforced with polyethylene fibers and/or fabrics could effectively meet this requirement. This paper will discuss the fabrication of such a material for a crewed vehicle. In addition, the capability of synthesizing radiation shielding materials for habitat structures primarily from Lunar or Martian in-situ resources will also be presented. Such an approach would significantly reduce the cost associated with transportation of such materials and structures from earth. Results from radiation exposure measurements will be presented demonstrating the shielding effectiveness of the developed materials. Mechanical testing data will be discussed to illustrate

that the specific mechanical properties of the developed composites are comparable to structural aluminum based alloys currently used for the space shuttle and space station.

Author

Radiation Shielding; Composite Materials; Epoxy Matrix Composites; Mechanical Properties; Spacecraft Structures; Radiation Dosage; Space Exploration; Galactic Cosmic Rays

20070038319 NASA Marshall Space Flight Center, Huntsville, AL, USA

Ares V: an Enabling Capability for Future Space Science Missions

Stahl, H. Philip; July 30, 2007; 14 pp.; In English; 7th Annual Mirror technology Days in the Government, 30 Jul. - 2 Aug. 2007, Albuquerque, NM, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038319>

The potential capability offered by an Ares V launch vehicle completely changes the paradigm for future space astrophysics missions. This presentation examines some details of this capability and its impact on potential missions. A specific case study is presented: implementing a 6 to 8 meter class monolithic UV/Visible telescope at an L2 orbit. Additionally discussed is how to extend the mission life of such a telescope to 30 years or longer.

Author

Ares 5 Cargo Launch Vehicle; Astrophysics; Ultraviolet Telescopes

20070038371 NASA Marshall Space Flight Center, Huntsville, AL, USA

JWST Mirror Technology Development Results

Stahl, H. Philip; August 26, 2007; 12 pp.; In English; Optics and Photonics 2007, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038371>

Mirror technology is a critical enabling capability for the James Webb Space Telescope (JWST). JWST requires a Primary Mirror Segment Assembly (PMSA) that can survive launch, deploy and align itself to form a 25 square meter collecting area 6.5 meter diameter primary mirror with a 131 nm rms wavefront error at temperatures less than 50K and provide stable optical performance. At the inception of JWST in 1996, such a capability did not exist. A highly successful technology development program was initiated including the Sub-scale Beryllium Mirror Demonstrator (SBMD) and Advanced Mirror System Demonstrator (AMSD) projects. These projects along with flight program activities have matured and demonstrated mirror technology for JWST. Directly traceable prototypes or flight hardware has been built, tested and operated in a relevant environment. This paper summarizes that technology development effort.

Author

James Webb Space Telescope; Mirrors; Satellite Design

20070038372 bd Systems, Inc., Huntsville, AL, USA

Rapid Contingency Simulation Modeling of the NASA Crew Launch Vehicle

Betts, Kevin M.; Rutherford, R. Chad; McDuffie, James; Johnson, Matthew D.; August 20, 2007; 20 pp.; In English; AIAA Guidance, Navigation and Control Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNM06AA01Z; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038372>

The NASA Crew Launch Vehicle is a two-stage orbital launcher designed to meet NASA's current as well as future needs for human space flight. In order to free the designers to explore more possibilities during the design phase, a need exists for the ability to quickly perform simulation on both the baseline vehicle as well as the vehicle after proposed changes due to mission planning, vehicle configuration and avionics changes, proposed new guidance and control algorithms, and any other contingencies the designers may wish to consider. Further, after the vehicle is designed and built, the need will remain for such analysis in the event of future mission planning. An easily reconfigurable, modular, nonlinear six-degree-of-freedom simulation matching NASA Marshall's in-house high-fidelity simulator is created with the ability to quickly perform simulation and analysis of the Crew Launch Vehicle throughout the entire launch profile. Simulation results are presented and discussed, and an example comparison fly-off between two candidate controllers is presented.

Author

Ares 1 Launch Vehicle; Simulation; Spacecraft Stability; Computer Programs

20070038373 NASA Marshall Space Flight Center, Huntsville, AL, USA

Ares V Launch Capability Enables Future Space Telescopes

Stahl, H. Philip; August 26, 2007; 9 pp.; In English; Optics and Photonics 2007, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038373>

NASA's Ares V cargo launch vehicle offers the potential to completely change the paradigm of future space science mission architectures. A major finding of the NASA Advanced Telescope and Observatory Capability Roadmap Study was that current launch vehicle mass and volume constraints severely limit future space science missions. And thus, that significant technology development is required to package increasingly larger collecting apertures into existing launch shrouds. The Ares V greatly relaxes these constraints. For example, while a Delta IV has the ability to launch approximate a 4.5 meter diameter payload with a mass of 13,000 kg to L2, the Ares V is projected to have the ability to launch an 8 to 12 meter diameter payload with a mass of 60,000 kg to L2 and 130,000 kg to Low Earth Orbit. This paper summarizes the Ares V payload launch capability and introduces how it might enable new classes of future space telescopes such as 6 to 8 meter class monolithic primary mirror observatories, 15 meter class segmented telescopes, 6 to 8 meter class x-ray telescopes or high-energy particle calorimeters.

Author

Ares 5 Cargo Launch Vehicle; Spaceborne Telescopes; Payloads; Low Earth Orbits

20070038939 NASA Johnson Space Center, Houston, TX, USA

Investigation of MMOD Impact on STS-115 Shuttle Payload Bay Door Radiator

Hyde, J.; Christiansen, E.; Lear, D.; Kerr, J.; Lyons, F.; Yasensky, J.; Orbital Debris Quarterly News, Vol. 11, No. 3; July 12, 2007, pp. 2-5; In English; See also [20070038938](#); Original contains color and black and white illustrations; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038939>

The Orbiter radiator system consists of eight individual 4.6 m x 3.2 m panels located with four on each payload bay door. Forward panels #1 and #2 are 2.3 cm thick while the aft panels #3 and #4 have a smaller overall thickness of 1.3 cm. The honeycomb radiator panels consist of 0.028 cm thick Aluminum 2024-T81 facesheets and Al5056-H39 cores. The face-sheets are topped with 0.005 in. (0.127 mm) silver-Teflon tape. The radiators are located on the inside of the shuttle payload bay doors, which are closed during ascent and reentry, limiting damage to the on-orbit portion of the mission. Post-flight inspections at the Kennedy Space Center (KSC) following the STS-115 mission revealed a large micrometeoroid/orbital debris (MMOD) impact near the hinge line on the #4 starboard payload bay door radiator panel. The features of this impact make it the largest ever recorded on an orbiter payload bay door radiator. The general location of the damage site and the adjacent radiator panels can be seen in Figure 2. Initial measurements of the defect indicated that the hole in the facesheet was 0.108 in. (2.74 mm) in diameter. Figure 3 shows an image of the front side damage. Subsequent observations revealed exit damage on the rear facesheet. Impact damage features on the rear facesheet included a 0.03 in. diameter hole (0.76 mm), a approx.0.05 in. tall bulge (approx.1.3 mm), and a larger approx.0.2 in. tall bulge (approx.5.1 mm) that exhibited a crack over 0.27 in. (6.8 mm) long. A large approx.1 in. (25 mm) diameter region of the honeycomb core was also damaged. Refer to Figure 4 for an image of the backside damage to the panel. No damage was found on thermal blankets or payload bay door structure under the radiator panel. Figure 5 shows the front facesheet with the thermal tape removed. Ultrasound examination indicated a maximum facesheet debond extent of approximately 1 in. (25 mm) from the entry hole. X-ray examinations revealed damage to an estimated 31 honeycomb cells with an extent of 0.85 in. x 1.1 in. (21.6 x 27.9 mm). Pieces of the radiator at and surrounding the impact site were recovered during the repair procedures at KSC. They included the thermal tape, front facesheet, honeycomb core, and rear facesheet. These articles were examined at JSC using a scanning electron microscope (SEM) with an energy dispersive x-ray spectrometer (EDS). Figure 6 shows SEM images of the entry hole in the facesheet. The asymmetric height of the lip may be attributed to projectile shape and impact angle. Numerous instances of a glass-fiber organic matrix composite were observed in the facesheet tape sample. The fibers were approximately 10 micrometers in diameter and variable lengths. EDS analysis indicated a composition of Mg, Ca, Al, Si, and O. Figures 7 and 8 present images of the fiber bundles, which were believed to be circuit board material based on similarity in fiber diameter, orientation, consistency, and composition. A test program was initiated in an attempt to simulate the observed damage to the radiator facesheet and honeycomb. Twelve test shots were performed using projectiles cut from a 1.6 mm thick fiberglass circuit board substrate panel. Results from test HITF07017, shown in figures 9 and 10, correlates with the observed impact features reasonably well. The test was performed at 4.14 km/sec with an impact angle of 45 degrees using a cylindrical projectile with a diameter and length of 1.25 mm. The fiberglass circuit board material had a density of 1.65 g/cu cm, giving a projectile mass of 2.53 mg. An analysis was performed using the Bumper code to estimate the probability of impact to the shuttle from a 1.25

mm diameter particle. Table 1 shows a 1.6% chance (impact odds = 1 in 62) of a 1.25 mm or larger MMOD impact on the radiators of the vehicle during a typical ISS mission. There is a 0.4% chance (impact odds = 1 in 260) that a 1.25 mm or larger MMOD particle would impact the RCC wing leading edge and nose cap during a typical mission. Figure 11 illustrates the vulnerable areas of the wing leading edge reinforced carbon-carbon (RCC), an area of the vehicle that is very sensitive to impact damage. The highlighted red, orange, yellow, and light green areas would be expected to experience critical damage if impacted by an OD particle such as the one that hit the RH4 radiator panel on STS-115.

Derived from text

Impact Damage; Space Debris; Space Shuttle Payloads; Carbon-Carbon Composites; Aluminum; Doors; Thermal Insulation; Honeycomb Structures

20070038976 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

GALEX Instrument: Pegasus Launch Temperature Effects on a Frequency Tuned Damped Structure

Coleman, Michelle; June 17, 2003; 17 pp.; In English; Spacecraft and Launch Vehicle Dynamic Environments Workshop, 17 Jun. 2003, El Segundo, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40422>

The viewgraph presentation about the GALEX instrument provides information about instrument layout, background information about the telescope response, instrument bipod redesign, and temperature effects on bipod stiffness and damping. The discussion of instrument bipod redesign includes stiffness reduction, damping, and test results.

Derived from text

Telescopes; Temperature Effects; Damping; Launching

20070038979 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Thermal Design and Flight Experience of the Mars Exploration Rover Spacecraft Computer-Controlled, Propulsion Line Heaters

Novak, Keith; Kinsella, Gary; Krylo, Robert; Sunada, Eric; July 21, 2004; 18 pp.; In English; 34th International Conference on Environmental Systems (ICES), 19-22 Jul. 2004, Colorado Springs, CO, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40428>

The viewgraph presentation examines propulsion line heater design and problems in the Mars Rover. Topics include a Mars Exploration Rover (MER) project description and MER spacecraft configuration, mission overview, MER cruise stage hardware, thermal design drivers in the propulsion lines, propulsion line control set points prior to launch, MER A and B flight trajectories, MER A early and mid cruise flight experience, MER A and B mid cruise flight experience, MER B late cruise flight experience, and lessons learned

Derived from text

Spacecraft Propulsion; Design Analysis; Mars Exploration; Rover Project; Spacecraft Design

20070039002 NASA Dryden Flight Research Center, Edwards, CA, USA

X-43A Project Overview: Adventures in Hypersonics

Davis, Mark; October 25, 2007; 23 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070039002>

This viewgraph presentation gives a general overview of the X-43A program. The contents include: 1) X-43A Program Overview; 2) Vehicle Description; 3) Flight 1, MIB & Return to Flight; 4) Flight 2 and Results; and 5) Flight 3 and Results. CASI

General Overviews; X-43 Vehicle; NASA Programs; Hypersonics; Spacecraft Configurations

20070039074 NASA Marshall Space Flight Center, Huntsville, AL, USA

Managing Radiation Degradation of CCDs on the Chandra X-Ray Observatory--III

O'Dell, Stephen L.; Aldcroft, Thomas L.; Blackwell, William C.; Bucher, Sabina L.; Chappell, Jon H.; DePasquale, Joseph M.; Grant, Catherine E.; Juda, Michael; Martin, Eric R.; Minow, Joseph I.; Murray, Stephen S.; Plucinsky, Paul P.; Shropshire, Daniel P.; Spitzbart, Bradley J.; Viens, Paul R.; Wolk, Scott J.; Schwartz, Daniel A.; August 25, 2007; 22 pp.; In English; SPIE

Optics and Photonics 2007, 25-31 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The CCDs on the Chandra X-ray Observatory are vulnerable to radiation damage from low-energy protons scattered off the telescope's mirrors onto the focal plane. Following unexpected damage incurred early in the mission, the Chandra team developed, implemented, and maintains a radiation-protection program. This program--involving scheduled radiation safing during radiation-belt passes, intervention based upon real-time space-weather conditions and radiation-environment modeling, and on-board radiation monitoring with autonomous radiation safing--has successfully managed the radiation damage to the CCDs. Since implementing the program, the charge-transfer inefficiency (CTI) has increased at an average annual rate of only 3.2×10^{-6} (2.3 percent) for the front-illuminated CCDs and 1.0×10^{-6} (6.7 percent) for the back-illuminated CCDs. This paper describes the current status of the Chandra radiation-management program, emphasizing enhancements implemented since the previous papers.

Author

Charge Coupled Devices; X Ray Astrophysics Facility; Protons; Radiation Protection; Mirrors; Space Weather

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20070038281 NASA Johnson Space Center, Houston, TX, USA

Integrated Docking Simulation and Testing with the Johnson Space Center Six-Degree of Freedom Dynamic Test System

Mitchell, Jennifer D.; Cryan, Scott P.; Baker, Kenneth; Martin, Toby; Goode, Robert; Key, Kevin W.; Manning, Thomas; Chien, Chiun-Hong; [2008]; 7 pp.; In English; STAIF 6th Conference on Human/Robotic, 19-14 Feb. 2008, Albuquerque, NM, USA; Original contains color illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

The Exploration Systems Architecture defines missions that require rendezvous, proximity operations, and docking (RPOD) of two spacecraft both in Low Earth Orbit (LEO) and in Low Lunar Orbit (LLO). Uncrewed spacecraft must perform automated and/or autonomous rendezvous, proximity operations and docking operations (commonly known as Automated Rendezvous and Docking, AR&D). The crewed versions may also perform AR&D, possibly with a different level of automation and/or autonomy, and must also provide the crew with relative navigation information for manual piloting. The capabilities of the RPOD sensors are critical to the success of the Constellation Program; this is carried as one of the CEV Project top risks. The Exploration Technology Development Program (ETDP) AR&D Sensor Technology Project seeks to reduce this risk by increasing technology maturation of selected relative navigation sensor technologies through testing and simulation. One of the project activities is a series of 'pathfinder' testing and simulation activities to integrate relative navigation sensors with the Johnson Space Center Six-Degree-of-Freedom Test System (SDTS). The SDTS will be the primary testing location for the Orion spacecraft's Low Impact Docking System (LIDS). Project team members have integrated the Orion simulation with the SDTS computer system so that real-time closed loop testing can be performed with relative navigation sensors and the docking system in the loop during docking and undocking scenarios. Two relative navigation sensors are being used as part of a 'pathfinder' activity in order to pave the way for future testing with the actual Orion sensors. This paper describes the test configuration and test results.

Author

Dynamic Tests; Navigation Instruments; Simulation; Spacecraft Docking; Space Navigation; Spacecraft Instruments

20070038284 NASA Johnson Space Center, Houston, TX, USA

Orion Entry Flight Control Stability and Performance

Strahan, Alan L.; Loe, Greg R.; Seiler, Pete; August 20, 2007; 17 pp.; In English; AIAA Guidance, Navigation and Control Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The Orion Spacecraft will be required to perform entry and landing functions for both Low Earth Orbit (LEO) and Lunar return missions, utilizing only the Command Module (CM) with its unique systems and GN&C design. This paper presents the current CM Flight Control System (FCS) design to support entry and landing, with a focus on analyses that have supported

its development to date. The CM FCS will have to provide for spacecraft stability and control while following guidance or manual commands during exo-atmospheric flight, after Service Module separation, translational powered flight required of the CM, atmospheric flight supporting both direct entry and skip trajectories down to drogue chute deploy, and during roll attitude reorientation just prior to touchdown. Various studies and analyses have been performed or are on-going supporting an overall FCS design with reasonably sized Reaction Control System (RCS) jets, that minimizes fuel usage, that provides appropriate command following but with reasonable stability and control margin. Results from these efforts to date are included, with particular attention on design issues that have emerged, such as the struggle to accommodate sub-sonic pitch and yaw control without using excessively large jets that could have a detrimental impact on vehicle weight. Apollo, with a similar shape, struggled with this issue as well. Outstanding CM FCS related design and analysis issues, planned for future effort, are also briefly be discussed.

Author

Control Systems Design; Design Analysis; Spacecraft Modules; Crew Exploration Vehicle; Atmospheric Entry; Spacecraft Landing; Flight Control; Spacecraft Control

20070038983 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

HYDRA: High Speed Simulation Architecture for Precision Spacecraft Formation Flying

Martin, Bryan J.; Sohl, Garrett A.; August 11, 2003; 12 pp.; In English; AIAA Modeling and Simulation Technologies Conference, 11-14 Aug. 2003, Austin, TX, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40553>

This viewgraph presentation describes HYDRA, which is architecture to facilitate high-fidelity and real-time simulation of formation flying missions. The contents include: 1) Motivation; 2) Objective; 3) HYDRA-Description and Overview; 4) HYDRA-Hierarchy; 5) Communication in HYDRA; 6) Simulation Specific Concerns in HYDRA; 7) Example application (Formation Acquisition); and 8) Sample Problem Results.

CASI

Computerized Simulation; Formation Flying; Technology Utilization; Reconfigurable Hardware; Architecture (Computers); High Speed

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*.

20070037448 NASA Marshall Space Flight Center, Huntsville, AL, USA

Current sheet Formation in a Conical Theta Pinch Faraday Accelerator with Radio-Frequency Assisted Discharge

Hallock, Ashley K.; Choueiri, Edgar Y.; Polzin, Kurt A.; September 17, 2007; 10 pp.; In English; 30th International Electric Propulsion Conference, 17-20 Sep. 2007, Florence, Italy; Original contains black and white illustrations

Report No.(s): IEPC-2007-165; Copyright; Avail.: CASI: [A02](#), Hardcopy

The inductive formation of current sheets in a conical theta pinch FARAD (Faraday Accelerator with Radio-frequency Assisted Discharge) thruster is investigated experimentally with time-integrated photography. The goal is to help in understanding the mechanisms and conditions controlling the strength and extent of the current sheet, which are two indices important for FARAD as a propulsion concept. The profiles of these two indices along the inside walls of the conical acceleration coil are assumed to be related to the profiles of the strength and extent of the luminosity pattern derived from photographs of the discharge. The variations of these profiles as a function of uniform back-fill neutral pressure (with no background magnetic field and all parameters held constant) provided the first clues on the nature and qualitative dependencies of current sheet formation. It was found that there is an optimal pressure for which both indices reach a maximum and that the rate of change in these indices with pressure differs on either side of this optimal pressure. This allowed the inference that current sheet formation follows a Townsend-like breakdown mechanism modified by the existence of a finite pressure-dependent radio-frequency-generated electron density background. The observation that the effective location of the luminosity pattern favors the exit-half of the conical coil is explained as the result of the tendency of the inductive discharge circuit to operate near its minimal self-inductance. Movement of the peak in the luminosity pattern towards the upstream side

of the cone with increasing pressure is believed to result from the need of the circuit to compensate for the increase in background plasma resistivity due to increasing pressure.

Author

Radio Frequency Discharge; Current Sheets; Inductance; Electric Propulsion; Plasmas (Physics); Magnetic Fields; Luminosity

20070037456 NASA Marshall Space Flight Center, Huntsville, AL, USA

Progress on the J-2X Upper Stage Engine for the Ares I Crew Launch Vehicle and the Ares V Cargo Launch Vehicle

Byrd, Thomas D.; Kynard, Michael .; September 18, 2007; 22 pp.; In English; AIAA Space 2007 Conference and Exposition, 18-20 Sep. 2007, Long Beach, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#),

Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070037456>

NASA's Vision for Exploration requires a safe, reliable, affordable upper stage engine to power the Ares I Crew Launch Vehicle (CLV) and the Ares V Cargo Launch Vehicle. The J-2X engine is being developed for that purpose, epitomizing NASA's philosophy of employing legacy knowledge, heritage hardware, and commonality to carry the next generation of explorers into low-Earth orbit and out into the solar system This presentation gives top-level details on accomplishments to date and discusses forward work necessary to bring the J-2X engine to the launch pad.

Author

Ares I Launch Vehicle; Ares 5 Cargo Launch Vehicle; Low Earth Orbits; Launch Vehicles; Launching; Spacecraft Propulsion

20070037474 Air Force Research Lab., Edwards AFB, CA USA

Design of Energetic Ionic Liquids (Challenge Project C2H) (Preprint)

Boatz, Jerry A; Gordon, Mark S; Voth, Greg A; Hammes-Schiffer, Sharon; May 4, 2007; 9 pp.; In English

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

Report No.(s): AD-A471067; AFRL-PR-ED-TP-2007-281; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471067>

The focus of this challenge project is on theoretical studies of ionic liquids as advanced monopropellants for rocket, missile, and satellite propulsion applications. Ionic liquids offer several advantages over conventional monopropellants such as hydrazine, including higher energy content, higher densities, very low vapor pressures, and reduced vapor toxicities. They are likewise well suited for use as working fluids in electric propulsion devices. The properties of ionic liquids may be tuned via the choice of component ions and their chemical substituents, so that they may be optimized for specific applications.

DTIC

Flux Density; Liquid Rocket Propellants; Liquids; Monopropellants

20070038165 NASA Glenn Research Center, Cleveland, OH, USA

Advanced Stirling Converter Testing at NASA Glenn Research Center

Oriti, Salvatore M.; Blaze, Gina M.; November 2007; 24 pp.; In English; Fifth International Energy Conversion Engineering Conference and Exhibit (IECEC), 25-27 Jun. 2007, Saint Louis, MO, USA; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2007-215010; AIAA Paper-2007-4840; E-16190; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038165>

The U.S. Department of Energy (DOE), Lockheed Martin Space Systems (LMSS), Sunpower Inc., and NASA Glenn Research Center (GRC) have been developing an Advanced Stirling Radioisotope Generator (ASRG) for use as a power system on space science and exploration missions. This generator will make use of the free-piston Stirling converters to achieve higher conversion efficiency than currently available alternatives. The ASRG will utilize two Advanced Stirling Convertors (ASC) to convert thermal energy from a radioisotope heat source to electricity. NASA GRC has initiated several experiments to demonstrate the functionality of the ASC, including: in-air extended operation, thermal vacuum extended operation, and ASRG simulation for mobile applications. The in-air and thermal vacuum test articles are intended to provide convertor performance data over an extended operating time. These test articles mimic some features of the ASRG without the requirement of low system mass. Operation in thermal vacuum adds the element of simulating deep space. This test article is being used to gather convertor performance and thermal data in a relevant environment. The ASRG simulator was designed to incorporate a minimum amount of support equipment, allowing integration onto devices powered directly by the convertors,

such as a rover. This paper discusses the design, fabrication, and implementation of these experiments.

Author

Stirling Cycle; Radioisotope Heat Sources; Thermoelectric Power Generation; Energy Conversion Efficiency; Alternating Current

20070038168 NASA Glenn Research Center, Cleveland, OH, USA

A Historical Review of Brayton and Stirling Power Conversion Technologies for Space Applications

Mason, Lee S.; Schreiber, Jeffrey G.; November 2007; 15 pp.; In English; Space Nuclear Conference 2007, 24-28 Jun. 2007, Boston, MA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 850661.04.01.03

Report No.(s): NASA/TM-2007-214976; Paper 2034; E-16140; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038168>

Dynamic power conversion technologies, such as closed Brayton and free-piston Stirling, offer many advantages for space power applications including high efficiency, long life, and attractive scaling characteristics. This paper presents a historical review of Brayton and Stirling power conversion technology for space and discusses on-going development activities in order to illustrate current technology readiness. The paper also presents a forecast of potential future space uses of these power technologies.

Author

Brayton Cycle; Stirling Cycle; Energy Conversion; Spacecraft Propulsion; Engine Design

20070038194 NASA Marshall Space Flight Center, Huntsville, AL, USA

Scaling and Systems Considerations in Pulsed Inductive Thrusters

Polzin, Kurt A.; September 17, 2007; 10 pp.; In English; 30th International Electric Propulsion Conference/Electric Rocket Propulsion Society, 17-20 Sep. 2007, Florence, Italy; Original contains black and white illustrations

Contract(s)/Grant(s): NNM06AA17G

Report No.(s): IEPC-2007-192; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038194>

Performance scaling in pulsed inductive thrusters is discussed in the context of previous experimental studies and modeling results. Two processes, propellant ionization and acceleration, are interconnected where overall thruster performance and operation are concerned, but they are separated here to gain physical insight into each process and arrive at quantitative criteria that should be met to address or mitigate inherent inductive thruster difficulties. The effects of preionization in lowering the discharge energy requirements relative to a case where no preionization is employed, and in influencing the location of the initial current sheet, are described. The relevant performance scaling parameters for the acceleration stage are reviewed, emphasizing their physical importance and the numerical values required for efficient acceleration. The scaling parameters are then related to the design of the pulsed power train providing current to the acceleration stage. The impact of various choices in pulsed power train and circuit topology selection are reviewed, paying special attention to how these choices mitigate or exacerbate switching, lifetime, and power consumption issues.

Author

Pulsed Inductive Thrusters; Energy Requirements; Current Sheets; Switching; Propellants; Energy Consumption

20070038263 NASA Marshall Space Flight Center, Huntsville, AL, USA

Plasma Measurements in an Integrated-System FARAD Thruster

Polzin, K. A.; Rose, M. F.; Miller, R.; Best, S.; September 17, 2007; 1 pp.; In English; 30th International Electric Propulsion Conference, 17-20 Sep. 2007, Florence, Italy; Copyright; Avail.: Other Sources; Abstract Only

Pulsed inductive plasma accelerators are spacecraft propulsion devices in which energy is stored in a capacitor and then discharged through an inductive coil. The device is electrodeless, inducing a current sheet in a plasma located near the face of the coil. The propellant is accelerated and expelled at a high exhaust velocity (order of 10 km/s) through the interaction of the plasma current and the induced magnetic field. The Faraday Accelerator with RF-Assisted Discharge (FARAD) thruster[1,2] is a type of pulsed inductive plasma accelerator in which the plasma is preionized by a mechanism separate from that used to form the current sheet and accelerate the gas. Employing a separate preionization mechanism allows for the formation of an inductive current sheet at much lower discharge energies and voltages than those used in previous pulsed inductive accelerators like the Pulsed Inductive Thruster (PIT). A benchtop FARAD thruster was designed following guidelines and similarity performance parameters presented in Refs. [3,4]. This design is described in detail in Ref. [5]. In this

paper, we present the temporally and spatially resolved measurements of the preionized plasma and inductively-accelerated current sheet in the FARAD thruster operating with a Vector Inversion Generator (VIG) to preionize the gas and a Bernardes and Merryman circuit topology to provide inductive acceleration. The acceleration stage operates on the order of 100 J/pulse. Fast-framing photography will be used to produce a time-resolved, global view of the evolving current sheet. Local diagnostics used include a fast ionization gauge capable of mapping the gas distribution prior to plasma initiation; direct measurement of the induced magnetic field using B-dot probes, induced azimuthal current measurement using a mini-Rogowski coil, and direct probing of the number density and electron temperature using triple probes.

Author

Pulsed Inductive Thrusters; Capacitors; Spacecraft Propulsion; Current Sheets; Plasma Currents; Magnetic Fields; Ionization Gages; Electron Energy; Plasma Accelerators

20070038340 NASA Glenn Research Center, Cleveland, OH, USA

Design, Fabrication, and Test of a LOX/LCH₄ RCS Igniter at NASA

Schneider, Steven J.; John, Jeremy W.; Zoeckler, Joseph G.; November 2007; 19 pp.; In English; 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 8-11 Jul. 2007, Cincinnati, OH, USA; Original contains color illustrations Report No.(s): NASA/TM-2007-215038; AIAA Paper-2007-5442; E-16215; No Copyright; Avail.: CASI: [A03](#), Hardcopy ONLINE: <http://hdl.handle.net/2060/20070038340>

A workhorse liquid oxygen-liquid methane (LOX/LCH₄) rocket igniter was recently tested at NASA Glenn Research Center's (GRC) Research Combustion Laboratory (RCL). These tests were conducted in support of the Reaction Control Engine (RCE) development task of the Propulsion and Cryogenics Advanced Development (PCAD) project. The igniter was a GRC in-house design used to evaluate the ignition processes for LOX/LCH₄. The test matrix was developed to examine the flammability of LOX/LCH₄ over a range of oxidizer-to-fuel mixture ratios, both in the core fuel flow and total flow. In addition, testing also examined the durability of the hardware by accumulating ignition pulses. Over the course of testing, a total of 1402 individual ignition pulses were successfully demonstrated over the range of mixture ratios. Testing was halted after the failure of the ceramic in the igniter spark plug.

Author

Liquefied Gases; Propulsion; Combustion; Methane; Liquid Oxygen; Ignition; Engine Design; Cryogenics

20070038632 Library of Congress, Washington, DC USA

U.S. Strategic Nuclear Forces: Background, Developments, and Issues

Woolf, Amy F; Sep 5, 2007; 32 pp.; In English

Report No.(s): AD-A471932; CRS-RL33640; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During the Cold War, the U.S. nuclear arsenal contained many types of delivery vehicles for nuclear weapons. The longer range systems, which included long-range missiles based on U.S. territory, long-range missiles based on submarines, and heavy bombers that could threaten Soviet targets from their bases in the USA, are known as strategic nuclear delivery vehicles. At the end of the Cold War, in 1991, the USA deployed more than 10,000 warheads on these delivery vehicles. That number has declined to around 6,000 warheads today, and is slated, under the 2002 Moscow Treaty, to decline to 2,200 warheads by the year 2012. At the present time, the U.S. land-based ballistic missile force (ICBMs) consists of 500 Minuteman III ICBMs, each deployed with between one and three warheads, for a total of 1,200 warheads. The Air Force recently deactivated all 50 of the 10-warhead Peacekeeper ICBMs; it plans to eventually deploy Peacekeeper warheads on some of the Minuteman ICBMs. The 2006 Quadrennial Defense Review (QDR) report also indicated that it planned to eliminate 50 of the Minuteman III missiles, leaving a force of 450 missiles that would carry, perhaps, 500-600 warheads. After submitting a study to Congress, the Air Force has begun to deactivate these 50 missiles. The Air Force is also modernizing the Minuteman missiles, replacing and upgrading their rocket motors, guidance systems, and other components. The Air Force had expected to begin replacing the Minuteman missiles around 2018, but has decided, instead, to continue to modernize and maintain the existing missiles. The U.S. ballistic missile submarine fleet currently consists of 14 Trident submarines; each carries 24 Trident II (D-5) missiles. The Navy has converted 4 of the original 18 Trident submarines to carry non-nuclear cruise missiles.

DTIC

Cruise Missiles; Intercontinental Ballistic Missiles; Nuclear Weapons; Rocket Engines; Submarines; Warheads

20070038903 Air Force Research Lab., Edwards AFB, CA USA

Performance of a Linear Hall Discharge with an Open Electron Drift (Postprint)

Capelli, M A; Walker, Q E; Meezan, N B; Hargus, Jr, W A; Jul 8, 2001; 7 pp.; In English

Report No.(s): AD-A471790; AIAA-2001-3503; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471790>

This paper presents a recent characterization of the thrust efficiency and specific impulse of a low power, linear-geometry (non-coaxial) Hall thruster with an open electron-drift current. The thruster was constructed with a boron-nitride insulating channel surrounded by a magnetic circuit served by four electromagnet coils, and was designed to operate in the 100-Watt power class. A survey of the thruster operation demonstrated promising performance ($T \approx 2.1$ mN, $\eta = 14.6\%$, $I_{sp} = 1070$ sec) in the very low power range (< 80 W). The thruster showed poor long-term stability at these operating conditions that demanded extremely high magnetic fields (~ 1.6 kG). Operation at lower magnetic field strengths ($\sim 300 \text{--} 400$ G) and therefore lower discharge power (< 50 W), allowed for continuous operation for extended durations, and permitted laser-induced fluorescence measurements of the ion velocities across and downstream of the linear exit channel. Velocities in excess of 3 km/s were measured at the discharge exit, and 8 km/s approximately 1.5 cm downstream of the discharge exit plane, consistent with measurements reported on for a similar co-axial discharge. The near exit-plane velocities were found to be somewhat sensitive to the xenon mass flow servicing the oversized hollow cathode, confirming the possible interferences that the cathode flow may have on the ion beam development in the near exit region as a result of possible charge-exchange collisions.

DTIC

Electrons; Hall Thrusters

20070038980 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

JPL Power Systems for Current Planned Missions

Timmerman, Paul J.; Karmon, Dan; Underwood, Mark; April 24, 2007; 40 pp.; In English; Space Power Workshop, 24-26 Apr. 2007, Los Angeles, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40435>

The viewgraph presentation includes fact sheets, instrument lists, and mission parameters for 13 future missions. Those missions include Moon Mineralogy Mapping (MMM), Space Interferometry Mission (ESA), New Millennium--Space Technology-8 (ST-8), Ocean Salinity Mapping Orbiter (Aquarius), Ocean Surface Topology Mission (OSTM), Asteroid Rendezvous Mission-SEP (Dawn), Mars Scout Lander Mission (Phoenix), Solar Powered Jupiter Orbiter (Juno), Earth orbiting carbon observatory (OCO), planet finder observatory (Kepler), far infrared/sub-millimeter telescope (Herschel), Wide-field Infrared Survey Explorer (WISE), and Mars Science Laboratory-Rover (MSL). The presentation also contains a table of current missions and instruments.

Derived from text

Aerospace Engineering; Space Missions; Spacecraft Instruments; Observatories; Spacecraft Power Supplies

23

CHEMISTRY AND MATERIALS (GENERAL)

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

20070036805 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Temperature Evolution of Excitonic Absorptions in Cd(1-x)Zn(x)Te Materials

Quijada, Manuel A.; Henry, Ross; [2007]; 8 pp.; In English; SPIE Conference, 26-30 Aug. 2007, San Diego, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070036805>

The studies consist of measuring the frequency dependent transmittance (T) and reflectance (R) above and below the optical band-gap in the UV/Visible and infrared frequency ranges for Cd(1-x),Zn(x),Te materials for $x=0$ and $x=0.04$. Measurements were also done in the temperature range from 5 to 300 K. The results show that the optical gap near 1.49 eV at 300 K increases to 1.62 eV at 5 K. Finally, we observe sharp absorption peaks near this gap energy at low temperatures. The close proximity of these peaks to the optical transition threshold suggests that they originate from the creation of bound

electron-hole pairs or excitons. The decay of these excitonic absorptions may contribute to a photoluminescence and transient background response of these back-illuminated HgCdTe CCD detectors.

Author

Cadmium Tellurides; Zinc Tellurides; Semiconductors (Materials); Alloys; Excitons; Absorption

20070037736 California Univ., San Diego, La Jolla, CA USA

Counter-Propagating Optical Trapping System for Size and Refractive Index Measurement of Microparticles

Flynn, Richard A; Shao, Bing; Chachisvilis, Mirianas; Ozkan, Mihrimah; Esener, Sadik C; Jun 1, 2005; 9 pp.; In English Report No.(s): AD-A471291; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We propose and demonstrate a novel approach to measure the size and refractive index of microparticles based on two beam optical trapping, where forward scattered light is detected to give information about the particle. The counter-propagating optical trap measurement (COTM) system exploits the capability of optical traps to measure pico-Newton forces for microparticles refractive index and size characterization. Different from the current best technique for microparticles refractive index measurement, refractometry, a bulk technique requiring changing the fluid composition of the sample, our optical trap technique works with any transparent fluid and enables single particle analysis without the use of biological markers. A ray-optics model is used to explore the physical operation of the COTM system, predict system performance and aid system design. Experiments demonstrate the accuracy of refractive index measurement of triangel $n = 0.013$ and size measurement of 3% of diameter with 2% standard deviation. Present performance is instrumentation limited, and a potential improvement by more than two orders of magnitude can be expected in the future. With further development in parallelism and miniaturization, the system offers advantages for cell manipulation and bioanalysis compatible with lab-on-a-chip systems.

DTIC

Microparticles; Optical Countermeasures; Optical Properties; Refractivity; Trapping

20070037892 Spectra Research Systems, Inc., Vandenberg AFB, CA USA

Stress Coatings for Large Scale Membrane Mirrors (preprint)

Conk, Ryan; Moore, J D; Patrick, B G; Marker, D; deBlonk, B; Sep 15, 2006; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F29601-03-C-0040; FA9453-03-C-0185; Proj-3005

Report No.(s): AD-A471588; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Finite element modeling and design need further adjustments, but have shown good correlation through successful results and actuator influence. Active boundary control effective in correcting mounting errors and other types of low order aberrations typically seen in membrane applications. Spherical aberration can be controlled (as required) through varied stress coatings on the membrane. Improvements must be made to ensure no increase in surface roughness of membrane. Deposition rate and dwell time adjustments. Testing will continue at AFRL with inclusion of real-time DN secondary.

DTIC

Coatings; Membranes; Mirrors

20070038338 NASA Langley Research Center, Hampton, VA, USA

Recent Progress in the Development of Neodymium Doped Ceramic Yttria

Prasad, Narasimha S.; Edwards, Chris; Trivedi, Sudhir B.; Kutcher, Susan; Wang, Chen-Chia; Kim, Joo-Soo; Hommerich, Uwe; Shukla, Vijay; Sadangi, Rajendra; Kear, Bernard; [2007]; 8 pp.; In English

Contract(s)/Grant(s): NNL04AB41P; NSF HRD-04-00041; NSF HRD-06-30372; N00014-01-1-0079; No Copyright;

Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038338>

Solid-state lasers play a significant role in providing the technology necessary for active remote sensing of the atmosphere. Neodymium doped yttria (Nd:Y₂O₃) is considered to be an attractive material due to its possible lasing wavelengths of approx.914 nm and approx.946 nm for ozone profiling. These wavelengths when frequency tripled can generate UV light at approx.305 nm and approx.315 nm, which is particularly useful for ozone sensing using differential absorption lidar technique. For practical realization of space based UV transmitter technology, ceramic Nd:Y₂O₃ material is considered to possess great potential. A plasma melting and quenching method has been developed to produce Nd³⁺ doped powders for consolidation into Nd:Y₂O₃ ceramic laser materials. This far-from-equilibrium processing methodology allows higher levels of rare earth doping than can be achieved by equilibrium methods. The method comprises of two main steps: (a) plasma

melting and quenching to generate dense, and homogeneous doped metastable powders, (b) pressure assisted consolidation of these powders by hot isostatic pressing to make dense nanocomposite ceramics. Using this process, several 1' x 1' ceramic cylinders have been produced. The infrared transmission of undoped Y2O3 ceramics was as high as approx.75% without anti-reflection coating. In the case of Nd:Y2O3 ceramics infrared transmission values of approx.50% were achieved. Furthermore, Nd:Y2O3 samples with dopant concentrations of up to approx.2 at. % were prepared without significant emission quenching.

Author

Yttrium Oxides; Doped Crystals; Neodymium; Nanocomposites; Solid State Lasers

20070038395 Stanford Univ., Stanford, CA USA

Interior and Exterior Laser-Induced Fluorescence and Plasma Potential Measurements on a Laboratory Hall Thruster (Postprint)

Hargus ,Jr , W A; Cappelli, M A; Jun 1999; 16 pp.; In English

Report No.(s): AD-A471643; AIAA-99-2721; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471643>

In this paper, we describe the results of a study of laser induced fluorescence velocimetry of ionic xenon in the plume and interior acceleration channel of a laboratory Hall type thruster operating at powers ranging from 250 to 725 W. Optical access to the interior of the Hall thruster is provided by a 1 mm axial slot in the insulator outer wall. Axial ion velocity profiles for four discharge voltages (100 V, 160 V, 200 V, 250 V) are measured as are radial velocity profiles in the near field plume. Internal neutral xenon axial velocity profiles are also measured at these conditions. For comparison, the plume plasma potential profile is measured with an emissive probe. These probe based potential measurements extend from 50 mm outside the plume to the near anode region for all but the highest discharge voltage condition. For each condition, the axial electric field is calculated from the plasma potential. In addition, an estimate of the local electron temperature is calculated from the Bohm criterion at the location of each plasma potential measurement.

DTIC

Hall Thrusters; Laser Induced Fluorescence; Measurement; Plasma Potentials

20070038417 Rutgers - The State Univ., New Brunswick, NJ USA

Strain Mapping in Nanostructured Coatings by Synchrotron Radiation

Tsakalagos, Thomas; Croft, Mark; Sadangi, Rajendra; Shukla, Vijay; Dec 2006; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-1-0880; Proj-07PR02131-00

Report No.(s): AD-A471696; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471696>

We report an Energy Dispersive X-ray Diffraction (EDXRD) method to determine the local strain field in a plasma sprayed Alumina-13% Titania ceramic coating. The measurements were carried out using high energy photons (100-300 KeV) on the X17B1 beamline at Brookhaven National Laboratory. The phase distribution of phases in the coatings produced from plasma spraying of micron size and agglomerated nanosize powder is described.

DTIC

Ceramic Coatings; Dispersing; Mapping; Photons; Plasma Spraying; Synchrotron Radiation; X Ray Diffraction; X Ray Sources

20070038423 North Carolina State Univ., Raleigh, NC USA

Quantitating the Absorption, Partitioning and Toxicity of Hydrocarbon Components of JP-8 Jet Fuel

Riviere, Jim E; Monteiro-Riviere, Nancy A; Baynes, Ronald E; Xia, Xin-Rui; Aug 24, 2007; 11 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0376

Report No.(s): AD-A471709; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471709>

The focus of this research project was to characterize the nature of JP-8 toxicity to the skin and continue development of an in vitro model system, membrane coated fiber (MCEG) array, for assessing physiochemical parameters related to hydrocarbon partitioning and absorption through skin. In vitro studies with human epidermal keratinocytes demonstrated that inhibition of the NF-kB pathway with blockers confirms its role in cytokine production in jet fuel and hydrocarbon exposure in vitro. This could potentially reduce the inflammatory effect of fuel exposure in vivo. Exposure to the synthetic hydrocarbon

fuel S-8 also is capable of inducing epidermal keratinocyte irritation in vitro as assessed by cytotoxicity and cytokine release. We have shown close correlation between MCF predicted dermal absorption of a series of compounds and measured permeability in skin. Patterns of aromatic hydrocarbon partitioning into three different MOE fibers (Polydimethylsiloxane, Polyacrylate, Carbowax) from three different vehicles (water, water/ethanol, biological albumin containing media) were different and could serve as a basis for clustering jet fuel hydrocarbon constituents in interpreting their patterns of absorption or biodistribution.

DTIC

Analytical Chemistry; Coatings; Hydrocarbons; Jet Engine Fuels; JP-8 Jet Fuel; Membranes; Toxicity

20070038430 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Evaluation of the Snap Sampler for Sampling Ground Water Monitoring Wells for VOCs and Explosives

Parker, Louise V; Mulherin, Nathan D; Aug 2007; 68 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471723; ERDC/CRREL-TR-07-14; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471723>

A series of laboratory and field studies were conducted to determine the ability of the Snap Sampler to recover representative concentrations of VOC and explosives in ground water. For the laboratory studies, statistical analyses of the data (for each analyte) were conducted to determine if the concentrations of analytes in samples taken with the Snap Sampler were significantly different from known concentrations of the analytes in samples collected from a standpipe (i.e., control samples). For the field studies, concentrations of analytes in samples taken with the Snap Sampler were compared with concentrations of the analytes in samples taken using the EPA's low-flow purging and sampling protocol. Again, statistical analyses were used to determine if there were statistically significant differences between the individual analyte concentrations in these samples. Two field trials were conducted for VOCs and one field trial was conducted for explosives. In the laboratory studies, the Snap Sampler recovered concentrations of VOCs that were comparable to those in the control samples after equilibrating the Snap Sampler for 3 days. Comparable concentrations of explosives were recovered after equilibrating the Snap Sampler for 24 hours. In the field studies, concentrations of VOCs and explosives were comparable to concentrations of these analytes in samples that were collected using low-flow purging and sampling.

DTIC

Explosives; Ground Water; Organic Compounds; Samplers; Sampling; SNAP; Wells

20070038591 Applied Research Associates, Inc., Tyndall AFB, FL USA

Reverse Osmosis Processing of Organic Model Compounds and Fermentation Broths

Diltz, Robert; Henley, Michael V; Marolla, Theodore V; Li, Lixiong; Apr 2006; 12 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A471861; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Post-treatment of an anaerobic fermentation broth was evaluated using a 150 gal/day, single cartridge prototype reverse osmosis (RO) system. Baseline tests were conducted at 25 C using six organic model compounds representing key species found in the fermentation broth: ethanol, butanol, acetic acid, oxalic acid, lactic acid, and butyric acid. Correlations of the rejection and recovery efficiencies for these organic species, individually and in simulated mixtures, were obtained as a function of feed pressure with and without recirculation of the retentate. The actual fermentation broth obtained from a continuous-flow biohydrogen process was treated by the RO system under the operating conditions similar to those used in the baseline tests, resulting in greater than 95% removal of total organic carbon. These results are encouraging and useful for further studies on the feasibility of incorporating the RO technology into an integrated and field deployable wastewater management and water recovery system.

DTIC

Broths; Fermentation; Organic Compounds; Reverse Osmosis; Water Reclamation

20070038678 Princeton Univ., NJ USA

Physical and Chemical Processes in Flames

Law, Chung K; Sep 2007; 19 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0003; Proj-2308

Report No.(s): AD-A472032; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of the present program was to study the structure and response of laminar premixed and nonpremixed

flames with emphases on effects of high pressure, flame/flow unsteadiness, and chemistry. Studies on flame dynamics show strong coupling between the intrinsic flamefront hydrodynamic cellular instabilities and the diffusional/thermal cellular or pulsating instabilities, for mixture Lewis numbers that are respectively smaller or larger than unity. Linear and nonlinear stability analyses on diffusion flames show regimes of stability and the influence of heat loss on their boundaries. Studies on combustion chemistry led to the determination of laminar flame speeds of high fidelity at atmospheric and high pressures for CO/H₂ as well as C₂-C₃ mixtures with air, and the counterflow ignition temperatures of dimethyl ether (DME) and 1,3-butadiene, allowing developments of detailed and reduced reaction mechanisms. A mathematical theory and computational algorithm termed directed relation graph was developed and then further improved that allows systematic and rapid determination and thereby elimination of unimportant species and reactions of detailed mechanisms, leading to skeletal mechanisms that are sufficiently small either for computational simulation of complex combustion phenomena. These results are expected to be useful to the general interests of AFOSR in the fundamental and practical issues of flame dynamics and chemical kinetics, turbulent combustion, soot formation, radiative heat transfer, flame extinction, stabilization, flammability, and supersonic combustion.

DTIC

Chemical Reactions; Flames; Laminar Flow; Oxidation

20070038727 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA

Modification of Operating Procedure for EZ-Retriever (Trademark) Microwave to Produce Consistent and Reproducible Immunohistochemical Results

Tompkins, Christina P; Fath, Denise M; Hamilton, Tracey A; Kan, Robert K; May 2006; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472094; USAMRICD-TR-06-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The present study was conducted to optimize the operating procedure for the EZ- Retriever' microwave oven to produce consistent and reproducible staining results with microtubule-associated protein 2 (MAP-2). After performing microwave antigen retrieval (MAR) at 98 degrees C, as recommended by the manufacturer, inconsistent patterns of MAP-2 immunoreactivity were produced. Uniform patterns of MAP- 2 staining are critical when performing qualitative and quantitative image analysis on sections; therefore, optimizing the temperature at which MAR was performed was essential. Results indicate that when using the EZ-Retriever' microwave, boiling sections in 10mM citric acid of pH 6.0 for 10 min at 106 degrees C is optimal for recovering MAP-2 in formalin-fixed, paraffin-embedded sections. Ultimately, this modification will permit more accurate and reliable image analyses in future immunohistochemical studies, including other proteins that require citrate based solutions for MAR.

DTIC

Antigens; Citric Acid; Microwaves; Proteins

20070038738 Boeing Phantom Works, Saint Louis, MO USA

Knowledge Data Base for Amorphous Metals

Hahn, Gail L; Jul 26, 2007; 13 pp.; In English

Contract(s)/Grant(s): FA9550-07-C-0031

Report No.(s): AD-A472116; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The program drew experts associated with thermal sprayed amorphous metals from the DARPA sponsored Naval Advanced Amorphous Coating (NAAC) program, developers from the DARPA sponsored Accelerated Insertion of Materials initiative (N00421-01-3-0098), and computing specialists from Object Computing Incorporated to recommend a framework for a knowledge data base for amorphous metal coatings to reduce risk and accelerate transition of the technology among materials suppliers, laboratories/technical specialists, thermal spray operators, inspectors, and program managers. A workshop was held on 26 April 2007 for to explore needs, work shed the workflow/process, develop recommendations, and set priorities. Microsoft Access was utilized to pilot the recommendations and further refine inspection sequences for the thermal spray process, and detail and demonstrate tracking (including shipping) and pedigree of the material, processes, coupons, plates, and coating installation on ship deck applications. The data base is for thermal spray coatings so it is applicable beyond NAAC.

DTIC

Amorphous Materials; Data Bases; Knowledge Based Systems; Metal Coatings; Metals; Sprayers

20070038873 Air Force Research Lab., Edwards AFB, CA USA

Laser Induced Fluorescence Measurements on a Laboratory Hall Thruster (Postprint)

Hargus, Jr , W A; Cappelli, M A; Jul 1998; 12 pp.; In English

Report No.(s): AD-A471678; AIAA-1998-3645; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471678>

In this paper, we describe the results of a study of laser induced fluorescence velocimetry of neutral xenon in the plume of a Hall type thruster operating at powers ranging from 250 to 725 W. Neutral velocities are seen to increase with thruster discharge voltage. There is no evidence for neutrals being accelerated in the near field plume. Velocities appear to remain constant past the cathode plane. In preparation for future ion velocimetry studies, the plume plasma potential profile is measured for a number of conditions. For a low power condition, the plasma potential profile is mapped through the ionization region into the interior of the thruster. For this condition, the electric field profile is calculated. We also find evidence of neutral xenon streaming toward the Hall thruster. These backstreaming neutrals make determination of neutral xenon velocities difficult. We believe the neutrals originate from the thruster plume wall impingement approximately 2 m from the thruster.

DTIC

Hall Thrusters; Laser Induced Fluorescence

20070038878 Air Force Research Lab., Edwards AFB, CA USA

Laser-Induced Fluorescence Measurements within a Laboratory Hall Thruster (Postprint)

Hargus, Jr , W A; Cappelli, M A; Jul 1999; 15 pp.; In English

Report No.(s): AD-A471791; AIAA-99-3436; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471791>

In this paper, we describe the results of a study of laser induced fluorescence velocimetry of ionic xenon in the plume and interior acceleration channel of a laboratory Hall type thruster operating at powers ranging from 250 to 725 W. Optical access to the interior of the Hall thruster is provided by a 1 mm axial slot in the insulator outer wall. Axial ion velocity profiles for four discharge voltages (100 V, 160 V, 200 V, 250 V) are measured as are radial velocity profiles in the near field plume. Internal neutral xenon axial velocity profiles are also measured at these conditions. For each test condition, the implied axial electric field is calculated from the measured ionic velocity profiles. These results are compared to previous plasma potential measurements performed with an emissive probe. The correspondence between the two sets of measurements indicates that the ionization and acceleration regions within the thruster are separated to some degree.

DTIC

Hall Thrusters; Laser Induced Fluorescence

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COMPOSITE MATERIALS

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

20070037471 Naval Air Warfare Center, China Lake, CA USA

Development of Processable High-Temperature Resins for Composite Materials (Preprint)

Guenthner, Andrew J; Wright, Michael E; Yandek, Gregory R; Marchant, Darrell; Tsotsis, Thomas K; May 29, 2007; 13 pp.; In English

Report No.(s): AD-A471063; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471063>

As part of a cooperative research and development agreement, the Navy, the Air Force, and Boeing are jointly working towards the development of novel processable polymer resins for structural applications requiring demanding thermal stability and hot-wet performance, targeting service temperatures in the range of 450 and 700 deg F. An overview of the program's approach and screening tools will be presented. Emphasis will be placed on the thermal and moisture absorption analysis techniques that are being implemented to guide resin formulation development ensuring facile liquid-molding processing, viz. resin-transfer molding (RTM) and resin film infusion (RFI). Some key findings regarding structure-property relationships are discussed.

DTIC

Composite Materials; High Temperature; Plastics; Polymers; Refractory Materials; Resin Transfer Molding; Resins; Thermal Stability

20070037554 Air Force Research Lab., Eglin AFB, FL USA

High Strain Rate Mechanical Properties of Epoxy and Epoxy-Based Particulate Composites

Jordan, Jennifer L; Richards, D W; White, Brad; Thadhani, Naresh N; Spowart, Jonathan E; Aug 2007; 35 pp.; In English
Contract(s)/Grant(s): Proj-2306

Report No.(s): AD-A471236; AFRL-MN-EG-TP-2007-7410; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471236>

Polymers and polymer-based particulate composites are becoming increasingly used in aerospace structural applications, where they experience complex, non-static loads. Correspondingly, the high strain rate mechanical properties are of increasing importance. This paper investigates the properties of epoxy - bisphenol-A/diethanolamine epoxy (Epon 826/DEA) - and epoxy-based particulate composites across strain rates from $10(-3)$ to $10(5)$ /s. The samples were tested using Instron, traditional split Hopkinson pressure bars (SHPBs) and a miniaturized SHPB for ultra-high strain rates. Additionally, the epoxy samples are tested with dynamic mechanical analysis to look at the effects of time-temperature superposition on the strain rate effects in the samples. The results of the testing are compared to the Hasan-Boyce model for polymers, which has shown good agreement with other epoxy studies, to develop constitutive equations for these materials.

DTIC

Composite Materials; Epoxy Matrix Composites; Epoxy Resins; Mechanical Properties; Particulates; Strain Rate

20070037901 Martin Marietta Energy Systems, Inc., Oak Ridge, TN USA

Ceramic Technology for Advanced Heat Engines Project Semiannual Progress Report for April Through September 1986

Johnson, D R; Mar 1987; 362 pp.; In English

Contract(s)/Grant(s): DE-AC05-84OR21400

Report No.(s): AD-A471601; ORNL/TM-10308; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Ceramics; Heat Engines

20070038334 NASA Langley Research Center, Hampton, VA, USA

An Engineering Solution for Solving Mesh Size Effects in the Simulation of Delamination with Cohesive Zone Models
FROM; Turon, A.; Davila, C. G.; Camanho, P. P.; Costa, J.; [2007]; 57 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): MAT2003-09768-C03-01; BR01/09; 23-064-30-22; Copyright; Avail.: CASI: [A04](#), Hardcopy

This paper presents a methodology to determine the parameters to be used in the constitutive equations of Cohesive Zone Models employed in the simulation of delamination in composite materials by means of decohesion finite elements. A closed-form expression is developed to define the stiffness of the cohesive layer. A novel procedure that allows the use of coarser meshes of decohesion elements in large-scale computations is also proposed. The procedure ensures that the energy dissipated by the fracture process is computed correctly. It is shown that coarse-meshed models defined using the approach proposed here yield the same results as the models with finer meshes normally used for the simulation of fracture processes.

Author

Simulation; Engineering; Mathematical Models; Grid Generation (Mathematics); Cohesion; Mechanical Properties; Delaminating

20070038346 NASA Langley Research Center, Hampton, VA, USA

A Semi-Analytical Method for Determining the Energy Release Rate of Cracks in Adhesively-Bonded Single-Lap Composite Joints

Yang, Charles; Sun, Wenjun; Tomblin, John S.; Smeltzer, Stanley S., III; [2007]; 34 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS1-03056; NSF -EIA-02-16178; NSF EPS-02-36913; 23-800-92-45; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038346>

A semi-analytical method for determining the strain energy release rate due to a prescribed interface crack in an adhesively-bonded, single-lap composite joint subjected to axial tension is presented. The field equations in terms of displacements within the joint are formulated by using first-order shear deformable, laminated plate theory together with

kinematic relations and force equilibrium conditions. The stress distributions for the adherends and adhesive are determined after the appropriate boundary and loading conditions are applied and the equations for the field displacements are solved. Based on the adhesive stress distributions, the forces at the crack tip are obtained and the strain energy release rate of the crack is determined by using the virtual crack closure technique (VCCT). Additionally, the test specimen geometry from both the ASTM D3165 and D1002 test standards are utilized during the derivation of the field equations in order to correlate analytical models with future test results. The system of second-order differential field equations is solved to provide the adherend and adhesive stress response using the symbolic computation tool, Maple 9. Finite element analyses using J-integral as well as VCCT were performed to verify the developed analytical model. The finite element analyses were conducted using the commercial finite element analysis software ABAQUS. The results determined using the analytical method correlated well with the results from the finite element analyses.

Author

Adhesive Bonding; Adhesives; Mathematical Models; Crack Closure; Composite Materials; Lap Joints; Strain Energy Release Rate

20070038347 NASA Langley Research Center, Hampton, VA, USA

Improving Strength of Postbuckled Panels Through Stitching

Jegley, Dawn C.; [2007]; 34 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038347>

The behavior of blade-stiffened graphite-epoxy panels with impact damage is examined to determine the effect of adding through-the-thickness stitches in the stiffener flange-to-skin interface. The influence of stitches is evaluated by examining buckling and failure for panels with failure loads up to 3.5 times greater than buckling loads. Analytical and experimental results from four configurations of panel specimens are presented. For each configuration, two panels were manufactured with skin and flanges held together with through-the-thickness stitches introduced prior to resin infusion and curing and one panel was manufactured with no stitches holding the flange to the skin. No mechanical fasteners were used for the assembly of any of these panels. Panels with and without low-speed impact damage were loaded to failure in compression. Buckling and failure modes are discussed. Stitching had little effect on buckling loads but increased the failure loads of impact-damaged panels by up to 30%.

Author

Panels; Buckling; Mechanical Properties; Failure Modes; Graphite-Epoxy Composites; Fasteners

20070038456 Air Force Research Lab., Eglin AFB, FL USA

Multiscale Modeling of Particle-Solidification Front Dynamics, Part 3: Theoretical Aspects and Parametric Study (Preprint)

Garvin, Justin W; Yang, Yi; Udaykumar, H S; Sep 2007; 27 pp.; In English

Report No.(s): AD-A471782; AFRL-MN-EG-TP-2007-7414; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471782>

The development of the solidified microstructure in metal-matrix composites depends on complex interactions between non-planar solidification fronts and multiple particles. The problem is multiscale in nature; the motion of the particle (under the action of a nano-scale disjoining pressure force and a micro-scale viscous drag force) is dynamically coupled with the developing solidification front morphology, which is dependent on a variety of thermal conditions. Using computational techniques discussed in parts I and II, this paper seeks to describe the complicated nonlinear parametric dependencies of the phenomenon. The effects of four of the most important parameters in the particle-solidification front interaction are investigated, i.e. the Hamaker constant, the particle size, the thermal conductivity ratio of the particle to the melt, and the solid-liquid interfacial free energy. By performing simulations using the multiscale approach the dependencies of the critical velocity on these four parameters is clarified.

DTIC

Models; Solidification

20070038478 2Phase Technologies, Inc., Santa Clara, CA USA

Developing High-Temperature Water-Soluble Coatings for Reconfigurable Tooling Materials-PREPRINT

Calvert, George; Cao, Kevin J; Jacobson, Ted; Clements, Linda; Luo, Shen-Yi; Kim, Kwang J; O'Toole, Brendan; Jul 2007; 12 pp.; In English

Contract(s)/Grant(s): FA8650-06-M-5315; Proj-3005

Report No.(s): AD-A471834; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471834>

Report delivered under SBIR contract for topic AF06-115. High-Temperature water-soluble coatings are under development for the reformable state-change tooling materials of 2Phase Technologies' rapid, low-cost reconfigurable tooling systems (RTS). Such coatings can provide surface finish, impermeability, and improved structural properties for these materials. This paper describes the development of such coatings, including the investigation of chemical modification and mechanical reinforcement as well as the suitability of the coatings in elevated-temperature use. The coatings developed are based upon the same binder used for the tooling materials in the current commercial 2Phase reconfigurable tooling systems. Coatings solution properties, including solution density, pH values, and wet ability, were measured at different binder compositions. In addition, optical microscopy was employed to evaluate the coating texture. The paper describes the high-quality coatings obtained and the approach to further development.

DTIC

Coatings; Composite Materials; High Temperature; Tooling; Water

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*.

20070036799 NASA Glenn Research Center, Cleveland, OH, USA

Synthesis and Characterization of Ru(II) Tris(1,10-phenanthroline)-Electron Acceptor Dyads Incorporating the 4-benzoyl-N-methylpyridinium Cation or N-Benzyl-N'-methyl-viologen. Improving the Dynamic Range, Sensitivity and Response Time of Sol-Gel Based Optical Oxygen Sensors

Leventis, Nicholas; Rawashdeh, Abdel-Monen M.; Elder, Ian A.; Yang, Jinhua; Dass, Amala; Sotiriou-Leventis, Chariklia; Chemical Materials; 2004; Volume 16, No. 8, pp. 1493-1506; In English

Contract(s)/Grant(s): NNC3-1064; NCC3-1064; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1021/cm034999b>

The title compounds (1 and 2, above) were synthesized by Sonogashira coupling reactions of appropriate Ru(II) complexes with the electron acceptors. Characterization was conducted in solution and in frozen matrices. Finally, the title compounds were evaluated as dopants of sol-gel materials. It was found that the intramolecular quenching efficiency of 4-benzoyl-N-methylpyridinium cation in solution depends on the solvent: photoluminescence is quenched completely in CH₃CN, but not in methanol or ethanol. On the other hand, intramolecular emission quenching by 4-benzyl-N-methyl viologen is complete in all solvents. The difference between the two quenchers is traced electrochemically to the solvation of the 4-benzoyl-N-methylpyridiniums by alcohol. In frozen matrices or adsorbed on the surfaces of silica aerogel, both Ru(II) complex/electron acceptor dyads of this study are photoluminescent, and the absence of quenching has been traced to the environmental rigidity. When doped aerogels are cooled at 77 K, the emission intensity increases by approximately 4x, and the spectra shift to the blue, analogous to what is observed with Ru(II) complexes in solutions undergoing fluid-to-rigid transition. However, in contrast to frozen solutions, the luminescent moieties in the bulk of aerogels kept at low temperatures are still accessible to gas-phase quenchers diffusing through the mesopores, leading to more sensitive platforms for sensors than other room-temperature configurations. Thus the photoluminescence of our Ru(II) complex dyads adsorbed on aerogel is quenchable by O₂ both at room temperature and at 77 K. Furthermore, it was also found that O₂ modulates the photoluminescence of aerogels doped with 4-benzoyl -N-methylpyridinium-based dyads over a wider dynamic range compared with aerogels doped with either our vislogen-based dyads or with Ru(II) tris(1,10-phenanthroline) itself.

Author

Aerogels; Doped Crystals; Dyadics; Optical Measuring Instruments; Oxygen; Sol-Gel Processes; Gas Detectors

20070037468 Texas Technological Univ., Lubbock, TX USA

Preparation of Optoelectronic Devices Based on AlN/AlGaN Superlattices

Holtz, M; Kipshidze, G; Chandolu, A; Yun, J; Borisov, B; Kuryathov, V; Zhu, K; Chu, S N; Nikishin, S A; Temkin, H; Jan 2002; 7 pp.; In English

Contract(s)/Grant(s): ECS09979240; ECS-9871290

Report No.(s): AD-A471059; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471059>

We present results on growth and fabrication experiments of AlN/AlGaN superlattices for ultraviolet 'UV' optoelectronic devices. Superlattices with extremely short periods have been studied. The AlN 'barrier' layers are 0.5 nm thick, and the Al_xGa_{1-x}N 'wells' are 1.25 nm thick, with $x \sim 0.08$. This combination gives an average AlN mole fraction of 0.63 across one full period. The superlattice periods, AlN mole fractions, and energy gaps are determined using TEM, X-ray diffraction, and optical reflectance. They are all consistent with each other. For device fabrication, p-i-n structures are grown doped with Si 'n-type' and Mg 'p-type'. The acceptor activation energy of ~ 0.2 eV is found. Mesa structures are plasma etched using chlorine chemistry. Etch rates of AlN are $\sim 1/3$ those of GaN under identical circumstances. Etch rates of 250 nm/min are used for the device structures. A light emitting diode, with primary emission at 280 nm is reported, and a detector with sensitivity edge at 260 nm are reported.

DTIC

Acceptor Materials; Aluminum Nitrides; Electron Transfer; Electro-Optics; Gallium Nitrides; Optical Properties; Optoelectronic Devices; Superlattices

20070037490 Army Research Lab., Aberdeen Proving Ground, MD USA

Measured Mass-Normalized Optical Cross Sections For Aerosolized Organophosphorus Chemical Warfare Simulants

Gurton, Kristan P; Felton, Melvin; Dahmani, Rachid; Ligon, David; Aug 2007; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471092; ARL-TR-4220; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471092>

We present newly measured results of an ongoing experimental program established to measure optical cross sections in the mid and long wave infrared for a variety of chemical and biologically based aerosols. For the present study we consider only chemically derived aerosols, and in particular, a group of chemical compounds often used as simulants for the detection of extremely toxic organophosphorus nerve agents. These materials include; diethyl methylphosphonate (DEMP), dimethyl methylphosphonate (DMMP), diisopropyl methylphosphonate (DIMP), and diethyl phthalate (DEP). As reported in a prior study, we combine two optical techniques well suited for aerosol spectroscopy (i.e., flow-through photoacoustics and FTIR emission spectroscopy), to measure in situ the absolute extinction and absorption cross sections over a variety of wavelengths spanning the IR spectral region from 3 to 13 μ m. Aerosol size distribution(s), particle number density, and dosimetric measurements are recorded simultaneously in order to present optical cross sections that are aerosol mass normalized, i.e., m²/gram. Photoacoustic results conducted at a series of CO₂ laser lines, compare well with measured broadband FTIR spectral extinction. Both FTIR and photoacoustic data also compare well with Mie theory calculations based on measured size distributions and previously published complex indices of refraction.

DTIC

Aerosols; Chemical Warfare; Signal to Noise Ratios

20070037503 Air Force Research Lab., Edwards AFB, CA USA

Mechanistic Liquid State Thermochemical Decomposition of Neat 1,3,5,5-Tetranitrohexahydropyrimidine (DNNC) and Its DNNC-d₂, DNNC-d₄, DNNC-d₆ Structural Isotopomers: Entering the DNNC Molecule (Preprint)

Shackelford, S A; Menapace, J A; Golden, J F; Jan 9, 2007; 52 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A471115; AFRL-PR-ED-JA-2007-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471115>

Global kinetics for the liquid state thermochemical decomposition of neat 1,3,5,5-tetranitrohexahydropyrimidine (DNNC), perdeuterio-labeled DNNC-d₆, and partially deuterium-labeled DNNC-d₂ and DNNC-d₄ isotopomers were obtained by isothermal differential scanning calorimetry (IDSC). Molecular kinetic deuterium isotope effect (KDIE) values obtained with DNNC and DNNC-d₆ from 174 to 194 deg. C revealed that C-H bond rupture regulates both an endothermic catalytic initiation and the exothermic propagation of the liquid thermochemical decomposition process. Using IDSC-based

KDIE comparisons with the DNNC-d2, DNNC-d4, and DNNC-d6 isotopomers, a more detailed chemical structure/mechanistic relationship emerged by entering the interior of the DNNC molecule. Here structure kinetic KDIE results showed the rate-controlling C-H bond rupture has its origin at the non-equivalent C-2 methylene group sandwiched between the two nitrated DNNC nitrogen ring atoms, versus at the chemically equivalent C-4 and C-6 methylene ring positions located elsewhere in the DNNC structure. Elucidation of such mechanistic features should aid in the structural design of new high energy compounds with improved thermochemical properties. A 170.0 kJ/mol activation energy appeared for the endothermic induction period, and a lower 104.2 kJ/mol activation energy was determined for the exothermic acceleratory portion of the DNNC decomposition process. The global neat liquid and solid state thermochemical decomposition processes for DNNC also are compared.

DTIC

Chemical Bonds; Decomposition; Kinetics; Reaction Kinetics; Thermochemistry

20070037504 Air Force Research Lab., Edwards AFB, CA USA

Polynitrogen/Nanoaluminum Surface Interactions (Challenge Project C2V) (Preprint)

Boatz, Jerry A; Sorescu, Dan C; May 8, 2007; 8 pp.; In English

Contract(s)/Grant(s): Proj-5026

Report No.(s): AD-A471116; AFRL-PR-ED-TP-2007-273; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471116>

First-principles density functional theory (DFT) calculations using the generalized gradient approximation (GGA) have been conducted to study the adsorption of a series of high-nitrogen compounds of increasing sizes and complexity on the Al(111) surface. The calculations employ periodic slab models with 4 Al layers, ranging in size from (3x3) to (7x7) surface unit cells, and containing up to 196 Al atoms. Complementary quantum chemical calculations, utilizing DFT and second-order perturbation theory methods, of the ground state potential energy surfaces of the corresponding polynitrogen/high nitrogen species in the absence of the aluminum surface also have been performed. For the set of chemical species N_x ($x=1,5$), NH_x ($x=1-3$), $N2H_x$ ($x=1-4$) and $N3H$, $N3H3$ and $N4H4$ the adsorption configurations at different surface sites and the corresponding binding energies have been determined. This analysis has been further extended to high-nitrogen compounds $N5H$ and $N6H2$. For these two systems it was found that the initial bonding to the surface takes place through a molecular mechanism (nondissociatively) with involvement of single or multiple N atoms of the molecule. However, dissociation on the surface can take place with small activation energies. This set of calculations has been further extended to include 1,3,5-triazene and 1,2,3-triazine ($C3H3N3$) as well as larger substituted triazene systems such as $C9N30$ and $C15N18$. For these large systems it was found that bonding takes place through multiple N centers with formation of highly strained and deformed adsorption configurations. In a number of instances the adsorption takes place dissociatively with $N2$ elimination.

DTIC

Nitrogen Compounds; Quantum Chemistry; Surface Reactions

20070037505 California Univ., San Diego, La Jolla, CA USA

Atomic Spectral Methods for Molecular Electronic Structure Calculations: Atomic-Pair Representations of Aggregate Hamiltonian Matrices (Preprint)

Langhoff, P W; Hinde, R J; Mills, J D; Boatz, J A; Jan 1, 2007; 60 pp.; In English

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

Report No.(s): AD-A471118; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471118>

New methods which avoid the repeated constructions of aggregate Hamiltonian matrices over antisymmetric basis states generally required in conventional calculations of adiabatic potential energy surfaces are reported for ab initio studies of the structures, spectra, and chemical reactions of molecules and other forms of matter. A representational basis in the form of an outer spectral product of atomic eigenstates, employed in the absence of overall electron antisymmetry, is shown to facilitate development of an exact atomic-pair expression for aggregate Hamiltonian matrices. Unphysical (no-Pauli) eigenstates spanned by the atomic product basis are identified and eliminated by a unitary transformation of the Hamiltonian matrix obtained from the matrix representative of the aggregate electron antisymmetrizer. Hermitian atomic and atomic-pair interaction matrices are defined which individually have appropriate asymptotic separation limits and can be constructed once and for all employing unitary transformations of antisymmetric adiabatic diatomic eigenstates and associated potential energy curves. The aggregate Hamiltonian matrix constructed in this way includes the effects of overall electron antisymmetry and incorporates Wigner rotation matrices for representation of all angular dependencies. A particular implementation of the theory

which explicitly enforces the limit of closure in spectral-product calculations is seen to correspond to adoption of canonically orthogonalized linearly-independent antisymmetrized diatomic states obtained from conventional computational procedures.
DTIC

Aggregates; Atoms; Chemical Reactions; Electronic Structure; Hamiltonian Functions; Molecular Dynamics; Molecular Structure; Spectral Methods; Surface Reactions

20070037511 Texas Technological Univ., Lubbock, TX USA

Micro-Raman Scattering From Hexagonal GaN, AlN, and Al_xGa_{1-x}N Grown on (111) Oriented Silicon: Stress Mapping of Cracks

Ramkumar, C; Prokofyeva, T; Seon, M; Holtz, M; Choi, K; Yun, J; Nikishin, S A; Temkin, H; Jan 2001; 7 pp.; In English
Contract(s)/Grant(s): F19628-99-0013

Report No.(s): AD-A471124; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471124>

We report post-growth micro-Raman stress mapping of cracks in GaN, AlN, and Al_xGa_{1-x}N grown on (111) oriented silicon. Cracks with an average spacing of ~ 100 μm are observed. These cracks are categorized into two types. The first type of crack propagates through the epilayer, and several microns deep into the substrate and is observed in all the samples investigated. The second type cracks epilayer only and is observed only in GaN. The micro-Raman stress mapping of the first type of crack shows that the epilayers are under biaxial tensile (< 0) stress and the silicon substrate is under compressive (> 0) stress far away from the cracks. The stress in the epilayers as well the substrate is found to relax from the equilibrium (far away from the cracks) value of -0.5 GPa (AlN), -0.16 GPa (GaN), -0.6 GPa (Al_xGa_{1-x}N) and 0.36 GPa (Si) as the crack position is approached. Partial relaxation is observed to occur over a range of 10 μm. At the crack position, the epilayers and the substrate are relaxed to nearly zero stress values. The stress mapping of the second type of crack reveals that the substrate is completely relaxed (stress is close o zero) far away from the cracks. At the crack position the GaN epilayer is partially relaxed from -0.2 GPa to -0.08 GPa, while the silicon substrate is seen to be under tensile stress of -0.39 GPa. The stress map of epilayers is well described by the distributed force model for both types of cracks. Furthermore, the calculated stress profiles of cracked and uncracked substrate using the above mentioned model are in excellent agreement with the experimental data.

DTIC

Aluminum Nitrides; Cracks; Gallium Nitrides; Raman Spectra; Raman Spectroscopy; Silicon

20070037513 University of Southern California, Los Angeles, CA USA

Synthesis and Characterization of z-N₃NFO⁺ and e-N₃NFO⁺ (Preprint)

Wilson, William W; Haiges, Ralf; Christe, Karl O; Boatz, Jerry; Jan 25, 2007; 21 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A471126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471126>

Only three well characterized stable nitrogen fluoride oxide molecules, FNO, FNO₂ and NF₃O, and one ion, NF₂O⁺, are known in which the fluorine and oxygen atoms are directly bonded to the nitrogen atom. In this paper, we report the synthesis and characterization of N₃NOF⁺, a novel stable nitrogen fluoride oxide cation which can exist in the form of two different configurational isomers.

DTIC

Cations; Fluorides; Nitrogen Oxides

20070037514 Air Force Research Lab., Edwards AFB, CA USA

Ultrahydrophobic Fluorinated Polyhedral Oligomeric Silsesquioxanes (F-POSS) (Preprint)

Mabry, Joseph M; Iacono, Scott T; Viers, Brent D; Vij, Ashwani; Jan 25, 2007; 11 pp.; In English

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

Report No.(s): AD-A471127; AFRL-PR-ED-JA-2007-055; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471127>

Recently, significant attention has been drawn to preparing low surface energy materials inspired by naturally evolved biological systems possessing a high degree of ultrahydrophobicity. Specifically, the lotus leaf exhibits an inherent

self-cleaning mechanism resulting from micron-sized waxy nodes protruding from its surface so that water is naturally repelled removing any foreign debris. This remarkable cleansing mechanism, coined the 'lotus effect,' has been artificially mimicked to produce materials with pronounced ultrahydrophobicity. Notable examples include surface patterning, molecular self-assembly, deposition, and etching. However, these examples require aggressive chemical surface treatments, high temperature post-surface modification, elaborate patterning, or necessitate the need for limitedly accessible deposition equipment. For such reasons, there exists a demand to construct ultrahydrophobic materials inspired by nature that are easy to prepare on a large scale.

DTIC

Chemical Reactions; Nanoparticles; Surface Reactions; Water

20070037517 Michigan Univ., Ann Arbor, MI USA

Relative Inhibitory Potencies of Chlorpyrifos Oxon, Chlorpyrifos Methyl Oxon, and Mipafos for Acetylcholinesterase Versus Neuropathy Target Esterase

Kropp, T J; Richardson, R J; Jan 2003; 15 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0388

Report No.(s): AD-A471136; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471136>

The relative inhibitory potency (RIP) of an organophosphorus (OP) inhibitor against acetylcholinesterase (AChE) versus neuropathy target esterase (NTE) is $[k_i(\text{AChE})/k_i(\text{NTE})]$, where k_i is the bimolecular rate constant of inhibition. RIPs >1 correlate with the inability of ageable OP inhibitors or their parent compounds to produce OP induced delayed neurotoxicity (OPIDN) at doses $<LD_{50}$. The RIP for chlorpyrifos oxon (CPO) is $\gg 1$ for enzymes from hen brain homogenate, and the parent compound, chlorpyrifos (CPS), cannot produce OPIDN in hens at sublethal doses. This study was done to test the hypothesis that the RIP for chlorpyrifos methyl oxon (CPMO), is $\gg 1$ and $>RIP$ for CPO. Mipafos (MIP) was included for comparison. Hen brain microsomes were used as the enzyme source, and k_i (mean SE, $M^{-1} \text{min}^{-1}$) determined for AChE and NTE ($n = 3, 4$ experiments, respectively). k_i values for CPO, CPMO, and MIP against AChE were 17.8 0.3, 10.9 0.1, and 0.00429 0.00001, respectively, and for NTE were 0.0993 0.0049, 0.0582 0.0013, and 0.00498 0.00006, respectively. Corresponding RIPs for CPO, CPMO, and MIP were 179 9, 187 4, and 0.861 0.011, respectively. Thus, RIPs for CPO and CPMO are comparable, markedly different from that for MIP, and $\gg 1$, indicating that CPS methyl, like CPS, could not cause OPIDN at sublethal doses.

DTIC

Acetyl Compounds; Cholinesterase; Enzymes; Methyl Compounds; Organic Phosphorus Compounds; Targets; Toxicity

20070037531 University of Southern California, Los Angeles, CA USA

Three-Dimensional Microstructural Characterization of GaN Nonplanar Substrate Laterally Epitaxially Overgrown by Metalorganic Chemical Vapor Deposition

Zhou, Wei; Ren, Dawei; Dapkus, P D; Jul 20, 2005; 11 pp.; In English

Report No.(s): AD-A471162; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471162>

Transmission electron microscopy techniques are applied to investigate three-dimensional (3D) microstructures of the GaN nonplanar substrate selectively grown by metalorganic chemical vapor deposition. Two-step lateral epitaxial overgrowth (LEO) has been utilized and optimized to fabricate fully coalesced nonplanar mesa substrate templates with the trapezoidal cross-section. All threading dislocations (TDs) penetrating beyond the two adjacent mask windows are engineered to bend 90° in the lower TD bending layer after the first step of growth. The dislocations, which approach the GaN mesa top, are predominantly perfect a type dislocations with Burgers vectors of $1/3 \langle 11\bar{2}0 \rangle$ and a density of $8 \times 10^7 \text{ cm}^{-2}$, which is reduced by three orders of magnitude compared with that of bulk GaN. The spatial distribution of different types of dislocations in the LEO nonplanar substrate is demonstrated herein. The main sources of a type dislocations in the post-bending layer are byproducts of dislocation reactions occurring at the TD bending layer.

DTIC

Electron Microscopy; Epitaxy; Gallium Nitrides; Metalorganic Chemical Vapor Deposition; Microstructure; Organometallic Compounds; Substrates

20070037739 California Inst. of Tech., Pasadena, CA USA

Ultra-High-Q Microcavity Operation in H₂O and D₂O

Armani, A M; Armani, D K; Min, B; Vahala, K J; Spillane, S M; Oct 7, 2005; 4 pp.; In English
Report No.(s): AD-A471296; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Optical microcavities provide a possible method for boosting the detection sensitivity of biomolecules. Silica-based microcavities are important because they are readily functionalized, which enables unlabeled detection. While silica resonators have been characterized in air, nearly all molecular detections are performed in solution. Therefore, it is important to determine their performance limits in an aqueous environment. In this letter, planar microtoroid resonators are used to measure the relationship between quality factor and toroid diameter at wavelengths ranging from visible to near-IR in both H₂O and D₂O, and results are then compared to predictions of a numerical model. Quality factors (Q) in excess of 10(exp 8), a factor of 100 higher than previous measurements in an aqueous environment, are observed in both H₂O and D₂O.

DTIC

Heavy Water; Optical Properties; Q Factors; Resonators; Silicon Dioxide; Water

20070037745 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Present State of CBRN Decontamination Methodologies (Stand van Zaken CBRN- Ontsmettingsmethodieken)

Boone, C M; Mar 2007; 31 pp.; In Dutch; In Dutch

Contract(s)/Grant(s): Proj-014.17718

Report No.(s): AD-A471314; TNO-DV-2007-A028; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Decontamination is defined as the removal and/or neutralization of chemical, biological, radiological and/or nuclear (CBRN) contamination. In this report, the present state of the art of decontamination technologies is discussed, divided into physical, chemical, enzymatic and energetic decontamination. Advantages and disadvantages of the available methods are given, as well as the applicability towards CBRN agents and tox4c industrial chemicals (TICs) and the commercial status. The report will be yearly updated (from 2006-2009) with the latest developments.

DTIC

Biological Effects; Biological Weapons; Chemical Warfare; Contamination; Decontamination; Nuclear Warfare; Radiology; Warfare

20070037759 Air Force Research Lab., Hanscom AFB, MA USA

Strain-free Ge/GeSiSn Quantum Cascade Lasers Based on L-Valley Intersubband Transitions

Soret, R A; Sun, G; Cheng, H; Menendez, J; Khurgin, J; Jan 2007; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2305

Report No.(s): AD-A471348; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The authors propose a Ge/Ge_{0.76}Si_{0.19}Sn_{0.05} quantum cascade laser using intersubband transitions at L valleys of the conduction band which has a clean offset of 150 meV situated below other energy valleys Gamma and X. The entire structure is strain-free because the lattice-matched Ge and Ge_{0.76}Si_{0.19}Sn_{0.05} layers are to be grown on a relaxed Ge buffer layer on a Si substrate. Longer lifetimes due to the weaker scattering of nonpolar optical phonons reduce the threshold current and potentially lead to room temperature operation.

DTIC

Germanium; Lasers; Quantum Cascade Lasers; Quantum Theory; Silicon; Valleys

20070037763 California Inst. of Tech., Pasadena, CA USA

Microfluidic Integration on Detector Array for Absorption and Fluorescence Micro-Spectrometers

Adam, Mark L; Enzelberger, Markus; Quake, Stephen; Scherer, Axel; Jun 1, 2005; 8 pp.; In English

Report No.(s): AD-A471353; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe a new approach for miniaturizing spectrometers by combining replica molded elastomeric micro-channels with filtered silicon detector arrays. Elastomers are excellent transparent materials, which provide hermetic seals to silicon dioxide and allow sensitive absorption and fluorescent spectroscopy in the visible and near-UV wavelength range. When integrated on dense detector arrays, such spectroscopy can be conducted on picoliter sample volumes. Elastomeric fluidic systems also permit easy integration of spectroscopic measurements with control functions for reaction monitoring and biological drug delivery and analysis systems. Here we present some results from our first experiments in which we explore the sensitivity of spectroscopic measurements within microfluidic channels. We show that multi-channel spectrometers defined

on complementary metal oxide semiconductor (CMOS) silicon detector arrays can be used to obtain absorption signatures even for dilute dye solutions.

DTIC

Absorption; Absorption Spectra; Antenna Arrays; Elastomers; Fluorescence; Microfluidic Devices; Silicon Dioxide; Spectrometers

20070037788 Air Force Research Lab., Wright-Patterson AFB, OH USA

Improved Electrical Properties of Epoxy Resin With Nanometer-Sized Inorganic Fillers (Postprint)

Horwath, John C; Schweickart, Daniel L; Garcia, Guido; Klosterman, Donald; Galaska, Mary; Schrand, Amanda; Walko, Lawrence C; May 2006; 5 pp.; In English

Contract(s)/Grant(s): Proj-3145

Report No.(s): AD-A471404; AFRL-PR-WP-TP-2007-231; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nanometer-sized inorganic fillers are increasingly used as reinforcing materials for mechanical or thermal property improvement of polymers. Improvements in mechanical modulus or heat deflection temperature are often realized. These fillers may also improve some electrical properties such as corona endurance or dielectric breakdown voltage in polymers. In compact high voltage power supplies, epoxy resins are often the potting material of choice in manufacturing processes. This is often true for applications requiring a robust or position-insensitive insulation system design, such as mobile communications equipment or aerospace flight vehicles. Nanometer-sized inorganic fillers in epoxy resins can result in improved mechanical and electrical performance, without affecting the processes for component manufacturing. In our previous work, polyhedral oligomeric silsesquioxane (POSS) was selected as the nanometer-sized inorganic filler of interest. POSS-filled epoxies showed a five times improvement in ac corona lifetime for selected POSS-epoxy blends compared to unloaded epoxy.

DTIC

Dielectric Properties; Electric Potential; Electrical Properties; Epoxy Resins; Fillers

20070037800 Inha Univ., Inchon, Korea, Republic of

Novel Form Birefringence Modeling for an Ultracompact Sensor in Porous Silicon Films Using Polarization Interferometry

O, Beom-Hoan; Choi, Chul-Hyun; Jo, Soo-Beom; Lee, Min-Woo; Park, Dong-Gue; Kang, Byeong-Gwon; Kim, Sun-Hyung; Liu, Rong; Li, Yang Y; Sailor, Michael J; Fainman, Yeshaiahu; Jun 1, 2005; 4 pp.; In English

Report No.(s): AD-A471427; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The optical form birefringence in porous silicon films is measured by analyzing the transmitted interference intensity of a polarization interferometer. A novel form birefringence model called 'boundary condition (BC) model' for porous materials is introduced and evaluated experimentally against samples of porous silicon films. The variation of optical indexes of refraction vs the porosity in silicon films agrees with the calculated values of $n(\text{sub } 0)/n(\text{sub } e)$ within 1% error using the BC model, in contrast to the ~15% error using effective medium approximation model.

DTIC

Birefringence; Interferometers; Interferometry; Porosity; Porous Materials; Porous Silicon; Silicon; Silicon Films

20070037802 Inha Univ., Inchon, Korea, Republic of

Vapor Sensor Realized in an Ultracompact Polarization Interferometer Built of a Freestanding Porous-Silicon Form Birefringent Film

O, Beom-Hoan; Liu, Rong; Li, Yang Y; Sailor, Michael J; Fainman, Yeshaiahu; Jun 1, 2005; 4 pp.; In English

Report No.(s): AD-A471430; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Abstract A novel vapor sensor that uses polarization interferometry in a form birefringent porous-silicon film is introduced, analyzed, and experimentally characterized. Simulations and analysis of accuracy, versatility, stability, and control of dynamic range of the device are provided. The simulation accurately predicts the polarization interference signal, which is used to estimate the effective refractive indexes characterizing the form birefringence of a porous-silicon film with 0.001 accuracy. The device was tested for the detection of heptane concentration in a range of 342 20 000 ppm (=2.0%).

DTIC

Birefringence; Interferometers; Interferometry; Porous Materials; Porous Silicon; Silicon; Silicon Films; Vapors

20070037806 California Univ., Santa Barbara, CA USA

1.3 micrometers Wavelength Vertical Cavity Surface Emitting Laser Fabricated by Orientation-Mismatched Wafer Bonding: A Prospect for Polarization Control

Okuno, Yae L; Geske, Jon; Gan, Kian-Giap; Chiu, Yi-Jen; DenBaars, Steven P; Bowers, John E; Jun 1, 2005; 4 pp.; In English Report No.(s): AD-A471434; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We propose and demonstrate a long-wavelength vertical cavity surface emitting laser (VCSEL) which consists of a (311)B InP-based active region and (100) GaAs-based distributed Bragg reflectors (DBRs), with an aim to control the in-plane polarization of output power. Crystal growth on (311)B InP substrates was performed under low-migration conditions to achieve good crystalline quality. The VCSEL was fabricated by wafer bonding, which enables us to combine different materials regardless of their lattice and orientation mismatch without degrading their quality. The VCSEL was polarized with a power extinction ratio of 31 dB.

DTIC

Bragg Angle; Crystal Growth; Fabrication; Gallium Arsenides; Laser Cavities; Surface Emitting Lasers; Wafers

20070037877 Air Force Research Lab., Edwards AFB, CA USA

Morphology and Phase Transitions in Styrene-Butadiene-Styrene Triblock Copolymer Grafted with Isobutyl Substituted Polyhedral Oligomeric Silsesquioxanes (Postprint)

Drazowski, Daniel B; Lee, Andre; Haddad, Timothy S; Jan 2007; 9 pp.; In English

Contract(s)/Grant(s): Proj-23030521

Report No.(s): AD-A471567; AFRL-PR-ED-JA-2006-439; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Two symmetric triblock polystyrene-butadiene-polystyrene (SBS) copolymers with different styrene content were grafted with varying amounts of isobutyl-substituted polyhedral oligomeric silsesquioxane (POSS) molecules. The POSS octamers, R'R₇Si₈O₁₂ were designed to contain a single silane functional group, R', which was used to graft onto the dangling 1,2 butadienes in the polybutadiene block and seven identical organic groups, R=isobutyl (iBu). Morphology and phase transitions of these iBu-POSS modified SBS were investigated using small angle X-ray scattering and rheological methods. It was observed that POSS with isobutyl moiety, when grafted to the polybutadiene (PB), appears to show a high affinity to stay within the PB domain; effectively, they enhance the segregation between butadiene and styrene domains. This causes a shift in the phase diagram to lower styrene content. From the rheology, we observed that values of storage modulus, G', at temperatures below the order-disorder transition increase due to the grafting of iBu-POSS. These observations lead us to conclude that the local order morphology between styrene and butadiene domains was better preserved due to the enhanced segregation forced by iBu-POSS.

DTIC

Butadiene; Copolymers; Grafting; Morphology; Phase Transformations; Polybutadiene; Styrenes; X Ray Scattering

20070037883 Pennsylvania State Univ., University Park, PA USA

Chemical Reaction Modeling for Hypervelocity Collisions between O and HCl

Ozawa, T; Levin, D A; Wysong, I J; Jan 2007; 15 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0104; HQ0006-05-C-0021; Proj-5026

Report No.(s): AD-A471577; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Treatment of chemical reactions in rarefied, nonequilibrium flows has been the subject of significant research. In some cases, proper treatment of reactions is needed to accurately predict overall shock thickness, stand-off, and heat transfer. In other cases, such as when reactants are minor species, the overall flowfield is not affected by details of the reaction model, but a particular radiation signature may be strongly affected. A case of the latter situation is the subject of the present study, and allows for a detailed examination of several issues important to chemical reaction models for rarefied, high-speed flows.

DTIC

Chemical Reactions; Collisions; Hydrochloric Acid; Molecular Dynamics; Nonequilibrium Flow

20070037884 Air Force Research Lab., Edwards AFB, CA USA

Hydrophobic and Oleophobic Fluoroalkyl Functionalized Silsesquioxane Nanostructures (Preprint)

Iacono, Scott; Grabow, Wade; Mabry, Joseph; Vij, Ashwani; Smith, Dennis; Jan 25, 2007; 14 pp.; In English

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

Report No.(s): AD-A471579; AFRL-PR-ED-JA-2007-059; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Polyhedral oligomeric silsesquioxane (POSS) compounds comprised of a functionalized silicon-oxygen core framework

have received much interest as robust nanoscale building blocks for the development of high performance materials. Notable applications include surface modified supports, semiconducting materials, atomic oxygen resistant coatings, and high use temperature composites. A plethora of POSS compounds with the general formula (RSiO_{1.5})₈ can be prepared possessing a rigid, cubic core diameter of 0.3-1.0 nm through either an acid- or base-catalyzed condensation with functionalized organosilane monomers (e.g., RSiCl₃ or RSi(OMe)₃). Derivatized nanosized POSS silicas can be incorporated into polymers assembling architectures such as, but not limited to blended composites, branched polymers, as well as incompletely condensed cages. Such hybrid organic-inorganic systems show an improvement of polymer properties such as glass transition, mechanical toughness, chemical resistance, ease of processing, fire resistance, and atomic oxygen permeability.

DTIC

Hydrophobicity; Nanostructures (Devices); Siloxanes; Surface Energy

20070037897 Alion Science and Technology Corp., Dayton, OH USA

Predicting Dose-Response Relationships of Acute Cadmium Hepatotoxicity and Metallothionein Regulation in the Rat Via In Vitro to In Vivo Extrapolation

Gearhart, Jeffery M; Todd, Diane M; Frazier, John M; Ebel, Ellen L; Eggers, Jeffrey S; Sterner, Teresa R; Feb 2006; 44 pp.; In English

Contract(s)/Grant(s): F33615-00-C-6060; Proj-2312

Report No.(s): AD-A471593; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this effort was to utilize cadmium, a known toxicant of environmental and occupational concern, to develop an understanding of the relationships between chemical kinetics (rates of chemical movement into the body) and cellular dynamics (cellular response to chemical entering the cells) in order to predict early target organ toxicity and refine/validate a biologically-based kinetic model. This effort involved three studies. The first measured cadmium kinetics over 24 hours in male Fischer 344 rats dosed intravenously with 0.0, 0.5, 1.0, 2.0 or 3.0 mg/kg Cd. Serum liver enzymes and histology were also monitored to determine the extent of hepatic damage. The second evaluated metallothionein (MT) mRNA regulation in these rats in response to the Cd toxicity. MT isoforms I and II were found to be separately regulated. In the third, male F344 rat hepatocytes were isolated and exposed to Cd in vitro at doses of 0 microM, 5 microM, 10 microM and 15 microM. MT mRNA expression in these hepatocytes was not similar to the in vivo response.

DTIC

Cadmium; Dosage; Extrapolation; In Vitro Methods and Tests; In Vivo Methods and Tests; Pharmacology; Predictions; Rats; Reaction Kinetics; Toxicity

20070037899 California Univ., Los Angeles, CA USA

Light Actuation of Liquid by Optoelectrowetting

Chiou, Pei Y; Moon, Hyejin; Toshiyoshi, Hiroshi; Kim, Chang-Jin; Wu, Ming C; Jun 1, 2005; 8 pp.; In English

Contract(s)/Grant(s): MDA972-00-1-0019

Report No.(s): AD-A471598; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Optical actuation of liquid droplets has been experimentally demonstrated for the first time using a novel optoelectrowetting (OEW) principle. The optoelectrowetting surface is realized by integrating a photoconductive material underneath a two-dimensional array of electrowetting electrodes. Contact angle change as large as 30 degrees has been achieved when illuminated by a light beam with an intensity of 65 mW/sq cm. A micro-liter droplet of deionized water has been successfully transported by a 4 mW laser beam across a 1 cm x 1 cm OEW surface. The droplet speed is measured to be 7 mm/s. Light actuation enables complex microfluidic functions to be performed on a single chip without encountering the wiring bottleneck of two-dimensional array of electrowetting electrodes.

DTIC

Actuation; Liquids; Wetting

20070038173 NASA Glenn Research Center, Cleveland, OH, USA

Redox-Active Star Molecules Incorporating the 4-Benzoylpyridinium Cation - Implications for the Charge Transfer Along Branches vs. Across the Perimeter in Dendrimer

Leventis, Nicholas; Yang, Jinua; Fabrizio, Even F; Rawashdeh, Abdel-Monem M.; Oh, Woon Su; Sotiriou-Leventis, Chariklia; Journal of American Chemical Society; 2004; Volume 126, No. 13, pp. 4094-4095; In English

Contract(s)/Grant(s): NNC3-1064; NCC3-1064; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1021/ja0390247>

Dendrimers are self-repeating globular branched star molecules, whose fractal structure continues to fascinate, challenge,

and inspire. Functional dendrimers may incorporate redox centers, and potential applications include antennae molecules for light harvesting, sensors, mediators, and artificial biomolecules. We report the synthesis and redox properties of four star systems incorporating the 4-benzoyl-N-alkylpyridinium cation; the redox potential varies along the branches but remains constant at fixed radii. Bulk electrolysis shows that at a semi-infinite time scale all redox centers are electrochemically accessible. However, voltammetric analysis (cyclic voltammetry and differential pulse voltammetry) shows that only two of the three redox-active centers in the perimeter are electrochemically accessible during potential sweeps as slow as 20 mV/s and as fast as 10 V/s. On the contrary, both redox centers along branches are accessible electrochemically within the same time frame. These results are explained in terms of slow through-space charge transfer and the globular 3-D folding of the molecules and are discussed in terms of their implications on the design of efficient redox functional dendrimers.

Author

Charge Transfer; Dendrimers; Molecules; Oxidation-Reduction Reactions; Dendritic Crystals

20070038174 NASA Glenn Research Center, Cleveland, OH, USA

Ru(II) Tris(3,8-Dibromo-1,10-Phenanthroline): A New Versatile Core for the Divergent Synthesis of Hyperbranched Systems

Sotiriou-Leventis, Chariklia; Yang, Jinhua; Duan, Penggao; Leventis, Nicholas; Synthetic Communications; 2004; ISSN 0039-7911; Volume 34, No. 19, pp. 3491-3496; In English

Contract(s)/Grant(s): NNC3-1064; NCC3-1064; 1 R15 CA82141-01A2; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1081/SCC-200030975>

We report the first synthesis of Ru(II) tris(3,8-dibromo-1,10-phenanthroline) bis(hexafluorophosphate), and we demonstrate its utility as a building core for the divergent synthesis of hyperbranched systems by coupling with phenylacetylene in the preparation of Ru tris(3,8-diphenylethynyl-1,10-phenanthroline) dihexafluorophosphate.

Author

Ruthenium Compounds; Nanostructure (Characteristics); Dendrimers; Complex Compounds

20070038377 Florida Univ., Gainesville, FL USA

Transition Metal Doped ZnO for Spintronics

Norton, David; Jul 2007; 24 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0370

Report No.(s): AD-A471606; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471606>

In this project, the properties of transition metal (TM) -doped ZnO will be investigated. The project focuses on two activities. First, the properties of ZnO doped with transition metals (Mn, Co, or Cr) and deep level impurities (Cu, As, Sn) is explored. The primary interest will be on elucidating the origin of magnetism in the TM-doped material, including understanding the role of deep level co-dopants in mediating ferromagnetism. Experiments will focus on correlating magnetic properties (Curie temperature, moment/TM dopant) with the TM and deep level dopant concentrations. Epitaxial film growth and ion implantation of single crystals will be used in these studies. Second, for the dilute magnetic semiconducting compounds, there appears to be a correlation of Curie temperature with semiconductor bandgap. In an effort to increase the Curie temperature to greater than 300 K, the properties of TM-doped (Zn,Mg)O will also be investigated, as the addition of Mg to ZnO increases the bandgap. The epitaxial films will be grown by pulsed-laser deposition. Temperature-dependent Hall and resistivity measurements will be used to determine conduction mechanisms, carrier type, and doping. SQUID magnetometry will be used to characterize the magnetic properties of transition metal doped materials.

DTIC

Curie Temperature; Doped Crystals; Epitaxy; Semiconductors (Materials); Transition Metals; Zinc Oxides

20070038391 University of Southern California, Los Angeles, CA USA

Threshold Dependence on the Spectral Alignment Between the Quantum-Well Gain Peak and the Cavity Resonance in InGaAsP Photonic Crystal Lasers

Cao, J R; Kuang, Wan; Choi, Seng-Jun; Lee, Po-Tsung; O'Brien, John D; Dapkus, P D; Jun 1, 2005; 4 pp.; In English

Contract(s)/Grant(s): DAAD19-99-1-0121; N66001-00-C-8079

Report No.(s): AD-A471624; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471624>

Lithographically defined multi wavelength photonic crystal laser arrays are reported. The dependence of the threshold

pump power on the spectral alignment between the quantum-well gain peak and the cavity resonance wavelength is investigated. This is done at, and slightly above, room temperature.

DTIC

Alignment; Cavity Resonators; Crystals; Gallium Arsenide Lasers; Gallium Phosphides; Indium Gallium Arsenides; Indium Phosphides; Quantum Wells; Spectra

20070038415 Wisconsin Univ., Madison, WI USA

Electromagnetic and Nanostructural Studies of Rare Earth Copper Oxide Grain Boundaries Grain Boundaries in High Temperature Superconductors

Larbalestier, David C; Gurevich, Alex; Oct 2006; 3 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0429

Report No.(s): AD-A471690; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471690>

There is strong Air Force interest in compact, airborne, high-power generators and klystron/gyrotron/magnetron magnets. Both applications need superconducting magnets that can operate off robust cryocoolers at temperatures near liquid nitrogen (77K). The decisive element for all such applications is the conductor from which such magnets can be made. The material of choice is YBa₂Cu₃O_{7-x}, made in the form of a multilayer tape as a Coated Conductor (CC). Such conductors are multilayers of ~50 micrometers-thick Ni-alloy to support an ~1 micrometer-thick buffer layer (for now generally Y₂O₃/YSZ/CeO₂) ~2-5 micrometers YBa₂Cu₃O_x layer, all topped by a high-conductivity, normal-metal overlayer for stabilization and protection. The single most important characteristic of any CC is the need for texture in the superconductor so that blockage of current at grain boundaries is minimized. Texture is vital, since even low angle grain boundaries partially obstruct the current, reducing the global J_c and providing significant local sources of dissipation that may induce instabilities during magnet use. Understanding why grain boundaries block current and searching for ways to mitigate the problem forms the central thrust of this work.

DTIC

Coatings; Copper Oxides; Electromagnetic Properties; Grain Boundaries; High Temperature Superconductors; Rare Earth Compounds

20070038606 Air Force Office of Scientific Research, Bolling AFB, Washington, DC USA

Army Research Office and Air Force Office of Scientific Research Contractors' Meeting in Chemical Propulsion Held in Boulder, Colorado on June 11-13, 2007

Anthenien, Ralph; Tishkoff, Julian M; Jun 2007; 163 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471886; AFRL-SR-AR-TR-07-0335; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force Office of Scientific Research (AFOSR) program in combustion and diagnostics currently is focused on five areas of study: high-speed propulsion, turbulent combustion, diagnostics, supercritical fuel behavior, and plasma-enhanced combustion. An assessment of major research needs in each of these areas is presented.

DTIC

Chemical Propulsion; Contractors; Propulsion System Configurations; Propulsion System Performance

20070038613 Southwest Research Inst., San Antonio, TX USA

Army Evaluation of JP-8 and Diesel Fuel Exposed to Anti-Detonation Material Filler (ADMFF) for Fuel Tank Effects

Wright, Bernard R; Frame, Edwin A; Sep 2005; 108 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAE07-99-C-L053-WD19

Report No.(s): AD-A471895; TFLRF-378; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Extensive laboratory research was conducted on metal mesh and organic foam products to determine their effects on fuels when placed in fuel tanks and the resulting effects to operating fuel systems. Tests done with and without mesh materials included fuel particulates, fuel elements, fuel color, fuel gum, Karl Fisher water, total acid number, jet fuel thermal oxidation test, conductivity, and lubricity (SLBOCLE BOCLE etc.). Two interestingly negative results were in the areas of lubrication and particle contaminants. All metallic mesh material had 'chaff' or particles in the matrix of the material. All mesh materials metal mesh and organic foam products produced a significant change in the measured lubricity of the output fuel. Results of

these extensive investigations did not identify any problems which could not be overcome (with additional resources) for the HMMWV and M915 FOV series military vehicles.

DTIC

Additives; Contaminants; Detonation; Diesel Fuels; Fillers; Fuel Tanks; Fuels; JP-8 Jet Fuel; Particulates

20070038637 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Fate and Transport of Tungsten at Camp Edwards Small Arms Ranges

Clausen, Jay L; Taylor, Susan; Larson, Steven L; Bednar, Anthony; Ketterer, Michael; Griggs, Chris S; Lambert, Dennis J; Hewitt, Alan D; Ramsey, Charles A; Bigl, Susan R; Aug 2007; 120 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471941; ERDC-TR-07-5; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Camp Edwards, Massachusetts, is the first of three military installations studied to assess the distribution of tungsten at small arms ranges. The study focused on three ranges at Camp Edwards. Tungsten was present in surface soils up to 2,080 mg/kg. Highest observed concentrations occurred at the berm face and decreased away from the berm in the following order: trough, target, range floor, and firing point. Tungsten concentration in surface soils at the firing point was similar to background levels, i.e., 1.5 mg/kg. Tungsten levels in subsurface soils decreased with depth with an order of magnitude or more decrease in concentration within the top 25 cm. However, samples collected at 150 cm still had tungsten levels above background. Tension lysimeters installed in the berm area had dissolved tungsten up to 400 mg/L. The 24 lysimeters did not exhibit consistent tungsten concentration trends and no trend was evident with depth, but concentration levels on the range were significantly elevated compared to background. Mean tungsten concentration for lysimeters installed in background locations was 0.09 mg/L and ranged from 0.011 to 0.169 mg/L. One of three monitoring wells sampled had tungsten with concentrations varying from 0.0044 to 0.56.

DTIC

Tungsten; Water; Wells

20070038665 Aerojet-General Corp., Sacramento, CA USA

Experimental Phase Equilibria of Selected Binary, Ternary, and Higher Order Systems. Part V. The Phase Diagram W-B-C

Rudy, Erwin; Feb 1970; 62 pp.; In English

Contract(s)/Grant(s): F33615-67-C-1513; Proj-7350

Report No.(s): AD-A472013; AFML-TR-69-117-PT-5; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ternary alloy system W-B-C was investigated experimentally by means of X-ray, melting point, DTA, and metallographic techniques on hot-pressed and heat-treated, as well as melted specimens, and a phase diagram from 1500 deg C through the melting range established. No ternary phases are formed in the system and the mutual solubilities between carbide and boride phases are small. The solid-state sections (<2000 deg C) are characterized by two phase equilibria existing between the phase pairs W₂B + W₂C, W₂B + WC, WC + WB, WB + C, W₂B₅ + C, W₂B₅ + B₄C, and WB₄ + B₄C. The two-phase equilibrium W₂B + WC is replaced by an equilibrium W₂C + WB above 2150 deg C. Fifteen ternary isothermal reactions have been found. Five are associated with pseudobinary eutectic equilibria, six with ternary eutectics and the remaining four with class II ternary four-phase reaction isotherms.

DTIC

Phase Diagrams; Refractory Materials; Ternary Systems

20070038677 Air Force Research Lab., Wright-Patterson AFB, OH USA

Nanoparticle Liquids for Reconfigurable Electronic Materials (Preprint)

MacCuspie, Robert I; Elsen, Andrea M; Patton, Steve; Jacobs, J D; Diamanti, Steve; Arlen, Michael; Voevodin, Andrey A; Vaia, Richard A; Apr 2007; 5 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A472030; No Copyright; Avail.: Defense Technical Information Center (DTIC)

High inorganic volume fraction, solventless nanoparticle liquids have many potential applications, including reconfigurable electronic materials. Materials such as conductive lubricants could find applications in MEMS devices to increase relay switch performance as one example. The ability of the conductive nanoparticles to reconfigure themselves and fill voids in damaged areas can increase the lifespan of devices where local defects can cause failure states. Solventless solid nanoparticles with liquid-like properties are an area of recent research interest. For example, Giannelis and colleagues have reported metal oxide and metal nanoparticle liquids which contain no free solvent but still can flow in a liquid-like fashion.

These materials contain large organic ligands bound to the surface of the nanoparticle through a combination of covalent and electrostatic bonds. By optimizing the attractive and repulsive forces between the nanoparticles through the surface chemistry of these organic ligands, the properties of the resulting liquids can be tailored.

DTIC

Liquids; Nanoparticles

20070038682 Army Research Lab., Aberdeen Proving Ground, MD USA

Design and Processing of Structural Composite Batteries

Wong, E L; Baechle, D M; Xu, K; Carter, R H; Snyder, J F; Wetzel, E D; Sep 2007; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472036; ARL-RP-194; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report is a reprint from the Proceedings of Society for the Advancement of Materiel and Process Engineering (SAMPE) 2007 Symposium and Exhibition held in Baltimore, MD, on 3-7 June 2007. Multifunctional structural composites are being developed to simultaneously bear mechanical loads and store electrochemical energy. These composite batteries can replace inert structural components and concurrently provide supplementary power for light load applications. Significant weight savings can be achieved by designing composite battery components, packaging, electrolyte, separator, and/or electrodes with built-in structural and energy efficiency. Prior efforts have focused only on utilizing structural packaging with traditional battery components. In this approach, novel electrolyte and electrode materials are being developed to optimize both electrochemical and mechanical proper properties. Solvent-free structural vinyl ester polymer electrolytes are being formulated to achieve necessary mechanical strength while enabling ion conductivity. Structural carbon anodes and cathode materials deposited on metal substrates are being developed as electrode components. Charge/discharge cycling is used to evaluate electrochemical capacity of the electrode materials, and tensile tests are used to evaluate their mechanical properties. Several different structural separator materials are being investigated as well. All of these components allow the use of moldable, scalable, and cost-effective composite processing techniques.

DTIC

Electric Batteries; Electrochemistry; Electrolytes; Mechanical Properties; Structural Design

20070038728 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Processing of Training Range Soils for the Analysis of Energetic Compounds

Hewitt, Alan; Bigl, Susan; Walsh, Marianne; Brochu, Sylvie; Bjella, Kevin; Lambert, Dennis; Sep 2007; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472096; ERDC/CRREL-TR-07-15; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Large soil samples are often necessary to represent areas where analytes are distributed as particulates. Proper processing of these large samples impose additional time, space, and equipment requirements on the laboratory community servicing environmental programs to investigate military training ranges. Part of this study evaluated the robustness of two methods used to process large soil samples for the determination of energetic munitions residues whole sample mechanical grinding (comminution) and solvent dissolution. Both methods have been used successfully to reduce subsampling variance for samples collected on training ranges where particles of energetic residues have accumulated. However, two energetic compounds frequently detected in such samples nitroglycerin (NG) and 2,4-dinitrotoluene (2,4-DNT) may be susceptible to evaporative losses during solvent dissolution. Robustness experiments involved both lab-spiked and field-collected soils with various concentrations of energetic residue. An experiment utilizing field-collected soils involved the use of a rotary splitter. Even with this highly regarded equipment, the samples could not be split consistently, preventing a direct comparison of the two techniques in soils with residue concentrations less than 40 mg/kg. Two other investigations evaluated sample holding times and cross-contamination resulting from grinding processes. The results indicated that energetic compounds typically found on military training ranges were stable in air-dried soils for periods in excess of 53 days when stored in the dark at room temperature. A slight amount of cross contamination from grinding was detectable using gas chromatography. The concentrations were below detectable levels when using liquid chromatography and were eliminated by adding a step of soaking the grinding bowl in a sonic bath filled with dilute cleaning detergent to the cleaning protocol.

DTIC

Contamination; Education; Liquid Chromatography; Soil Sampling; Soils

20070038928 New Jersey Inst. of Tech., Newark, NJ USA

Nanoscale Application for Carbon Nanotube Arrays

Farrow, Reginald C; Aug 31, 2007; 8 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0461

Report No.(s): AD-A471875; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The original goals for the research program were to: 1) fabricate an interconnected array of single wall carbon nanotubes (SWNT) and 2) use the device to investigate cellular signaling in live cells. The most challenging part of this research (as anticipated) was the fabrication of the carbon nanotube array and most of the effort of this seed program was focused on this part. The interconnect fabrication was completed. A sample device without carbon nanotubes was packaged and tested with living cells to test the interface with optical microscopes and signal electronics. The most difficult part of fabricating an interconnected array of SWNTs is accurately growing or assembling them (with known properties) on interconnects. It was discovered that the nanotubes can be assembled on the interconnects using lithography that is much less demanding than previously reported or anticipated in the original proposal. This groundbreaking discovery will yield many applications for biological devices and integrated circuits using nanotubes. The main advantage is that the requirements on the lithography may be relaxed to the point where traditional manufacturing technology may be used to fabricate the device. This is a disruptive technology in that it may significantly shorten the time line for the introduction of many nanotube devices that would otherwise have to wait for the introduction of lithography that is at the end of the current roadmap for semiconductor technology. The result of this research program may be to reduce the development costs for nanotube devices by hundreds of millions of dollars.

DTIC

Carbon Nanotubes; Cells (Biology); Semiconductors (Materials); Nanostructure Growth

26

METALS AND METALLIC MATERIALS

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

20070037744 Air Force Research Lab., Eglin AFB, FL USA

High Strain Rate Properties of Tantalum Processed by Equal Channel Angular Pressing

Flater, Philip J; House, Joel W; O'Brien, James M; Hosford, William F; Aug 2007; 18 pp.; In English

Contract(s)/Grant(s): Proj-2502

Report No.(s): AD-A471311; AFRL-MN-EG-TP-2007-7412; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Current ingot refinement and solidification techniques used in tantalum processing often result in inconsistent mechanical properties. Subsequent processing by equal channel angular pressing (ECAP) has been shown to reduce or eliminate internal structural variations as well as part-to-part variability [2]. This paper presents the effects of ECAP processing on the properties of tantalum. The materials of interest are 2.5-inch round bar tantalum supplied by H.C. Starck and Cabot Supermetals. Three metallurgical conditions were examined for each material: as worked, fine-grain annealed, and large-grain annealed. Prior to annealing, each bar was processed eight times through a 135-degree ECAP die using route C and then forged into 0.25-inch thick plates. Mechanical property specimens were subsequently removed from the plates for low and high-rate uniaxial compression experiments. Orientation dependence was characterized by orienting specimen load axes through the thickness or in the plane of the forged plate. Wave propagation and anisotropy were studied using Taylor impact experiments.

DTIC

Anisotropy; Annealing; Strain Rate; Tantalum

20070037826 Dayton Univ. Research Inst., OH USA

A Coupled Creep-Plasticity Model for Residual Stress Relaxation of a Shot-Peened Nickel-Base Superalloy

Buchanan, Dennis J; May 2007; 122 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-04-C-5200; Proj-4347

Report No.(s): AD-A471471; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Shot peening has been employed in numerous industries for decades to impart beneficial compressive residual stresses on the surface of metal components. Compressive residual stresses retard initiation of surface cracks and therefore improve fatigue resistance and fatigue life. For elastic conditions, accurate fatigue life predictions, including credit for residual stresses, are possible for complex geometries with complicated load histories. For inelastic material behavior, shot-peened residual

stresses may change continuously under cyclic loading, or elevated temperature static loading, such as thermal exposure and creep. Under inelastic conditions, taking full credit for compressive residual stresses would result in a nonconservative life prediction. As a result, designers are reluctant to incorporate any compressive residual stresses into fatigue life predictions of turbine engine components, subject to elevated temperatures and inelastic loading conditions. Identification and characterization of the underlying rate controlling deformation mechanism is required for development of a reliable relaxation model for shot-peened materials.

DTIC

Creep Properties; Deformation; Fatigue Life; Heat Resistant Alloys; Life (Durability); Models; Nickel Alloys; Plastic Properties; Predictions; Residual Stress; Shot Peening; Stress Relaxation

20070038380 Air Force Materials Lab., Wright-Patterson AFB, OH USA

Precracked Charpy Impact Fracture Toughness Properties of Backup Flux-Welded Ti-5A1-2.5 Sn Alloy Plate from -320 Degrees to 550 Degrees Fahrenheit

Davis, Sidney O; Niemi, Roger M; Jan 1966; 28 pp.; In English

Report No.(s): AD-A471610; AFML-TR-65-304; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471610>

A program was conducted to evaluate the effects of a proprietary backup flux-welding technique on the impact fracture toughness properties of Ti-5A1-2.5 Sn alloy plate. The flux was the product of Mitron Research and Development Corporation. Precracked Charpy (often called subsize Charpy) specimens were tested under impact loads at -320 degrees F, -100 degrees room temperature, and 550 degrees F. The weld and heat affected zone (HAZ) had greater fracture toughness resistance than the base metal. The fracture resistance, work per unit area (W/A) decreased with decreasing test temperature. At -320 degrees F the weld and HAZ retained 1/3 of their fracture resistance at room temperature. However, the weld- and HAZ-converted W/A impact fracture resistance at -320 degrees F had a K_c approximately equal 125 ksi square root of in. which indicated good toughness for this temperature. The fracture resistance did not appear to be a function of the specimen's location through the thickness of the plate for a given specimen orientation. In general, the fracture resistance of the weld and HAZ compared to the base metal was excellent.

DTIC

Alloys; Charpy Impact Test; Fracture Strength; Impact Resistance; Impact Strength; Toughness

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*.

20070037512 Texas A&M Univ., College Station, TX USA

Start-Up Response of Fluid Film Lubricated Cryogenic Turbopumps (Preprint)

San Andres, Luis; Jun 13, 2007; 38 pp.; In English

Contract(s)/Grant(s): FA9300-04-C-0016; Proj-5026

Report No.(s): AD-A471125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471125>

Reusable primary power cryogenic turbopumps (TPs) implement externally pressurized fluid film bearings to support the expected large thrust and lateral radial loads. Compact - low count part TPs operate super critically at exceedingly high shaft speeds (180 krpm) and with large pressure differentials. Hybrid journal bearings (HJBs) enable smaller and lighter turbopumps through no bearing DN life limitation. The growth of an 'all-fluid-film- bearing' technology for reusable and less costly (per launch) TPs demands the development of analytical models and design tools accompanied by the testing of components. The paper presents a computational model for the prediction of the start-up performance of a flexible rotor supported on hydrostatic radial bearings. The transient response of rotor-bearing systems is of importance to determine safe operation and reliable dynamic performance under extreme loading conditions. In the start-up operation of a cryogenic TP, the fluid supply and discharge pressures, as well as the radial loads acting on the bearings, depend on pump rotor speed. The designed aerodynamic performance of the whole turbopump determines the schedule of rotor speed ramp-up. The start-up event is quite short in nature, lasting a few seconds at most. The bearing reaction forces are calculated from the numerical solution of unsteady bulk-flow equations including fluid inertia, flow turbulence, variable fluid properties and thermal energy transport. The equations of motion for the rotor and the fluid film bearings are solved numerically with local linearization at each integration

time step. Predictions for the transient start-up response of a test rotor supported on water hydrostatic bearings are presented. The numerical results evidence the effect of rotor mass on the rotordynamic stability of the rotor-bearing system.

DTIC

Computational Fluid Dynamics; Cryogenics; Fluid Films; Turbine Pumps

20070037827 Auburn Univ., AL USA

Mechanical Properties of MI SiC/SiC Composites and Their Constituents (Preprint)

Gowayed, Y; Ojard, G; Miller, R; Santhosh, U; Ahmad, J; John, R; Apr 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-01-C-5234; Proj-4347

Report No.(s): AD-A471472; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A series of 15 melt infiltrated SiC/SiC composites were fabricated per the standard process arrived at by NASA-GRC (01/01 material). This was done based on the in-situ boron nitride process prior to fiber interface coating and subsequent densification. A series of physical property testing was conducted to determine the mechanical properties, cyclic load response, damage progression, and the effect of temperature on elastic properties. Other tests addressed properties that are typically assumed such as through thickness, elastic modulus, and shear modulus. Additionally, in-situ moduli of constituent materials were experimentally evaluated using nano-indentation techniques at room temperature. An analytical model (pcGINA) was further developed and used to predict the elastic properties of CMC textile reinforced composites. The analytical modeling components were constructed within a unit cell constituent-based geometric model to map the 3D spatial description of the fabric preform. The model implemented a hybrid finite element approach and a virtual work technique.

DTIC

Ceramic Matrix Composites; Infiltration; Mechanical Properties; Silicon Carbides

20070037864 Martin Marietta Energy Systems, Inc., Oak Ridge, TN USA

Ceramic Technology for Advanced Heat Engines Project Semiannual Progress Report for Period October 1985 Through March 1986

Johnson, D R; Aug 1986; 369 pp.; In English

Contract(s)/Grant(s): DE-AC05-84OR21400

Report No.(s): AD-A471541; ORNL/TM-10079; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Ceramic Technology For Advanced Heat Engines Project was developed by the Department of Energy's Office of Transportation Systems (OTS) in Conservation and Renewable Energy. This project, part of the OTS's Advanced Materials Development Program, was developed to meet the ceramic technology requirements of the OTS's automotive technology programs. Significant accomplishments in fabricating ceramic components for the Department of Energy (DOE), National Aeronautics and Space Administration (NASA), and Department of Defense (DOD) advanced heat engine programs have provided evidence that the operation of ceramic parts in high-temperature engine environments is feasible. However, these programs have also demonstrated that additional research is needed in materials and processing development, design methodology, and data base and life prediction before industry will have a sufficient technology base from which to produce reliable cost-effective ceramic engine components commercially.

DTIC

Ceramics; Heat Engines

20070037886 Naval Weapons Center, China Lake, CA USA

A New Silicon-Containing Bis(Cyanate) Ester Resin with Improved Thermal Oxidation and Moisture Resistance (Postprint)

Guenther, Andrew J; Yandek, Gregory R; Wright, Michael E; Petteys, Brian J; Quintana, Roxanne; Connor, Dan; Gilardi, Richard D; Marchant, Darrell; Jan 2006; 9 pp.; In English

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

Report No.(s): AD-A471581; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A new cyanate ester monomer was prepared from bis(4-cyanatophenyl)-dimethylsilane (SiMCy) and fully characterized by analytical and spectroscopic techniques. The monomer was found to have a melting point about 20 deg. c lower than that of the commercial bis(4-cyanatophenyl)dimethylmethane (BADCy) with similar melt viscosity, curing kinetics, and post-cure glass transition temperature. Analysis of the single-crystal molecular structure by x-ray diffraction showed that intermolecular packing was dominated by weak hydrogen-bonding attractions between the aromatic rings and the _OCN nitrogen atoms. In

contrast, the packing interactions found in BADCy are dominated by dipole-dipole interactions of the OCN groups. These differences may explain the 50% reduction in moisture uptake observed in SiMCy as compared to BADCy during exposure to boiling water. In addition, thermogravimetric analysis revealed that SiMCy exhibited a significantly higher char yield in air than BADCy, presumably due to the formation of silicates at high temperature. The combination of improved thermo-oxidative stability and reduced moisture absorption without significant loss in ease of processing or mechanical properties makes SiMCy an important potential 'drop in' replacement for BADCy, and demonstrates the power of the molecular level approach to designing new high-temperature polymer materials.

DTIC

Cyanates; Esters; Moisture Resistance; Monomers; Oxidation Resistance; Resins; Silicon; Thermal Resistance; Thermoplastic Resins

20070038078 Department of the Navy, Washington, DC USA

Method and Apparatus for Improved Adhesion at an Interfacing Surface

Quartarone, James R, Inventor; Sep 12, 2005; 22 pp.; In English

Report No.(s): AD-D020306; No Copyright; Avail.: Other Sources

An apparatus for improving and increasing sustainable shear force capabilities at an interfacing surface between a rigid material and a flexible material is disclosed. The interface includes at least two superimposed components having different surface roughness. A coarse surface roughness component has a surface roughness about 3 orders of magnitude greater than that of a fine surface roughness component. The interface is useful for all types of devices with a rigid-to-flexible interface that needs to resist shear, tension, torsion, compression, or any disturbing steady-state or variable force or forces.

DTIC

Adhesion; Patent Applications

20070038418 Minnesota Univ., Minneapolis, MN USA

Reactive Nanoengineered Coatings

Cussier, Edward L; Apr 30, 2007; 9 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0333

Report No.(s): AD-A471697; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471697>

This project used two strategies to develop barrier coatings 10,000 times less permeable than those currently in existence. The first strategy used aligned impermeable flakes which reduced by roughly a factor of 50 both the permeability and the lag, that is the time before any significant penetration. The second strategy, sacrificial reagents, did not effect the permeability in the steady state limit but increased the lag by a factor of 1000 or more. The two strategies together can meet the original goal.

DTIC

Block Copolymers; Flakes; Permeability; Protective Coatings; Reactivity; Scavenging

20070038688 Army Research Lab., Aberdeen Proving Ground, MD USA

Developing Rigid Polymer Electrolytes

Snyder, James F; Sep 2007; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472043; ARL-RP-188; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report is a reprint of a paper published in Polymer Preprints, Vol. 45, No. 2, by the American Chemical Society in Fall 2004. The focus of this research is the synthesis and characterization of highly conductive rigid polymer electrolytes. Traditional solvent-free polymer electrolytes allow for long-range ion diffusion by means of ion-polymer coupling in the amorphous phase of the polymer host. Coupled systems typically require low glass transition temperatures for fast ion diffusion, resulting in poor mechanical properties when fillers are not added. The effort described here explores polymer electrolytes in which ion diffusion is decoupled from polymer motion. These materials allow for the development of polymers with desirable structure and fast ion transport at low temperatures. This is accomplished through the design of high dielectric polymer hosts with large internal free volume. The recently reported step polymerization using vinylene carbonate and oxalic acid derivatives was modified to eliminate the formation of a dominant byproduct, and extended to include more robust but less reactive monomers, including derivatives of 3-sulfolene, maleimide, and malonic acid.

DTIC

Electrolytes; Rods

20070038690 Army Research Lab., Aberdeen Proving Ground, MD USA

Combining Structure and Power in Battery Materials

Snyder, James F; Carter, Robert H; Wetzel, Eric D; Sep 2007; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A472046; ARL-RP-189; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report is a reprint of a paper published in Proceedings of the American Chemical Society Division of Polymeric Materials: Science & Engineering (PMSE Preprints) by the American Chemical Society in Fall 2004. Many current applications demand lighter and stronger structural materials. In addition, more weight efficient power generating devices are needed to support the increasing integration of electronic technology into everyday systems. A multifunctional concept for material development will be presented that combines structural performance with power generation. Such devices would replace inert structural components in common items, such as a vehicle shell, and simultaneously provide supplementary power for light load applications. Particular focus is on the development of polymer electrolyte membranes which exhibit an efficient combination of structural and electrochemical properties. A greater emphasis is placed on structure than is generally seen in the literature. We will present several routes that are underway in our lab to accomplish this goal, including development of fast ion conductive rigid polymers; ion conductive resins or resin scaffolds filled with amorphous polymer; and blending inorganic fibers and fillers with amorphous polymer electrolytes.

DTIC

Electric Batteries; Electric Generators; Electric Power Plants; Electrochemistry; Electrolytes; Rods

20070038714 Cincinnati Univ., OH USA

Fabrication of Organic Thin Film Transistors Using Layer-By-Layer Assembly (Preprint)

Stricker, Jeffery T; Gudmundsdottir, Anna D; Smith, Adam P; Taylor, Barney E; Durstock, Michael F; Mar 2007; 27 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A472076; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Layer-by-layer assembly is presented as a deposition technique for the incorporation of ultra-thin gate dielectric layers into thin-film transistors utilizing a highly doped organic active layer. This deposition technique enables the fabrication of device structures with a controllable gate dielectric thickness. In particular, devices with a dielectric layer comprised of poly(allylamine hydrochloride)/poly(acrylic acid) (PAH/PAA) bilayer films were fabricated to examine the properties of poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) as the transistor active layer. The transistor Ion/off ratio and switching speed are shown to be controlled by the gate bias, which is dependent upon the voltage applied and the number of bilayers deposited for the gate dielectric. The devices operate in the depletion mode as a result of de-doping of the active layer with the application of a positive gate bias. The depletion and recovery rate are highly dependent on the level of hydration in the film and the environment under which the device is operated. These observations are consistent with an electrochemical de-doping of the conducting polymer during operation.

DTIC

Electrolytes; Fabrication; Thin Films; Transistors

20070038715 Air Force Materials Lab., Wright-Patterson AFB, OH USA

Protonation and Chemical Doping Behavior of Poly(P-Phenylene Benzobisthiazole) (BPZT): Towards Stable n-Type Conjugated Polymers (Preprint)

Durstock, Michael F; Mecoli, Marc; Mar 2007; 34 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A472077; AFRL-ML-WP-TP-2007-479; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Poly(p-phenylene benzobisthiazole) (PBZT) is a rigid-rod polymer that has been thoroughly studied for its good mechanical and thermo-oxidative properties. Recently, however, it was discovered that PBZT also exhibits quite interesting and unusual optical and electrical properties that are highly dependent upon the presence of an acid within the film, which acts to protonate the nitrogen sites in the aromatic heterocycle. When protonated, this material becomes a very good electron acceptor and can be n-type (reductively) doped with a variety of metals to yield a high conductive material. The doped material is stable with respect to water, but becomes de-doped in the presence of oxygen. A thorough examination of the protonation and chemical doping behavior of thin films of PBZT in a variety of different acids is presented and a general mechanism is discussed.

DTIC

Additives; Chemical Reactions; Conjugation; Phenyls

20070038721 Army Research Lab., Aberdeen Proving Ground, MD USA

Vinyl Ester Polymer Electrolytes for Multifunctional Composites

Snyder, James F; Hagon, Matthew J; Carter, Rob H; Wetzel, Eric D; Jan 2005; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472083; ARL-RP-191; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Polymer electrolytes have potential for use in solid state electrochemical devices owing to favorable material properties. We have developed a multifunctional concept for material development that integrates structural performance with energy storage. One focus of our research is to develop polymer electrolytes that exhibit a desirable combination of mechanical strength and ion conductivity. In the present study, PEG vinyl esters were complexed with lithium triflate and studied as both homopolymer and random copolymer electrolytes. Lithium content was first optimized on a diverse sampling of the set through varied salt concentrations. Homopolymer electrolytes at 30 EO:Li were then characterized. The homopolymers vary in length of PEG oligomers, number of vinyl esters per monomer, and additional functionality. Random copolymer electrolytes were investigated using electrochemically strong monomers and mechanically strong monomers in systematically varied weight percent. The resulting electrochemical and mechanical properties will be discussed as well as the directions of future research.

DTIC

Electrolytes; Esters; Lithium; Vinyl Polymers

20070038723 Army Research Lab., Aberdeen Proving Ground, MD USA

Multifunctional Structural Composite Batteries

Snyder, J F; Carter, R H; Wong, E L; Nguyen, P A; Xu, K; Ngo, E H; Wetzel, E D; Sep 2007; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472085; ARL-RP-192; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We are developing structural polymeric composites that both carry structural loads and store electrochemical energy. These multifunctional batteries could replace inert structural components while providing supplementary power for light load applications. If designed with sufficient structural and energy efficiency, these materials could also enable significant system-level weight reductions. To enable this concept, loadbearing properties must be engineered into the battery packaging, electrolyte, and/or electrodes. Previous examples of structural batteries have primarily utilized structural packaging. However, in this study, structural properties are designed directly into the electrolyte and electrode materials such that each component is itself multifunctional. Novel electrode and electrolyte materials are being synthesized to optimize both electrochemical and load-bearing capacity. One focus of our research is the development of solvent-free structural polymer electrolytes based on vinyl ester resins that exhibit a desirable combination of mechanical strength and ion conductivity. Using these resin electrolytes the components are being integrated using moldable, scalable, cost-effective composite processing techniques.

DTIC

Electric Batteries; Electrolytic Cells; Fuel Cells

20070038925 Case Western Reserve Univ., Cleveland, OH USA

Directionally Solidified Multifunctional Ceramics

Sayir, Ali; Dec 2006; 17 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0128

Report No.(s): AD-A471705; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471705>

In order to achieve a significant increase in toughening and to retain the toughness at elevated temperatures a new multifunctional approach is proposed. The multifunctionality were achieved through directional solidification of polyphase materials comprising the load-bearing and functional phases. The functional phases include shape recovery and health monitoring. In parallel, new ideas about the load bearing phases were investigated to achieve tougher materials.

DTIC

Ceramics; Directional Solidification (Crystals)

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*.

20070037449 NASA Marshall Space Flight Center, Huntsville, AL, USA

Preliminary Experimental Measurements for a Gallium Electromagnetic (GEM) Thruster

Thomas, Robert E.; Burton, Rodney L.; Glumac, Nick G.; Polzin, Kurt A.; September 17, 2007; 8 pp.; In English; 30th International Electric Propulsion Conference, 17-20 Sep. 2007, Florence, Italy; Original contains black and white illustrations Report No.(s): IEPC-2007-286; Copyright; Avail.: CASI: [A02](#), Hardcopy

A low-energy gallium plasma source is used to perform a spatially and temporally broad spectroscopic survey in the 220-520 nm range. Neutral, singly, and doubly ionized gallium are present in a 20 J, 1.8 kA (peak) arc discharge operating with a central cathode. When the polarity of the inner electrode is reversed the discharge current and arc voltage waveforms remain similar. Utilizing a central anode configuration, multiple Ga lines are absent in the 270-340 nm range. In addition, neutral and singly ionized Fe spectral lines are present, indicating erosion of the outer electrode. With graphite present on the insulator to facilitate breakdown, line emission from the gallium species is further reduced and while emissions from singly and doubly ionized carbon atoms and molecular carbon (C₂) radicals are observed. These data indicate that a significant fraction of energy is shifted from the gallium and deposited into the various carbon species.

Author

Gallium; Plasmas (Physics); Electric Potential; Cathodes; Arc Discharges; Propellants

20070038170 NASA Glenn Research Center, Cleveland, OH, USA

Methane Hydrates: More Than a Viable Aviation Fuel Feedstock Option

Hendricks, Robert C.; November 2007; 21 pp.; In English; Original contains color and black and white illustrations Contract(s)/Grant(s): WBS 561581.02.08.03.16.03

Report No.(s): NASA/TM-2007-214816; AIAA Paper-2007-4757; E-15975; No Copyright; Avail.: CASI: [A03](#), Hardcopy ONLINE: <http://hdl.handle.net/2060/20070038170>

Demand for hydrocarbon fuels is steadily increasing, and greenhouse gas emissions continue to rise unabated with the energy demand. Alternate fuels will be coming on line to meet that demand. This report examines the recovering of methane from methane hydrates for fuel to meet this demand rather than permitting its natural release into the environment, which will be detrimental to the planet. Some background on the nature, vast sizes, and stability of sedimentary and permafrost formations of hydrates are discussed. A few examples of the severe problems associated with methane recovery from these hydrates are presented along with the potential impact on the environment and coastal waters. Future availability of methane from hydrates may become an attractive option for aviation fueling, and so future aircraft design associated with methane fueling is considered.

Author

Aircraft Fuels; Methane; Hydrates; Hydrocarbon Fuels; Gas Recovery

20070038448 Library of Congress, Washington, DC USA

Intelligence Issues for Congress

Best, Jr, Richard A; Aug 7, 2007; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471766; CRS-RL33539; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471766>

To address the challenges facing the U.S. Intelligence Community in the 21st century, congressional and executive branch initiatives have sought to improve coordination among the different agencies and to encourage better analysis. In December 2004, the Intelligence Reform and Terrorism Prevention Act (P.L. 108- 458) was signed, providing for a Director of National Intelligence (DNI) with substantial authorities to manage the national intelligence effort. The legislation also established a separate Director of the Central Intelligence Agency. Making cooperation effective presents substantial leadership and managerial challenges. The needs of intelligence consumers ranging from the White House to cabinet agencies to military commanders must all be met, using the same systems and personnel. Intelligence collection systems are expensive and some critics suggest there have been elements of waste and unneeded duplication of effort while some intelligence targets have been neglected. The DNI has substantial statutory authorities to address these issues, but the organizational relationships will remain

complex, especially for Defense Department agencies. Members of Congress will be seeking to observe the extent to which effective coordination is accomplished.

DTIC

Deep Water; Gases; Intelligence; Oils

20070038662 Library of Congress, Washington, DC USA

The Gas to Liquids Industry and Natural Gas Markets

Pirog, Robert; Aug 27, 2007; 14 pp.; In English

Report No.(s): AD-A472008; CRS-RL32666; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Technological improvements and investment commitments from the world's largest oil companies suggest the gas to liquids (GTL) industry is likely to expand rapidly over the next decade. GTL uses large quantities of natural gas to produce liquid petroleum products like diesel fuel and home heating fuel. The GTL industry might become an important competitor to the liquefied natural gas industry (LNG) in the effort to secure natural gas supplies. As a result, LNG markets may be tighter, with higher prices, potentially altering LNG's projected role in the U.S. natural gas market. The Energy Information Administration projects U.S. natural gas consumption increases of 18.6% by 2030, compared to 2005 levels. Much of this increased demand is expected to be met by importing LNG. LNG is natural gas that has been cooled to a liquid state to facilitate transportation. Although expanding LNG imports has drawbacks, the main positive factor is the belief that worldwide, there are large quantities of natural gas that have previously not had access to the market. Some believe that as the supply of imported LNG expands, it will provide a price cap for U.S. natural gas markets. An expanded GTL industry makes this result potentially less likely. The GTL industry is poised for a major expansion based in Qatar, but also in Nigeria and Australia. The expansion is being funded by the major oil companies, in some cases in tandem with synthetic fuel companies and national oil companies. The projected expansion of the industry is based on favorable market conditions in addition to advances in technology. High oil and natural gas prices, declining capital investment costs, and improvements in technology that allow large-scale production facilities are important factors in the industry's expansion. The GTL industry offers an attractive choice to nations with economically stranded natural gas reserves because it allows those nations to diversify in the use of their resources.

DTIC

Competition; Industries; Liquefied Natural Gas; Liquids; Market Research; Natural Gas; Supplying

20070038664 North American Energy Working Group, Washington, DC USA

North American Natural Gas Vision

Jan 2005; 119 pp.; In English

Report No.(s): AD-A472010; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report, the North American Natural Gas Vision, is a deliverable for the North American Energy Working Group (NAEWG) and was produced by the NAEWG Natural Gas Experts Group. The NAEWG Natural Gas Trade and Interconnections' Experts Group was established in December 2001 by Canada, Mexico and the U.S., at the second meeting of the North American Energy Working Group. The scope of the Experts Group includes the full range of issues related to natural gas development, production, transportation and transmission, distribution and consumption in North America. This report is unique because it presents the views of the three governments, working in close cooperation, on the gas market now and in the future. Further, this report recognizes private sector views. In preparing this report, the NAEWG Gas Experts Group held a workshop in December 2003 to gain views on issues related to the future of the North American gas market. The report examines the increasingly important role that natural gas has played over time in the energy sectors of three countries. The report presents the restructuring and regulatory changes in all three countries that have accompanied the increase in natural gas demand and have had impacts on infrastructure development. The report details the amount of trade among the three countries. Trade in natural gas is highly developed and functions extremely efficiently in the North American market. The report looks at how provisions of the Canada-U.S. Free Trade Agreement (FTA) and the North American Free Trade Agreement (NAFTA), along with the General Agreement on Tariffs and Trade (GATT) govern energy trade in North America. Both the FTA and NAFTA resulted in some important changes in the rules governing energy trade. The report builds on the idea, recognized by the three governments, that growth in natural gas use has been fueled by three key factors: sustainable energy policies, technological advancement and private sector investment.

DTIC

International Trade; Natural Gas; North America

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*.

20070037506 University of Southern California, Los Angeles, CA USA

Thrust Stand Micro-Mass Balance Diagnostic Techniques for the Direct Measurement of Specific Impulse (Preprint)

Lee, Riki; D'Souza, Brian; Ketsdever, Andrew; Jun 4, 2007; 19 pp.; In English

Contract(s)/Grant(s): Proj-5026

Report No.(s): AD-A471119; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471119>

A technique has been developed to directly measure the specific impulse from pulsed thruster systems. The technique is especially useful for propulsion devices that utilize solid propellants where a direct measurement of the propellant mass flow is extremely difficult. A torsion balance is used with a horizontal axis of rotation. A thruster is placed on the balance such that the impulse of the thruster firing and the change in mass due to the expending of propellant act in the same direction. The coupled force measurements can then be decoupled to assess the ratio of the impulse to the weight of propellant expended, also known as the specific impulse. A model has been developed to show the utility of the technique for pulsed systems with a firing time less than the natural period of the balance. In this study, a laser ablation thruster using Buna, Viton and Teflon propellants was investigated. Specific impulse measurements on the order of 200 sec have been demonstrated with the laser ablation thruster.

DTIC

Balance; Mass Distribution; Specific Impulse

20070037507 Washington Univ., Seattle, WA USA

Microarcjet Microthruster for Nanosat Applications (Preprint)

Slough, John; Ewing, J J; Jun 22, 2007; 8 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-2514; Proj-OSDBR4QL

Report No.(s): AD-A471120; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471120>

This paper summarizes experiments and analysis of the micro-discharge microarcjet thruster. A small, very low power (2-5 Watt) micro-discharge was maintained between two electrodes in geometries compatible with application to a cold gas thruster. To evaluate the efficiency of the discharge in providing an increase in Isp and thrust, a special torsional micro-balance thrust stand, capable of micro-Newton resolution, was designed and constructed. The micro-balance thrust stand was installed in a large dielectric chamber with high pumping speed to eliminate stray coupling of the discharge with the vacuum chamber or background gas. A battery operated driver provided the 240-280 volts required to sustain the very low current (5-40 mA) arc discharge. The discharge was also ballasted inductively to avoid capacitive effects as well as resistive losses. Thrust measurements using a variety of electrode geometries and propellants were carried out. It was found that the optimum scale for the discharge bore for these low power levels was ~ 300 micron. Smaller bores resulted in too large a power loss in thermal transfer to the thruster/nozzle body. A larger bore led to large mass flows at the pressures required to produce a stable discharge. All ring or cavity electrode structures showed no appreciable gain and were rapidly eroded by the discharge. The only electrode configuration to show an increase in thrust from the application of the discharge with no measurable electrode erosion was in a configuration similar to the standard arcjet. Most of the studies were conducted in Argon, but other gases from H to Xe were also used. In Argon the optimal mass flow was ~ 2 mg/s with between 10 to 20 kPa upstream of the nozzle.

DTIC

Electric Propulsion; Microminiaturization; Microrocket Engines; Nanosatellites; Spacecraft Propulsion

20070037735 University of Southern California, Los Angeles, CA USA

Transmission Electron Microscopy Study of Defect Reduction in Two-Step Lateral Epitaxial Overgrown Nonplanar GaN Substrate Templates

Zhou, Wei; Ren, Dawei; Dapkus, P D; Jun 1, 2005; 8 pp.; In English

Report No.(s): AD-A471288; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Transmission electron microscopy (TEM) is carried out to characterize the extended defect reduction in low-defect nonplanar GaN substrate templates grown by lateral epitaxial overgrowth (LEO). The LEO nonplanar GaN substrate template has a trapezoidal cross section with smooth (0 0 0 1) and f11 22g facets. We demonstrate here the dislocation distribution and

behavior in both ordinary LEO and two-step LEO. Penetration of threading dislocations (TDs) beyond mask windows is observed in ordinary LEO substrates. In two-step LEO substrates, which utilize the tendency for TDs to bend 90° at certain plane interfaces, only a type dislocations with Burgers vector $b = \frac{1}{2} [110]$ are generated in the upper part above the TD bending zone between two mask windows with a density of $8 \times 10^7 \text{ cm}^{-2}$, and there are almost no dislocations in the LEO wing region. This approach provides a promising path to produce low-defect GaN substrate templates for high-performance buried heterostructure lasers.

DTIC

Defects; Electron Microscopy; Epitaxy; Substrates; Templates; Transmission Electron Microscopy

20070037754 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Characteristics and Sampling Efficiencies of Two Personal Aerosol Samplers

Kesavan, Jana S; Schepers, Deborah R; Jul 2007; 21 pp.; In English

Contract(s)/Grant(s): Proj-ACB2

Report No.(s): AD-A471338; ECBC-TN-031; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Characteristics and aerosol sampling efficiencies of two units of the same model Personal Aerosol Sampler (PAS-1 and PAS-2) were characterized at ECBC. These samplers were designed and manufactured by Research Center for Toxicology and Hygienic Regulation of Biopreparations at the Federal Directorate of Medical, Biological and Extreme Problems 'Medbioextrem', Ministry of Health of the Russian Federation, Russia. These samplers have non-traditional wetted wall cyclones to collect and concentrate aerosols into liquid. The samplers are small, portable, and easy to use for decontamination. The sampling efficiency tests were conducted with monodisperse 0.5-, 1-, and 2.1-micrometre fluorescent Polystyrene Latex (PSL) microspheres, and 5.8- and 9.6-micrometre fluorescent oleic acid particles. The air flow rate of PAS-1 was 10 Lpm and the air flow rate of PAS-2 was 9 Lpm. The sample output volumes for PAS-1 and PAS-2 were $1.9 \pm 0.5 \text{ cu cm}$ and $2.0 \pm 0.5 \text{ cu cm}$, respectively. The results of PAS-1 and PAS-2 showed the highest sampling efficiency of $72.6\% \pm 6.8\%$ and 77.6% for 5.8-micrometre particles, respectively. The power requirements of these samplers will depend on the vacuum pumps used to pull the air through the samplers.

DTIC

Aerosols; Efficiency; Evaluation; Samplers; Sampling; System Effectiveness

20070037820 Air Force Safety Center, Kirkland AFB, NM USA

Boeing Michigan Aeronautical Research Center (BOMARC) Missile Shelters and Bunkers Scoping Survey Workplan

Rademacher, Steven E; Hubbell, Joshua L; Cicotte, George R; Aug 2007; 70 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471460; IOH-SD-BR-SR-2007-0001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Weapons Safety Division of Headquarters, Air Force Safety Center (HQAFSC/SEW) and Radiation Surveillance Division, Air Force Institute for Operational Health (AFIOH/SDR) jointly agreed to perform radiological scoping surveys of select structures on the Boeing Michigan Aeronautical Research Center (BOMARC) site. The work coincides with on-site oversight responsibilities of the two organizations during final status surveys and spot remediation under contract to Cabrera Services. The report details the strategy for conducting scoping surveys. In addition the report provides a comprehensive review of the risk analysis that was accomplished in the Remedial Investigation/Feasibility, that formed the basis for the Record of Decision (ROD). In particular, the discrete particle intake paradigm was discussed and other issues that raised recent concerns on the applicability of the risk analysis accomplished in the ROD. Criteria for acceptable surface contamination levels for shelter interiors were proposed. One for continued intermittent use with institutional controls in place and the other under a shelter demolition/on-site burial assumption.

DTIC

Bomarc Missiles; Research Facilities; Risk; Shelters; Surveys

20070038467 Washington Univ., Seattle, WA USA

Optical Tomography of the ZaP Flow Z-Pinch Plasma

Madson, Adam M; Jan 2005; 154 pp.; In English

Report No.(s): AD-A471808; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471808>

The ZaP Flow Z-Pinch Experiment forms a Z-pinch with an embedded axial flow that exhibits stability for 500 - 2000

times the instability growth time for a static Z-pinch. Two linear photodiode arrays placed orthogonal to each other measure chord-integrated emissivity of the plasma. Deconvolving these data produce time resolved 1-D and 2-D emission profiles of the Z-pinch cross-section during the stable quiescent period. These unfiltered emission profiles show that the pinch has a radius of approximately 1 cm. Filtering the light for H(alpha) emission shows a defined hollow profile 1 cm in radius. Bremsstrahlung filtered light exhibits a peaked profile during periods of high intensity emissivity and a hollow profile at lower intensities. Additional measurements from an Imacon camera, interferometer, and azimuthal arrays of magnetic probes determine the spatial correlation between plasma emissivity, plasma density, and plasma current. The tomographic information collected by the photodiode arrays increases understanding of flow stabilization theory and Z-pinch configuration plasmas.

DTIC

Plasmas (Physics); Tomography; Zeta Pinch

20070038616 Joint Task Force Eight, Washington, DC USA

Report by Commander Joint Task Force Eight to the Chairman, USA Atomic Energy Commission and the Joint Chiefs of Staff on the 1962 Pacific Nuclear Tests (Operation DOMINIC). Enclosure L: Report of Scientific Summary

Jun 4, 1964; 105 pp.; In English

Report No.(s): AD-A471900; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This enclosure describes the participation of Joint Task Force Eight in Operation DOMINIC, the nuclear test series conducted during the Spring, Summer, Fall of 1962. Additional information on the participation of subordinate units is also covered in a general manner. It covers the time period from the initial activation of Joint Task Force EIGHT until termination of the operational period for Operation DOMINIC. It describes the magnitude of the tasks accomplished, problems encountered, and recommendations for organizations involved in future nuclear test operations. This report is not intended to be a scientific treatise on the technical aspects of the operation as these points are covered in technical publications of the scientific laboratories participating. Rather it is a general description of the support afforded the scientific effort and a brief outline of the scientific information gleaned during the operation.

DTIC

Enclosure; Nuclear Electric Power Generation; Nuclear Explosions; Pacific Islands; Pacific Ocean; United States

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*.

20070036801 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

High Gain Antenna Pointing on the Mars Exploration Rovers

Vanelli, C. Anthony; Ali, Khaled; October 10, 2005; 27 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40558>

This paper describes the algorithm used to point the high gain antennae on NASA/JPL's Mars exploration rovers. Each rover's gimballed antenna must track the Earth as it moves across the Martian sky during communication sessions. The pointing algorithm accounts for obstacles to the line-of-sight posed by (1) features on the rover and in the surrounding environment (2) gimbal range limitations, and (3) kinematic singularities in the gimbal mechanism. The algorithm treats all obstacles with a generalized approach that computes the intercept-times to each obstacle. Where possible, the algorithm takes advantage of pairs of joint-space solutions arising from the mechanism design. The algorithm chooses the solution that provides the longest obstruction-free tracking time. Upon encountering an obstacle, the algorithm automatically switches to the other solution if it is not also obstructed. This algorithm has successfully provided obstruction-free pointing for both rovers throughout the mission.

Author

Gimbals; High Gain; Mars (Planet); Directional Antennas; Mars Roving Vehicles; Mars Missions

20070037561 California Univ., Los Angeles, CA USA

Evaluation of Multihop Relaying for Robust Vehicular Internet Access

Yang, Yi; Marina, Mahesh; Bagrodia, Rajive; Jan 2007; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-05-1-0246

Report No.(s): AD-A471250; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471250>

In this paper, we study connectivity benefits of using a multihop relaying strategy for improved Internet access in a WiFi-based vehicular environment relative to the common strategy that allows only direct communication between vehicles and access points 'APs'. We use real AP location data and realistic and detailed vehicular mobility traces for our study. Our results show that multihop relaying strategy leads to substantial gains in connectivity relative to direct access as much as 400%, and that multihop relaying combined with increased communication range provides even greater gains 'up to 467%'. Further, relay paths with few hops are sufficient to realize most of the gain with multihop relaying.

DTIC

Communication Networks; Internets

20070037751 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Inrichting Gemeenschappelijke Ops-Room Voor DTO, JCG en C2000 (A Common Operations Room for DTO, JCG and C2000)

Rakhorst-Oudendijk, M L; te Brake, G M; Essens, P J; Feb 2007; 35 pp.; In Dutch; Original contains color illustrations

Report No.(s): AD-A471333; TNO-DV-2007-A002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An integrated operations room for C2000, JCO and DTO has been designed. Military and police networks can be managed using a flexible solution based on uniform workplaces and a KVM-gateway for secure and non-secure domains.

DTIC

Layouts; Networks

20070038109 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Performance Analysis and Comparison of Multiple Routing Protocols in a Large-Area, High-Speed Mobile Node Ad Hoc Network

Roberts, Daniel K; Jun 2007; 139 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471071; AFIT/GE/ENG/07-28; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471071>

The U.S. Air Force is interested in developing a standard ad hoc framework using 'heavy' aircraft to route data across large regions. The Zone Routing Protocol (ZRP) has the potential to provide seamless large-scale routing for DOD under the Joint Tactical Radio System program. The goal of this study is to determine if there is a difference between routing protocol performance when operating in a large-area MANET with high-speed mobile nodes. This study analyzes MANET performance when using reactive, proactive, and hybrid routing protocols, specifically AODV, DYMO, Fisheye, and ZRP. This analysis compares the performance of the four routing protocols under the same MANET conditions. Average end-to-end delay, number of packets received, and throughput are the performance metrics used. Reactive protocol performance is better than hybrid and proactive protocol performance in each metric. Average ETE delays are lower using AODV (1.17 secs) and DYMO (2.14 secs) than ZRP (201.9 secs) or Fisheye (169.7 secs). Number of packets received is higher using AODV (531.6) and DYMO (670.2) than ZRP (267.3) or Fisheye (186.3). Throughput is higher using AODV (66,500 bps) and DYMO (87,577 bps) than ZRP (33,659 bps) or Fisheye (23,630bps). The benefits of ZRP and Fisheye are not able to be taken advantage of in the MANET configurations modeled in this research using a 'heavy' aircraft ad hoc framework.

DTIC

High Speed; Networks; Protocol (Computers); Reliability Analysis

20070038145 Army War Coll., Carlisle Barracks, PA USA

Always On: Achilles Heel of the Networked Force?

Barry, Michael T; Mar 30, 2007; 21 pp.; In English

Report No.(s): AD-A471302; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Thoroughly enamored with the benefits of exchanging information in near-real-time, the U.S. military has committed itself to networking the battlefield. Brought about by the convergence of military and consumer communications technology, the networked battlefield boasts continuous connectivity with digitized information. However, the network-centric force is

reliant on the radio frequency spectrum to pass information, and is always-on, which is to say, it is constantly producing radio frequency emissions in order to share information in near-realtime. Historical experience should not be ignored. Passive radio transmission detection techniques have been used since the dawn of radio to achieve decisive results. The Achilles heel of the networked force is that it is always-on, continuously exposed to detection. Recommendations are advanced to quantify this awkward vulnerability, train and educate for more decentralized command and control, and focus effort on developing a primarily passive, rather than transmission dependent, situational awareness architecture.

DTIC

Telecommunication; Military Technology; Radio Transmission; Communication Networks

20070038285 NASA Goddard Space Flight Center, Greenbelt, MD, USA

X-Band Radar for Studies of Tropical Storms from High Altitude UAV Platform

Rodriguez, Shannon; Heymsfield, Gerald; Li, Lihua; Bradley, Damon; [2007]; 2 pp.; In English; International Geoscience and Remote Sensing Symposium 2007, 23-27 Jul. 2007, Barcelona, Spain; No Copyright; Avail.: Other Sources; Abstract Only

The increased role of unmanned aerial vehicles (UAV) in NASA's suborbital program has created a strong interest in the development of instruments with new capabilities, more compact sizes and reduced weights than the instruments currently operated on manned aircrafts. There is a strong demand and tremendous potential for using high altitude UAV (HUAV) to carry weather radars for measurements of reflectivity and wind fields from tropical storms. Tropical storm genesis frequently occurs in ocean regions that are inaccessible to piloted aircraft due to the long off shore range and the required periods of time to gather significant data. Important factors of interest for the study of hurricane genesis include surface winds, profiled winds, sea surface temperatures, precipitation, and boundary layer conditions. Current satellite precipitation and surface wind sensors have resolutions that are too large and revisit times that are too infrequent to study this problem. Furthermore, none of the spaceborne sensors measure winds within the storm itself. A dual beam X-band Doppler radar, UAV Radar (URAD), is under development at the NASA Goddard Space Flight Center for the study of tropical storms from HUAV platforms, such as a Global Hawk. X-band is the most desirable frequency for airborne weather radars since these can be built in a relatively compact size using off-the-shelf components which cost significantly less than other higher frequency radars. Furthermore, X-band radars provide good sensitivity with tolerable attenuation in storms. The low-cost and light-weight URAD will provide new capabilities for studying hurricane genesis by analyzing the vertical structure of tropical cyclones as well as 3D reflectivity and wind fields in clouds. It will enable us to measure both the 3D precipitation structure and surface winds by using two antenna beams: fixed nadir and conical scanning each produced by its associated subsystem. The nadir subsystem is a magnetron based radar modified from a marine radar transceiver. It is capable of measuring vertical reflectivity and velocity profile while being a lower-cost, smaller size, and lighter weight version of the NASA ER-2 Doppler Radar (EDOP), which has flown during many NASA field campaigns and has provided valuable scientific information on hurricanes and weather phenomena. Unfortunately, EDOP is too large and heavy for most UAV platforms, but the experience gained with this instrument provided us with the heritage to build a new low-cost, light-weight, smaller system that will be capable of flying on UAVs. The scanning subsystem uses a TWT transmitter and provides measurements of 3D reflectivity/wind fields in-clouds. Conical scanning of the radar beam at a 35 deg. incidence angle will also provide information of surface wind speed and direction derived from the surface return over a single 360 deg. sweep. URAD data system will be Linux based with the capability of autonomous operation. It will utilize cutting edge digital receiver and FPGA technologies to carry out the data acquisition and processing tasks. High speed navigation data from the aircraft will also be captured and saved along with radar data for 3D measurement field reconstruction and aircraft motion correction. There is a tremendous potential for UAVs to carry down-looking weather radars for measurements of reflectivity, horizontal and vertical winds from tropical storms. With operation from HUAV platforms, the dual beam X-band radar under development promises to provide greatly needed information for tropical storm research.

Author

High Altitude; Pilotless Aircraft; Tropical Storms; Doppler Radar; Superhigh Frequencies; Weather

20070038333 NASA Glenn Research Center, Cleveland, OH, USA

Advances in Scanning Reflectarray Antennas Based on Ferroelectric Thin Film Phase Shifters for Deep Space Communications

Romanofsky, Robert R.; September 2007; 14 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 439432.32.04.04.01

Report No.(s): NASA/TM-2007-214983; E-16153; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038333>

Though there are a few examples of scanning phased array antennas that have flown successfully in space, the quest for

low-cost, high-efficiency, large aperture microwave phased arrays continues. Fixed and mobile applications that may be part of a heterogeneous exploration communication architecture will benefit from the agile (rapid) beam steering and graceful degradation afforded by phased array antennas. The reflectarray promises greater efficiency and economy compared to directly-radiating varieties. Implementing a practical scanning version has proven elusive. The ferroelectric reflectarray, under development and described herein, involves phase shifters based on coupled microstrip patterned on Ba(x)Sr(1-x)TiO₃ films, that were laser ablated onto LaAlO₃ substrates. These devices outperform their semiconductor counterparts from X- through and K-band frequencies. There are special issues associated with the implementation of a scanning reflectarray antenna, especially one realized with thin film ferroelectric phase shifters. This paper will discuss these issues which include: relevance of phase shifter loss; modulo 2(pi) effects and phase shifter transient effects on bit error rate; scattering from the ground plane; presentation of a novel hybrid ferroelectric-semiconductor phase shifter; and the effect of mild radiation exposure on phase shifter performance.

Author

Antenna Arrays; Ferroelectricity; Low Cost; Phased Arrays; Beam Steering; Space Communication

20070038426 Army War Coll., Carlisle Barracks, PA USA

DoD Disaster Response: 'Unity of Effort versus Unity of Command'

Jensen, Garrett P; May 17, 2007; 27 pp.; In English

Report No.(s): AD-A471714; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471714>

Hurricane Katrina left the vast majority of Americans feeling that the U.S. Government's response had failed at all levels. Included in the public scrutiny was the view that the Department of Defense's (DoD) efforts were slow and uncoordinated. On September 2, 2005, aboard Air Force One, President George W. Bush encouraged Louisiana Governor Kathleen Blanco to acquiesce and federalize her National Guard forces. This would place them under the command of Lieutenant General Honore, the Joint Task Force Katrina Commander. She respectfully declined. One year later, her decision came to rest in Section 1076 of the Warner Defense Authorization Act. With little opportunity for debate, this legislation modified the 1807 Insurrection Act by adding a clause which specifically authorizes the President to federalize the National Guard for disaster response. This paper will demonstrate that modifying the Insurrection Act was unnecessary and it should be repealed.

DTIC

Armed Forces (United States); Command and Control; Congressional Reports; Defense Program; Disasters; Hurricanes; Law (Jurisprudence); Responses

20070038461 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Building a Planning Transition Capability into the New American Way of War

Hickey, Christopher M; May 14, 2007; 78 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471797; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471797>

Fast-tempo decisive combat operations have been called the 'New American Way of War.' This is in contrast to the traditional 'American Way of War,' which emphasized using massive amounts of firepower in a 'grinding strategy of attrition' like the USA did against Germany and Japan in World War II. A major problem for Joint Force commanders and their staffs is that the speed of the campaign in this 'New American Way of War' challenges their ability to adequately plan for both the decisive war fight and the transition to post-conflict operations. To better facilitate the transition from the dominate phase to the stability phase will require separate operational-level headquarters, each with sufficient training and expertise, working under a geographic combatant commander's overall operational design. This monograph uses organizational theory concepts of differentiation and integration to analyze the command structures in each of three case studies. The first case study is General Eisenhower's Supreme Headquarters' Allied Expeditionary Force (SHAEP) in the European Theater of Operations (ETO) during World War II, which is an example of the traditional 'American Way of War.' In the SHAEP command structure, the length of the dominate phase was long, which allowed adequate time to prepare for the stability phase. The other two case studies, U.S. joint operations in Panama and Operation Iraqi Freedom, are examples of the 'New American Way of War.' These operations had dominate phases that were very short, necessitating a quick transition to the stability phase. The SHAEP case study provides insights into the types of organizations, policies, procedures, and training that need to be integrated into the 'New American Way of War' so that there is adequate time to plan for the transition between combat and post-conflict operations. The author recommends that this transition be trained for in exercises and taught in Army and Joint schools.

DTIC

Combat; Command and Control; Military Operations; Planning; Warfare

20070038468 Space and Naval Warfare Systems Center, San Diego, CA USA

Composable Chat over Low-Bandwidth Intermittent Communication Links

Wilcox, D R; Apr 2007; 41 pp.; In English

Report No.(s): AD-A471810; SSC/SD-TR-1956; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471810>

Intermittent low-bandwidth communication environments, such as those encountered in U.S. Navy tactical radio and satellite links, have special requirements that do not pertain to commercial applications. They need a bandwidth-compression algorithm that limits the dependence of encoding symbols on previous state information because the loss of the previous state has a ripple effect on the interpretation of what follows. They also need a homing mechanism to permit synchronization at an arbitrary point in the broadcast message stream when reception is re-established, ideally, without negotiation between the transmitter and the receiver.

DTIC

Bandwidth; Broadband; Communication Networks; Low Frequencies; Satellite Communication

20070038469 Library of Congress, Washington, DC USA

The Transition to Digital Television: Is America Ready

Kruger, Lennard G; Sep 7, 2007; 14 pp.; In English

Report No.(s): AD-A471813; CRS-RL34165; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471813>

The Deficit Reduction Act of 2005 (P.L. 109-171) directs that on February 18, 2009, over-the-air television broadcasts - which are currently provided by television stations in both analog and digital formats - will become digital only. Digital television (DTV) technology allows a broadcaster to offer a single program stream of high definition television (HDTV), or alternatively, multiple video program streams (multicasts). Households with over-the-air analog-only televisions will no longer be able to receive television service unless they either: (1) buy a digital-to-analog converter box to hook up to their analog television set; (2) acquire a digital television or an analog television equipped with a digital tuner; or (3) subscribe to cable, satellite, or telephone company television services, which will likely provide for the conversion of digital signals to their analog customers. Households using analog televisions for viewing over-the-air television broadcasts are likely to be most affected by the digital transition. Of particular concern to many policymakers are low-income, elderly, disabled, non-English speaking, and minority populations. Many of these groups tend to rely more on over-the-air television, and are thus more likely impacted by the digital transition.

DTIC

Digital Systems; Television Systems

20070038624 Air Force Flight Test Center, Edwards AFB, CA USA

Limited Evaluation of an 802.11b Air-to-Air Wireless Data Link (Project Have HALO II)

Volesky, Robert A; Geitgey, Jason W; Vap, Jason C; Creviston, Douglas O; Kikuchi, Morikazu; Jun 1, 2007; 53 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471919; AFFTC-TIM-07-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents the results of Project Have HALO II a limited evaluation of an 802.11b wireless air-to-air data link between two C-12C aircraft. This test program demonstrated the 802.11b wireless data link reception range under 1 Watt and 5 Watts of amplification, corresponding to 0.32 and 1.58 Watt effective isotropic radiated power. The test team also demonstrated the capability of transmitting still photos, streaming video, pre-recorded video and text files across the data link. The USAF Test Pilot School (TPS), Class 06B, conducted 7 flight tests totaling 35.0 hours at Edwards AFB, California, from 14 to 29 Mar 2007. All test objectives were met.

DTIC

Data Links; Halos; Wireless Communication

20070038638 Army Engineer Research and Development Center, Vicksburg, MS USA

Setup and Operation of the TeleEngineering Communications Equipment - Fixed Site (TCE-F), Version 2

Williamson, Jeffrey L; Lynch, Larry N; Powell, Jeff; Register, Bryan; Oct 2004; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471942; ERDC-SR-04-3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In FY97, the U.S. Army Engineer Research and Development Center initiated a technology demonstration program to

determine the feasibility of providing deployed troops with direct access to subject matter experts (SME). Direct access to the SME allows responses to engineering challenges beyond the in-theater capability to be provided without the time delays and costs associated with deploying the SME to the theater. The purpose of this report is to describe the various components of the fixed-site TeleEngineering communications system and to provide the step-by-step procedures required to set up and operate the system. Chapter 2 presents the components that comprise the system. Chapter 3 provides details on setting up the equipment and the interconnections between the individual components. The operation of the system (i.e., conducting a VTC and transferring data) is presented in Chapter 4; methods of receiving technical support are provided in Chapter 5. Appendix A provides a wiring diagram for the fixed-site system; Appendix B provides troubleshooting tips.

DTIC

Communication Equipment; Engineering; Telecommunication

20070038686 Office of Force Transformation, Washington, DC USA

Fighting the Networked Force

Garstka, John J; Apr 2005; 57 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472041; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Command and Control; Situational Awareness

20070038872 Office of the Deputy Inspector General for Auditing, Arlington, VA USA

Acquisition: Allegations Concerning Mismanagement of the Aerial Targets Program

Jolliffe, Richard B; Burton, Bruce A; Pearson, Dianna J; Hilliard, Thomas J; Miller, Timothy; McKay, Celeste; Silver, Kiana; Bobbio, Jaime A; Chang, Wei K; Aug 4, 2006; 30 pp.; In English

Report No.(s): AD-A472006; ODIGAD-D-2006-106; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Air Force acquisition and flight test officials affiliated with the Gulf Range Drone Control System Program and the DoD test flight community should read this report. The report addresses allegations to the Defense Hotline concerning mismanagement of the Aerial Targets Program. We performed the audit in response to allegations concerning waste and mismanagement by the Air Force Aerial Targets Systems Program Office. The Hotline allegations were submitted in three letters by an anonymous complainant and addressed concerns about the lack of participation and support by the Air Force Aerial Targets Systems Program Office for the Multi-Service Target Control System Program. Appendix B shows the six primary areas of concern that were identified in the three letters and Appendix C shows the audit response to those concerns.

DTIC

Targets; Telecommunication

20070039040 National Inst. of Information and Communications Technology, Tokyo, Japan

Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network)

Kurihara, Noriyuki, Editor; Okano, Naoki, Editor; Wakana, Hiromitsu, Editor; Isobe, Shunkichi, Editor; December 2006; ISSN 1349-3205; 148 pp.; In English; See also 20070039041 - 20070039054; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

The contents include: 1) Researches on New Generation Mobile Network in NICT; 2) Broadband Wireless Access System for Next Generation Seamless Mobile Communication; 3) Advanced Wireless Packet Cellular System using Multi User OFDM-SDMN Inter-BTS Cooperation with 1.3 GbiVs Downlink Capacity; 4) Software Defined Radio for Next Generation Seamless Mobile Communication Systems; 5) Technology and Devices for 4th Generation Mobile Communication Terminals using Software Defined Radio; 6) Mobile Ethernet and its Security Toward Ubiquitous Network; 7) Secure Service Framework on Mobile Ethernet; 8) Scalable Mobile Ethernet and Fast Vertical Handover; 9) Empirical Evaluation of Real-Time Vertical Handover for Beyond 3G Wireless Network; 10) Overview of Research and Development on Seamless Networking Technologies; 11) Basic Access Signaling and Context-Aware Seamless Networking; 12) Context-Aware Service Mobility and Smart Space; 13) Mobile Ring Network for Large-Scale Mobile Internet; and 14) A Study of a Naming Scheme for User-Centric Environment.

CASI

Mobile Communication Systems; Communication Networks; Information Theory; Telecommunication

20070039041 Tohoku Univ., Japan

Researches on New Generation Mobile Network in NICT

Adachi, Fumiyuki; Miura, Ryu; Ogawa, Hiroyo; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 1-7; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

R&D on new generation mobile network has attracted a growing interest over the world on the background of rapid market growth for 2nd and 3rd - generation cellular networks and wireless LANs/MANs. The National Institute of Information and Communications Technology (NICT) started the New Generation Mobile Network Project in April 2002, and has developed fundamental technologies to enable seamless and secure integration of various wireless access networks such as existing cellular networks, wireless LANs, home networks, intelligent transport systems (ITS), the Beyond-3G (B3G) cellular and other wireless access systems. This paper overviews the achievements of the project focusing on network and access technologies.

Author

Telecommunication; Communication Networks; Local Area Networks; Broadcasting; Wide Area Networks

20070039042 National Inst. of Information and Communications Technology, Tokyo, Japan

Broadband Wireless Access System for Next Generation Seamless Mobile Communication

Harada, Hiroshi; Funada, Ryuhei; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 9-22; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

In this article, we propose a new generation mobile communication system that can realize 100 Mbps carrier bit rate under high mobility environment and can access IP network easily. The new system is based on dynamic parameter controlled orthogonal frequency and time division multiple access (DPC-OF/TDMA) in which users share 'slots' that use certain number of subcarriers and certain time. To access the slots, mobile stations use a packet-reservation-based protocol: packet reservation dynamic time-slotted multiple access (PR-DSMA). In addition, to avoid co-channel interference from adjacent cells and increase frequency utilization efficiency, we use an adaptive modulation scheme that is based on an interference detection algorithm. In this article, we mention the concept and the basic transmission performance of the proposed system.

Author

Broadband; Mobile Communication Systems; Wireless Communication; Frequency Division Multiple Access; Time Division Multiple Access

20070039043 National Inst. of Information and Communications Technology, Tokyo, Japan

Empirical Evaluation of Real-Time Vertical Handover for Beyond 3G Wireless Network

Saito, Yoshia; Miyamoto, Goh; Ishizu, Kentaro; Kuroda, Masahiro; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 83-; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

The Beyond 3 G Wireless Network, which is discussed at ITU-R, integrates various radio systems including 3 G, WLAN, and 4 G. It provides an all IP wireless solution to offer services taking advantage of each radio system. Current approach to integrate wireless systems is to localize wireless dependent functions and to integrate into all IP network using Mobile IP technologies. We proposed the Mobile Ethernet architecture, a Beyond 3 G, as all IP integrated wireless network using MAC layer technologies. There are some discussions to extend the Ethernet format to hold wireless frames efficiently caring about Mobility, QoS, and security along with the standardization activities in IEEE802 wireless technologies. In this paper we discuss mobility using common radio signaling scheme on the Mobile Ethernet and the vertical handover on the scheme. We design the Mobile Ethernet having W-CDMA and IEEE802.11 b with the common radio signaling and evaluate the vertical handover performance in an outdoor test bed environment. We describe issues on packet loss in relation to link quality threshold for handover and speed of terminal movement. We also clarify remaining issues for the standardization.

Author

Code Division Multiple Access; Performance Tests; Test Stands; Real Time Operation; Standardization

20070039044 National Inst. of Information and Communications Technology, Tokyo, Japan

Context-Aware Service Mobility and Smart Space

Hasegawa, Mikio; Bandara, Udana; Morikawa, Hiroyuki; Inoue, Masugi; Minami, Masateru; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 109-119; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

Various wireless and wired terminals have been well developed, but there are big differences between a compact mobile

phone and a desktop PC connecting to the high-speed Internet, on their performances and qualities. If we could switch among those different terminals adaptively according to availability, quality, cost and usability, the most appropriate terminal can be always used. In the ubiquitous network environment, various sensors and actuators will be connected to the networks and new communication services are expected to come out. As a new communication service candidate, in this paper, we show cross-device handover technology which switches an on-going multimedia communication session from an actuator to another actuator. We also show a context sensing platform for providing context-aware services to the mobile users. We realize a ubiquitous network application that the sensors collect the user's current information, a server in the network estimates the user's context, and appropriate information is provided to the user by the optimum way according to the contextual information.

Author

Actuators; Mobility; Telecommunication; Internets; Connectors; Detection; Multimedia

20070039045 Mitsubishi Electric Corp., Tokyo, Japan

Technology and Devices for 4th Generation Mobile Communication Terminals using Software Defined Radio

Sunaga, Terumi; Kiyohara, Tyozo; Itakura, Tetsuro; Terashima, Yoshiaki; Suematsu, Noriharu; Hirose, Yoshio; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 41-49; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

In the future mobile communication, it is expected that various wireless communication systems will coexist. Therefore mobile terminal must have multi-band/multi-mode features. Software defined radio (SDR) is one of the technique achieve these functions. In this paper, we describe the development results of device and key technology for SDR.

Author

Mobile Communication Systems; Wireless Communication; User Requirements; Telecommunication

20070039047 Tokyo Univ., Japan

Overview of Research and Development on Seamless Networking Technologies

Morikawa, Hiroyuki; Hasegawa, Mikio; Mahmud, Khaled; Pyo, Chang Woo; Minami, Masateru; Inoue, Masugi; Murakami, Homare; Ryoki, Nobuo; Tran, Ha Nguyen; Teraoka, Fumio; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 91-100; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

National Institute of Information and Communications Technology of Japan (NICT) completed a project on new-generation mobile communications networks for beyond 3G or 4G in March of 2006. This paper presents our vision of a new generation mobile communications networks from networking perspective and their capabilities to be offered: fast and large-capacity handover, cross-network handover, cross-device handover and interworking between real and cyber worlds. Then, Metro Mobile Ring network technology for the first capability. MIRAI architecture for the second and third capabilities and other works are presented.

Author

Information Systems; Mobile Communication Systems; Wireless Communication; Communication Networks

20070039048 National Inst. of Information and Communications Technology, Tokyo, Japan

Secure Service Framework on Mobile Ethernet

Inoue, Daisuke; Kuroda, Masahiro; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 61-71; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

Diverse and highly-developed mobile services will arise on next generation wireless networks. Users on the networks will have to securely manage a lot of credentials in their mobile terminals. It is necessary to provide a secure and easy-to-use framework for managing credentials independent of mobile terminals. In the New Generation Mobile Network Project, we have designed a secure service framework that separates credentials from a mobile terminal and stores them into a tamper resistant smartcard. This paper describes an overview of the secure service framework and its prototype implementation.

Author

Ethernet; Wireless Communication; Prototypes; High Speed; Computer Information Security

20070039049 National Inst. of Information and Communications Technology, Tokyo, Japan

Mobile Ring Network for Large-Scale Mobile Internet

Inoue, Masugi; Mahmud, Khaled; Pyo, Chang Woo; Kubo, Takeshi; Idoue, Akira; Yamamoto, Shu; Hasegawa, Mikio; Ryoki, Nobuo; Tran, Ha Nguyen; Yokota, Hidetoshi; Takeuchi, Kazunori; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 121-130; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

Mobile networking technologies for use in metropolitan areas are needed to realize IP-based new-generation mobile networks. For this purpose, provision of high scalability in the number of mobile devices to be accommodated and the volume of traffic they receive and transmit as well as low latency in switching connection from one access point to another while accommodating a huge volume of traffic are of great importance. We proposed a new mobility management architecture where multiple Localized Mobility Agents (LMA) are interconnected on a flat ring to decentralize location information of the visiting mobile devices and packet forward processing. Performance evaluations of the packet forwarding and outdoor experimental demonstration using testbed network were carried out. The proposed Mobile Ring has an advantage in a large-scale network that accommodates tens of thousands of mobile devices against conventional hierarchical networks.

Author

Telecommunication; Mobility; Protocol (Computers); Ring Structures; Internets

20070039050 National Inst. of Information and Communications Technology, Tokyo, Japan

A Study of a Naming Scheme for User-Centric Environment

Murakami, Homare; Olsen, Rasmus Lovenstein; Schwefel, Hans-Peter; Prasad, Ramjee; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 131-140; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

We will be able to access to our all resources through Personal Network (PN) connecting a user's Private Personal Area Network (P-PAN) and his/her clusters in a secure manner. We describe in this paper requirements on the naming scheme for the user-centric environment. Hereafter we propose a naming scheme, named New Naming Scheme (NNS) the Naming scheme is based on Domain Name System (DNS) and satisfies the requirements. The naming scheme introduces two layer concept to divide name space into private flat name space and hierarchical name space.

Author

Naming; Information Systems; Wireless Communication; Computer Networks

20070039051 National Inst. of Information and Communications Technology, Tokyo, Japan

Scalable Mobile Ethernet and Fast Vertical Handover

Ishizu, Kentaro; Kuroda, Masahiro; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 73-81; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

The 3G cellular system has infiltrated into market and the next generation wireless system called Beyond 3G is discussed at ITU-R. The Beyond 3G system integrates various wireless accesses including 3G and wireless LANs and provides an all IP wireless solution to offer services taking advantage of each wireless communication of the system. Current approach to integrate wireless systems is to localize wireless dependent functions and to integrate into all IP network using IP technologies. We propose a scalable Mobile Ethernet architecture for the all IP integrated network using MAC layer technologies, such as Provider Bridge, RPR, and IEEE802, and the fast vertical handover introducing common radio resource and signaling managements. We discuss network segmentation with mobility management and multicast management for the scalability of the Mobile Ethernet by reducing network traffic. We evaluate the network from the viewpoint of scalability. In the evaluation we understand that the design that the gateway switch of a segment forwarding MAC frames as an anchor point becomes effective in case that the gateway switch of each segment cannot hold entries for all mobile terminals. We also evaluate the vertical handover comparing to Mobile IPv6 fast handover, and understand that the fast vertical handover consumes less network resources and flexible in having an anchor point for handover.

Author

Ethernet; Wireless Communication; Mobile Communication Systems; Network Control

20070039052 National Inst. of Information and Communications Technology, Tokyo, Japan

Software Defined Radio for Next Generation Seamless Mobile Communication Systems

Harada, Hiroshi; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 31-39; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

In this paper, the configuration of the newly developed small-size software defined radio terminal for new generation seamless mobile communication systems is introduced. The terminal consists of a common platform that includes an original FPGA board, a CPU board, and RF boards with open interface. Users have only to prepare software modules for FPGAs and CPUs that can configure mobile communication systems that users hope to operate. In addition, the common platform has a control software that can change several communication systems as users like by using several algorithms based on certain conditions. On the common platform, the software modules of W-CDMA and IEEE802.11a that realize physical layer, data-link layer, and network (TCP/IP) layer has been established.

Author

Mobile Communication Systems; Network Synthesis; Radio Receivers; Radio Telemetry

20070039053 National Inst. of Information and Communications Technology, Tokyo, Japan

Basic Access Signaling and Context-Aware Seamless Networking

Inoue, Masugi; Murakami, Homare; Morikawa, Hiroyuki; Hasegawa, Mikio; Mahmud, Khaled; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 101-108; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

A variety of wireless access technologies such as cellular system, wireless LAN, Bluetooth and WiMAX emerged or are emerging. Applications that can be connected to the network have also been diversified from telephone terminals to consumer electronics and game machines. The presence of such diversified, heterogeneous networks and appliances will be a defining characteristic of the new-generation mobile network era, which will demand advanced telecommunication services and greater usability through optimal selection and switching among networks and appliances. We proposed 'MIRAI' architecture where an out-of-band signalling network separated from other networks for data transfer is established and have studied the feasibility and enhancement of the concept. This paper describes the characteristics, deployment scenarios and experimental systems of the MIRAI architecture.

Author

Telecommunication; Wireless Communication; Communication Networks; Signal Transmission

20070039054 KDDI R and D Labs., Inc., Saitami, Japan

Advanced Wireless Packet Cellular System using Multi User OFDM-SDMN Inter-BTS Cooperation with 1.3Gbit/s Downlink Capacity

Kawazawa, Toshio; Fujishima, Kenzaburo; Yoshida, Makoto; Inoue, Takashi; Taira, Masanori; Akasegawa, Akihiko; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 23-30; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

To realize the 4th generation mobile communications system, we have been developing elements of advanced wireless signal processing technologies for space, time and frequency domain, that are MU-OFDM (Multi User Orthogonal Frequency Division Multiplexing) technology, Cryogenic RF front-end technology, SDMA (Space Division Multiple Access) and space-time inter BTS (Base Transmission Station) scheduling using multi beamforming technology. This report proposes MU-OFDM-SDMA/Inter BTS cooperation packet cellular system with integration of the technology elements. We also report that the downlink transmission performance and spectral efficiency by simulation using the elements technology results achieved 1.3 [Gbit/s] and 18 [bit/s/Hz/cell], respectively.

Author

Downlinking; Wireless Communication; Packet Switching; Mobile Communication Systems; Orthogonal Multiplexing Theory

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*.

20070037518 California Univ., San Diego, La Jolla, CA USA

Coherence Optimization of Vertical Cavity Semiconductor Optical Amplifiers

Sanchez, Michael; Wen, Pengyue; Gross, Matthias; Kibar, Osman; Esener, Sadik C; Jun 1, 2005; 11 pp.; In English

Report No.(s): AD-A471137; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471137>

Vertical cavity semiconductor optical amplifiers (VCSOAs) are attractive devices for use in coherent optical amplification, especially where 2-D amplifier arrays are required. However, the coherence preservation quality of a VCSEA depends strongly on the bias condition, resonant wavelength mismatch, and the optical input power level. We characterize the coherence degree of a VCSEA as a function of these parameters by measuring interference fringe visibility with an interferometer. The dominant factors influencing the contrast of the fringes are the ratio of coherent, stimulated emission photons to amplified spontaneous emission (ASE) photons, and the spectral distortion of the amplified signal. Mostly, the overall gain and the saturation characteristic of the amplifier determine the ratio of stimulated emission to ASE. The spectral distortion of the signal is due to the narrow gain window of the VCSEA, but the effect significantly degrades the visibility only for relatively large wavelength mismatch from the gain peak. Analytic expressions may be used to identify the optimal bias current and optical input power to maximize the amplifier gain and visibility of the interference.

DTIC

Amplifiers; Cavities; Light Amplifiers; Optical Properties; Semiconductors (Materials)

20070037521 Forschungsgesellschaft fuer Angewandte Naturwissenschaften e.V, Wachtberg-Werthhoven, Germany

Fundamentals of Signal Processing for Phased Array Radar

Nickel, Ulrich; Sep 1, 2006; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471141; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471141>

No abstract available

Beamforming; Monopulse Radar; Phased Arrays; Signal Processing

20070037563 New Mexico Univ., Albuquerque, NM USA

Entrapment of Enzymes and Carbon Nanotubes in Biologically Synthesized Silica: Glucose Oxidase-catalyzed Direct Electron Transfer, Preprint

Invitski, Dmitri; Artyuskova, Kateryna; Rincon, Rosalba A; Atanassov, Plamen; Luckarift, Heather R; Johnson, Glenn R; Aug 2007; 24 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A471255; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471255>

This work demonstrates a new approach for building bio-inorganic interfaces by integrating biomimetically-derived silica with single-walled carbon nanotubes to create a conductive matrix for immobilization of enzymes. Such a strategy not only allows simple integration into bio-devices but presents an opportunity to intimately interface an enzyme and manifest direct electron transfer features. Biologically-templated silica/carbon nanotube/enzyme composites were evaluated electrochemically and characterized by means of X-ray photoelectron spectroscopy. Voltammetry of the composites displayed stable oxidation and reduction peaks at an optimal potential close to that of the FAC/FADS(sub 2) cofactor of immobilized glucose oxidase. The immobilization stabilized enzyme activity for a period of one month and retained catalytic activity towards the oxidation of glucose. It was demonstrated that the resulting composite can be successfully integrated into functional bio-electrodes for biosensor and biofuel cell applications.

DTIC

Biomimetics; Carbon Nanotubes; Catalysis; Electron Transfer; Entrapment; Enzymes; Glucose; Oxidase

20070037567 Oregon State Univ., Corvallis, OR USA

Low-Cost Deposition Methods for Transparent Thin-Film Transistors

Norris, Benjamin J; Sep 26, 2003; 188 pp.; In English

Report No.(s): AD-A471261; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471261>

The objective of this dissertation is to introduce low-cost processing methods for the fabrication of ZnO transparent thin-film transistors 'TTFTs'. A novel method for depositing ZnO body layers via spin-coating of a zinc nitrate-based spin solution is presented. The processing conditions of spin-coated ZnO are optimized to produce continuous and polycrystalline thin-films. Optimal spin-coated ZnO thin-films are obtained for a 32 nm thick film which is converted to ZnO at 600-C in air. Spin-coated ZnO TTFT mobilities are consistently in the range of 0.1 - 0.2 cm²=V s. Spin-coating deposition methods for HfO₂ are presented as a novel way to deposit low-cost gate insulators. Spin-coated HfO₂ dielectric has a breakdown field, dielectric constant, loss tangent, and leakage current at 1 MV=cm of ? 2:1 MV=cm, 12.1-13.5, 0.411%, and 17.37 nA=cm², respectively. Additionally, ZnO TTFTs constructed using spin-coated HfO₂ gate insulators possess electrical characteristics similar to those obtained with aluminum oxide and titanium oxide superlattice 'ATO' gate dielectrics. A second objective of this dissertation is to demonstrate a novel photolithography processing method for ZnO TTFTs with critical dimensions as small as 25 ?m. Lithography patterning of ZnO TTFTs is introduced as a means of assessing the effects of shrinking device dimensions on electrical performance.

DTIC

Deposition; Low Cost; Thin Films; Transistors; Transparency

20070037569 Oregon State Univ., Corvallis, OR USA

p-Type Transparent Electronics

Valencia, Melinda M; Sep 25, 2003; 95 pp.; In English

Report No.(s): AD-A471264; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471264>

The objective of this thesis is to contribute to the development of p-type materials for transparent electronics applications. Thin films of ?-BaCu₂S₂, a p-type semi-transparent semiconductor, are fabricated and characterized. ?-BaCu₂S₂ has a transmittance of 60% to 80 % in the visible portion of the electromagnetic spectrum. The mobility, conductivity, and carrier concentration of ?-BaCu₂S₂ are 3.5 cm²/V-s 17 S/cm, and 1019 cm⁻³, respectively. The potential use of BaCu₂S₂ in thin-film solar cells is described. A number of p-channel transparent thin-film transistors 'p-TTFTs' based on BaCu₂S₂, NiO, NiO:Li, and CuScO₂ are fabricated and characterized. None of these p-TTFTs are operational. The key issues in these transistors are as follows. BaCu₂S₂ p-TTFTs exhibit excessively large gate leakage current caused by the interaction of BaCu₂S₂ with the gate insulator. In undoped NiO p-TTFTs and in CuScO₂ p-TTFTs, the injected carriers are trapped in the transistor channel layer thin film. CuScO₂ p-TTFTs also suffer from gate leakage due to interaction of CuScO₂ with the gate insulator. In this work it is found that having Cu containing materials in contact with gate insulators leads to enhanced gate leakage current. In NiO:Li p-TTFTs, the bulk channel layer is too conductive to modulate with the transistor gate; thus, the transistors do not work. Information obtained from the characterization of these p-TTFTs is used to identify and explore important considerations in making a functional p-TTFT. These considerations include efficient injecting contacts to wide-bandgap p-type insulators, and the conductivity of materials used for the transistor channel in p-TTFTs. The topic of injecting contacts to wide-bandgap insulators and the topic of channel layer conductivity are explored and quantified.

DTIC

Semiconductors (Materials); Transparency

20070037729 Naval Research Lab., Washington, DC USA

A Design Study of a C-Band Crestatron

Abe, David K; Levush, Baruch; Chernin, David P; Jun 8, 2007; 25 pp.; In English

Report No.(s): AD-A471274; NRL/MR/6840-07-9055; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This memorandum presents a design study of a high power C-band Crestatron Amplifier. While conventional helix traveling-wave tubes (TWT's) are operated in an exponentially growing-wave mode, the Crestatron operates a 'beating-wave' regime where three constant-amplitude voltage waves traveling at different phase velocities along the helix beat together to produce power gain. Although inherently lower in gain than a TWT, the Crestatron can produce high power rf over a surprisingly broad frequency range with very good efficiency. In our design example, CHRISTINE 1-D large-signal simulations show that a 5850 volt, 196 mA Crestatron can produce in excess of 250 W of rf power over a frequency span of 3 to 5.5 GHz. When combined with a two-stage depressed collector, the peak efficiency of the Crestatron is ~64% compared

with ~50% for a TWT of similar power over this band. The Crestatron is also a higher power density device, with an estimated 40% reduction in length and 25% reduction in mass compared to the TWT. Compact, efficient, high power, high gain transmitters can be realized by combining the Crestatron with a low-noise solid-state driver in a microwave power module (MPM) configuration. Such a system has promising applications in volume- and weight-constrained platforms such as airborne pods and unmanned vehicles.

DTIC

Amplifiers; C Band; Traveling Wave Tubes

20070037742 Oregon State Univ., Corvallis, OR USA

Contact Resistance and Stability Analysis of Oxide-Based Thin Film Transistors

Hung, Celia M; Sep 19, 2006; 111 pp.; In English

Contract(s)/Grant(s): MURI-E-18-667-G3

Report No.(s): AD-A471307; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis focuses on 2 aspects of oxide-based thin-film transistors (TFTs), contact resistance and instability assessment. Determination of the contact resistance of indium tin oxide (ITO) on two wide-band gap semiconductors, zinc oxide (ZnO) and indium gallium oxide (IGO), is attempted and the effects of contact resistance on device performance is investigated. Both transistor and transfer length method structures are used and 3 material systems are employed: ZnO on SiO₂, ZnO on aluminum titanium oxide (ATO), and IGO on SiO₂. It is found the measured resistance is not dominated by contact resistance effects. It is concluded that the device dimensions used in this study are too large to yield an accurate estimate of the contact resistance. Second, a methodology for assessing the stability of oxide-based TFTs is developed and implemented. This stability assessment strategy is first applied to 3 semiconducting materials: ZnO, zinc indium oxide (ZIO), and IGO, using thermal silicon oxide as the gate dielectric. Relatively stable devices are obtained after post-deposition annealing at a temperature of ~ 600 deg. C for ZnO and IGO TFTs, and ~ 400 deg. C for ZIO TFTs. The presence of instability in these devices, which is more pronounced at a lower annealing temperature, results in a positive shift in the turn-on voltage and clockwise hysteresis in the drain current-gate voltage transfer curve. Such an instability is attributed to electron trapping near the channel/insulator interface. The stability a ZnO TFT fabricated using a spin-coat synthesized aluminum phosphate (AlPO) as the gate dielectric is also investigated. It is shown that stable TFTs can be fabricated with oxide-based channel layers if a high quality insulator is available and if a post-deposition anneal at an elevated temperature is employed.

DTIC

Contact Resistance; Oxide Films; Stability Tests; Thin Films; Transistors

20070037743 Oregon State Univ., Corvallis, OR USA

Computationally Efficient Substrate Noise Coupling Estimation in Lightly Doped Silicon Substrates

Srinivasan, Kavitha; Sep 22, 2006; 114 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471309; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A Z-parameter based macromodel for characterizing the substrate noise coupling in a lightly doped substrate at low frequencies has been developed. The model is scalable with contact geometries and separation. The cross-coupling impedance between two contacts is modeled using an improved geometric mean distance formulation. This approach obviates the need for using several spacing related parameters for describing the contact separations, sizes, and orientation. An improved self-impedance model has also been developed. Proximity effects of neighboring contacts are taken into account by a paneling approach. The macromodel with paneling has been successfully used to predict the noise coupling for multi-contact examples. The errors from the macromodel relative to a numerical simulator are within acceptable limits of 15%.

DTIC

Doped Crystals; Silicon; Substrates

20070037756 Texas Univ., Austin, TX USA

Integrated Silicon Optical Receiver with Avalanche Photodiode

Csutak, S M; Schaub, J D; Wang, S; Mogab, J; Campbell, J C; Jun 1, 2005; 4 pp.; In English

Report No.(s): AD-A471343; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An optical receiver consisting of an avalanche photodiode integrated with a trans-impedance amplifier is reported. The optical receiver was fabricated on a 2 micrometers thick SOI substrate in a 130 nm unmodified CMOS process flow. the unity gain external quantum efficiency of the photodetectors was ~10% at 850 nm. Optimum sensitivity was achieved for an

avalanche gain $M=8$. This gain accounted for 5 dB improvement in receiver Sensitivity at 2 Gbit/s. Operation at 8 Gbit/s was achieved only when the photodetector was biased in the avalanche gain regime.

DTIC

Avalanche Diodes; Avalanches; Optical Equipment; Photodiodes; Receivers; Silicon

20070037758 Air Force Research Lab., Hanscom AFB, MA USA

Application of Evolutionary Algorithms and Neural Network Concepts to the Design of Low-Cost, Wideband Antenna Arrays

Santarelli, Scott G; Mailloux, Robert J; Yu, Tian-Li; Roberts, Thomas M; Champion, Michelle H; Goldberg, David E; Apr 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A471346; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes the application of biologically-inspired algorithms and concepts to the design of wideband antenna arrays. In particular, we address two specific design problems. The first involves the design of a constrained-feed network for a Rotman-lens beamformer. We implemented two evolutionary optimization (EO) approaches, namely a simple genetic algorithm (SGA) and a competent genetic algorithm. We conducted simulations based on experimental data, which effectively demonstrate that the competent GA outperforms the SGA (i.e., finds a better design solution) as the objective function becomes less specific and more general. The second design problem involves the implementation of polyomino-shaped subarrays for sidelobe suppression of large, wideband planar arrays. We use a modified screen-saver code to generate random polyomino tilings. A separate code assigns array values to each element of the tiling (i.e., amplitude, phase, time delay, etc.) and computes the corresponding far-field radiation pattern. In order to conduct a statistical analysis of pattern characteristics vs. tiling geometry, we needed a way to measure the similarity between two arbitrary tilings to ensure that our sampling of the tiling space was somewhat uniformly distributed. We ultimately borrowed a concept from neural network theory, which we refer to as the dot-product metric, to effectively categorize tilings based on their degree of similarity.

DTIC

Algorithms; Antenna Arrays; Antennas; Broadband; Low Cost; Neural Nets

20070037786 Department of the Navy, Washington, DC USA

Field Programmable Gate Array Based Global Communication Channel for Digital Signal Processor Chips

Dutton, C R, Inventor; Jul 11, 2005; 12 pp.; In English

Report No.(s): AD-A471400; No Copyright; Avail.: Other Sources

An apparatus comprising a host digital signal processor (DSP), at least one field programmable gate array (FPGA) in communication with the host DSP for receiving a digital signal from the host DSP, and at least one non-host DSP in communication with the at least one FPGA for receiving the digital signal.

DTIC

Channels (Data Transmission); Chips; Digital Systems; Field-Programmable Gate Arrays; Signal Analyzers; Signal Processing

20070037790 European Aeronautic Defence and Space Co., Bremen, Germany

RCS Simulation

Ritter, Jan; May 1, 2005; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471408; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Radar Targets; Rectifiers; Simulation

20070037807 California Univ., Berkeley, CA USA

Rate Equations of Vertical-Cavity Semiconductor Optical Amplifiers

Royo, P; Koda, R; Coldren, L A; Mar 1, 2002; 4 pp.; In English

Report No.(s): AD-A471436; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We rigorously establish the rate equations for vertical-cavity semiconductor optical amplifiers, starting from a general energy rate equation. Our results show that the conventional rate equation used so far in the literature is incorrect because of

an inappropriate calculation of the mirror losses. Our calculations include the effect of amplified spontaneous emission and can be used to describe the properties of resonant-cavity-enhanced photodetectors.

DTIC

Cavities; Laser Cavities; Light Amplifiers; Optical Properties; Semiconductors (Materials); Surface Emitting Lasers

20070037815 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA

DARPA Quantum Network Testbed

Elliott, Chip; Yeh, Henry; Jul 2007; 164 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-01-C-0170; DARPA ORDER-L750; Proj-L750

Report No.(s): AD-A471450; No Copyright; Avail.: Defense Technical Information Center (DTIC)

BBN has designed and built the world's first Quantum Network testbed, delivering end-to-end network security via high-speed Quantum Key Distribution (QKD), and testing that Network against sophisticated eavesdropping attacks. BBN has fielded this ultrahigh-security network into commercial fiber across the metro Boston area. BBN's QKD network comprises 10 nodes. It is both extremely secure and 100% compatible with today's Internet technology. Four of the 10 nodes are running 24x7 over Boston metro telecom fiber between BBN, BU and Harvard and protecting Internet traffic; four other nodes are free-space; and two are based on polarization entanglement through fiber. BBN also teamed with NIST & University of Rochester to build the first superconducting single-photon detector. It saw first light in 2005. We characterized our prototype detector at temperatures ranging from 2K to 4K and expect to operate a full detector suite in early 2006 at speed up to 100MHz (20x faster than any existing detector). BBN also collaborated with MIT to build the world's first experimental demonstration of Eve, a quantum eavesdropper. The results were published in Summer 2006.

DTIC

Computer Networks; Test Stands

20070037828 Oregon State Univ., Corvallis, OR USA

Substrate Noise Coupling Analysis in 0.18 micrometer Silicon Germanium (SiGe) and Silicon on Insulator (SOI) Processes

Pham, Hui E; Aug 24, 2004; 109 pp.; In English

Report No.(s): AD-A471473; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Analysis of substrate noise coupling was performed for a 0.18 micrometer, lightly doped silicon germanium BiCMOS process. Techniques to minimize noise coupling in the chip and board design are presented, as are methods for accurate modeling for substrate noise coupling simulations. Measurements from a test chip were taken to verify that the modeling approach used in simulation and the substrate noise model obtained using Silencer! are accurate to within 10%. The effects of a deep trench moat structure, bulk separation, and die perimeter ring also were tested as possible noise reduction methods. Strategies for simulation and measurement of substrate noise coupling in a 0.18 micrometer SOI process also are presented.

DTIC

CMOS; Computerized Simulation; Germanium; Integrated Circuits; Noise Reduction; Silicon; SOI (Semiconductors); Substrates

20070037829 Oregon State Univ., Corvallis, OR USA

Silencer! A Tool for Substrate Noise Coupling Analysis

Birrer, Patrick; Jan 9, 2004; 149 pp.; In English

Report No.(s): AD-A471474; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis presents Silencer!, a fully automated, schematic-driven tool for substrate noise coupling simulation and analysis. It has been integrated into the CADENCE DFII environment and seamlessly enables substrate coupling analysis in a standard mixed-signal design flow. Silencer! aids IC designers in the analysis of substrate noise coupling at different levels of hierarchy -- from a level where only an approximate layout of the transistors is known to a level that incorporates various parasitic elements. It can be used for layout optimization to reduce substrate cross-talk noise between circuitry that injects noise into the substrate and other circuitry that is sensitive to it. Examples in a TSMC 0.35 micrometer heavily doped process have been simulated and the results are in good agreement with measured fabricated chips.

DTIC

Computer Programs; Computerized Simulation; Integrated Circuits; Metal Oxide Semiconductors; Silencers; Substrates; Transistors

20070037834 Oregon State Univ., Corvallis, OR USA

Frequency Domain Steady-state Simulation of Oscillators

Duan, Xiaochun; Jun 8, 2005; 125 pp.; In English

Report No.(s): AD-A471487; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The focus of this work is on developing algorithms for frequency domain steady-state analysis of oscillators. Convergence problems associated with the frequency domain harmonic balance simulation of oscillators have been examined. Globally convergent homotopy methods have been combined with the harmonic balance method for robust high-Q oscillator simulation. Various homotopy options are evaluated leading to an algorithm that is applicable to a wide variety of oscillator circuits. Two new approaches have also been developed for the simulation of ring oscillators using the harmonic balance method. These include a single-delay cell method and a multiple-probe method. The new methods that have been proposed are robust compared to traditional methods and readily converge for a wide range of single-ended and differential oscillators. They enable harmonic balance simulation of 'difficult-to-converge' oscillator circuits.

DTIC

Frequencies; Oscillators; Simulation; Steady State

20070037835 Oregon State Univ., Corvallis, OR USA

Ferroelectric Thin Film Development

Harman, Taran V; Dec 10, 2003; 108 pp.; In English

Contract(s)/Grant(s): DMR-0071727

Report No.(s): AD-A471488; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The long-term goal of the research project initiated with this thesis is the development of lead-free, fully-transparent ferroelectric devices, such as ferroelectric capacitors or ferroelectric-gate field-effect transistors. Ferroelectric materials exhibit spontaneous polarization with the application of an external electric field, which is persistent upon removal of the applied field, and can be reversed by applying a field of opposite polarity. Ferroelectric thin films can be used in non-volatile memory applications in storage capacitors or as the gate dielectric of a field-effect transistor. Ferroelectric devices are fabricated by the deposition of ferroelectric lead zirconate titanate 'PZT' by RF sputtering and by the chemical solution deposition 'CSD' method of spin coating. Ferroelectric PZT capacitors are characterized by measuring capacitance and conductance as a function of frequency, and by measuring polarization as a function of applied electric field using a Sawyer-Tower circuit. Ferroelectric PZT capacitors with opaque Au or Ni top electrodes exhibit dielectric constants in the range of 300-600, typical of a ferroelectric film. However, all attempts to fabricate ferroelectric capacitors with transparent top contacts, involving several types of transparent conductors and the use of insulating buffer layers, resulted in charge injection and breakdown before the ferroelectric layer is fully polarized.

DTIC

Ferroelectric Materials; Ferroelectricity; Thin Films

20070037894 Oklahoma State Univ., Stillwater, OK USA

Multiscale Modeling and Simulation of Material Processing

Komanduri, Ranga; Lu, Hongbing; Raff, Lionel; Roy, Samit; Jul 2006; 224 pp.; In English

Contract(s)/Grant(s): F46920-03-1-0281

Report No.(s): AD-A471590; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project is on the development of scaling laws for multiscale simulations from atomistic to continuum using material testing techniques, such as tension and indentation. The main objective is to address critical issues involved in modeling. Specific problems addressed in this project are: (1) Multiscale simulation from atomistic to continuum via mesoplasticity by coupling molecular dynamics with the material point method in microtensile testing and nanoindentation. (2) Material behavior at nano- and microlevels using an in situ microtensile stage on an atomic force microscope and a nanoindentation system, (3) Multiscale simulation using the generalized interpolation material point method and parallel processing; (4) Combined finite element method and nanoindentation tests to determine material properties of single crystal copper in different orientations, incorporating mesoplastic constitutive laws, (5) Development of accurate and robust potentials from ab initio calculations using Gaussian O3 software, novelty sampling, and feed-forward neural networks (NN); and (6) Monte Carlo-Steepest Descent simulations of nanometric cutting.

DTIC

Molecular Dynamics; Parallel Processing (Computers); Simulation

20070037902 University of Southern California, Los Angeles, CA USA

Calculated Out-of-Plane Transmission Loss for Photonic-Crystal Slab Waveguides

Kuang, Wan; Kim, Cheolwon; Stapleton, Andrew; Kim, Woo J; O'Brien, John D; Jun 1, 2005; 4 pp.; In English

Contract(s)/Grant(s): ECS-00944020

Report No.(s): AD-A471602; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A fully three-dimensional finite-difference time domain numerical model is presented for calculating the out-of-plane radiation loss in photonic-crystal slab waveguides. The propagation loss of a single-line defect waveguide in triangular-lattice photonic crystals is calculated for suspended-membrane, oxidized-lower-cladding, and deeply etched structures. The results show that low-loss waveguides are achievable for sufficiently suspended membranes and oxidized-lower-cladding structures.

DTIC

Crystals; Slabs; Transmission Loss; Waveguides

20070037905 University of Southern California, Los Angeles, CA USA

Microring Resonators Vertically Coupled to Buried Heterostructure Bus Waveguides

Choi, Seung J; Djordjev, Kostadin; Choi, Sang J; Dapkus, P D; Lin, Wilson; Griffel, Giora; Menna, Ray; Connolly, John; Jun 1, 2005; 4 pp.; In English

Report No.(s): AD-A471605; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The authors demonstrate all epitaxial semiconductor microring resonators vertically coupled to buried heterostructure (BH) bus waveguides for the first time. Planar vertically stacked waveguides are successfully grown on BH mesas by conducting a two-step regrowth process. This approach is potentially important for any buried waveguide technology where subsequent surface planarity is required. The measured transmission spectra show resonance dips (1.55 ~ 1.60) micrometers with quality factors, extinction ratios, and free spectral ranges of 2500-3.5 dB, and ~11 nm, respectively, for 10-micrometers-radii microrings.

DTIC

Epitaxy; Resonators; Semiconductors (Materials); Waveguides

20070038080 NASA Dryden Flight Research Center, Edwards, CA, USA

Measuring Radiofrequency and Microwave Radiation from Varying Signal Strengths

Davis, Bette; Gaul, W. C.; July 08, 2007; 15 pp.; In English; Health Physics Society Conference, 8-12 Jul. 2007, Portland, OR, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation discusses the process of measuring radiofrequency and microwave radiation from various signal strengths. The topics include: 1) Limits and Guidelines; 2) Typical Variable Standard (IEEE) Frequency Dependent; 3) FCC Standard 47 CFR 1.1310; 4) Compliance Follows Unity Rule; 5) Multiple Sources Contribute; 6) Types of RF Signals; 7) Interfering Radiations; 8) Different Frequencies Different Powers; 9) Power Summing - Peak Power; 10) Contribution from Various Single Sources; 11) Total Power from Multiple Sources; 12) Are You Out of Compliance?; and 13) In Compliance. Derived from text

Microwaves; Radio Frequencies; Variations; Signal Transmission

20070038381 University of Southern California, Los Angeles, CA USA

Laterally Coupled Buried Heterostructure High-Q Ring Resonators

Choi, Seung J; Djordjev, Kostadin; Peng, Zhen; Yang, Qi; Choi, Sang J; Dapkus, P D; Jun 1, 2005; 4 pp.; In English

Report No.(s): AD-A471611; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471611>

All-buried InP-InGaAsP ring resonators laterally coupled to bus waveguides are demonstrated. The buried configurations offer a lower built-in refractive index step along the resonator periphery, which affords enhanced optical coupling coefficients between the waveguides and reduced scattering losses caused by the resonator sidewall imperfections. Very low optical intensity attenuations of 0.4 /cm and coupling-limited quality factors of greater than 10(exp 5) are observed from 200-micrometers-radii ring resonators. The measured spectral linewidth is as narrow as 0.0145 nm.

DTIC

Q Factors; Resonators

20070038389 University of Southern California, Los Angeles, CA USA

Carrier-Induced Refractive Index Changes in InP-Based Circular Microresonators for Low-Voltage High-Speed Modulation

Sadagopan, Thiruvikraman; Choi, Seung J; Choi, Sang J; Djordjev, Kostadin; Dapkus, P D; Jun 1, 2005; 4 pp.; In English Report No.(s): AD-A471621; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471621>

Optical InP-based microresonator modulators which achieve low-voltage high-bandwidth modulation are presented, where resonant wavelength tuning of a circular resonator by free carrier injection is used as the modulation mechanism. Since thermal effects in small resonant cavities and switching speed limitations posed by minority carrier lifetime are the primary concerns in such types of devices, ion bombardment in microtoroidal structures is used to increase the speed of response. The modulation speed is enhanced by an order of magnitude.

DTIC

High Speed; Low Voltage; Modulation; Refractivity; Resonators

20070038411 University of Southern California, Los Angeles, CA USA

An Eight-Channel Demultiplexing Switch Array Using Vertically Coupled Active Semiconductor Microdisk Resonators

Choi, Seung J; Peng, Zhen; Yang, Qi; Choi, Sang J; Dapkus, P D; Nov 2004; 4 pp.; In English Report No.(s): AD-A471676; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471676>

The authors demonstrate a 1.6-nm spectrally spaced eight-channel demultiplexer using active semiconductor microdisk resonators as a platform technology. Taking full advantage of the active microdisks, they are able to switch ON and OFF a resonator individually and tune the resonant wavelength as well by controlling the current injection levels. The use of active microdisks affords narrow spectral linewidth (<0.15 nm), low insertion loss (<2.5 dB), and distinct channel isolation (>15 dB) for the demultiplexed output signals.

DTIC

Demultiplexing; Insertion Loss; Optical Switching; Photonics; Resonators; Semiconductors (Materials); Switches

20070038412 California Univ., San Diego, La Jolla, CA USA

Analysis of Enhanced Second-Harmonic Generation in Periodic Nanostructures using Modified Rigorous Coupled-Wave Analysis in the Undepleted-Pump Approximation

Nakagawa, Wataru; Tyan, Rong-Chung; Fainman, Yeshaiahu; Sep 2002; 11 pp.; In English Report No.(s): AD-A471677; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471677>

The authors present an extension of the rigorous coupled-wave analysis (RCWA) technique to analyze second-harmonic generation (SHG) in periodic optical nanostructures in the undepleted-pump approximation. They apply this method to analyze SHG in two example nanostructures for which they predict enhanced nonlinearity due to transverse near-field localization of the fundamental optical field in the nonlinear material. First, they examine a periodic nanostructure that yields up to twice the transmitted SHG intensity output compared with the bulk nonlinear material, but only for small nanostructure depths because of mismatch of the fundamental and second-harmonic mode phase velocities. Second, they develop and analyze a modified nanostructure and find that this nanostructure concurrently achieves transverse localization and phase matching for SHG. In principle, this permits an arbitrary coherent interaction length, and for several specific nanostructure depths they predict a transmitted SHG intensity output more than two orders of magnitude greater than that of the bulk material.

DTIC

Augmentation; Electromagnetic Wave Transmission; Harmonic Generations; Nanostructures (Devices); Near Fields; Nonlinear Optics; Nonlinearity; Phase Matching; Photonics; Position (Location)

20070038453 Pennsylvania State Univ., University Park, PA USA

Piezoelectric Tailoring with Enhanced Electromechanical Coupling for Concurrent Vibration Control of Mistuned Periodic Structures

Wang, Kon-Well; Dec 2006; 33 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0054

Report No.(s): AD-A471779; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471779>

The objective of this research is to advance the state of the art of vibration control of mistuned periodic structures utilizing

the electromechanical coupling and damping characteristics of piezoelectric networking. In this investigation, an active coupling enhancement approach through negative capacitance has been developed to increase the piezoelectric electromechanical coupling. Experiments were carried out to validate the delocalization concept of the piezoelectric network. It was verified that the vibration localization level in a mistuned periodic structure can be reduced by using the piezoelectric networking and further improved by the negative capacitance. The piezoelectric networking concept was further extended and investigated as an effective means for vibration suppression of mistuned bladed disks. An optimal network was analytically derived and the performance and robustness of the optimal network was analyzed numerically through Monte Carlo simulation. The analysis showed that the optimal network can effectively suppress vibration of bladed disk systems under multiple spatial harmonic excitations, and is effective for mistuned systems. The optimal network is also robust against variations in circuitry parameters. Experiments were performed to demonstrate the multiple spatial harmonic vibration suppression effect of the piezoelectric network on a coupled blade and disk system. The test results verified the analytical predictions and showed that the proposed approach is effective in suppressing multiple engine order excitations.

DTIC

Coupling Circuits; Electromechanical Devices; Electromechanics; Networks; Piezoelectricity; Vibration; Vibration Damping

20070038612 Massachusetts Inst. of Tech., Cambridge, MA USA

Evaluation of Non-Intrusive Load Monitoring for Shipboard Cycling System Diagnostics

Mosman, James P; Jun 1, 2006; 99 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62271-97-G-0026

Report No.(s): AD-A471894; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Non-Intrusive Load Monitor (NILM) is a device that utilizes voltage and current measurements to determine the operating schedule of all of the major loads on an electrical service. Additionally, the NILM can use its electrical measurements to diagnose impending failures in the mechanical systems that are actuated by the electric loads. Ongoing NILM research conducted at Massachusetts Institute of Technology's Laboratory for Electromagnetic and Electronic Systems (LEES) is exploring the application of NILM technology in shipboard environments. For the current shipboard applications, diagnostic software development is in progress. To aid in that process, research was done to understand the dynamics of a shipboard cycling system. This thesis presents an in-depth examination of the development of diagnostic indicators for a shipboard vacuum assisted waste disposal system. Measurements and experimentation were conducted onboard USCGC SENECA (WMEC-906), a 270-foot Coast Guard Cutter. In order to better understand the system dynamics, a computer based model was developed to simulate the system. The intent of creating an in-depth model was to develop diagnostic methods that are applicable to any shipboard cycling systems. First, a base model is designed followed by the exploration of a realistic model that includes variation commonly found in the system. Thirdly, a diagnostics section explores methods to detect increased pump operation and distinguish between high system usage and the presence of a leak. Lastly, a basic cost analysis is done on the sewage system to show the benefits of installing a NILM.

DTIC

Cycles; Diagnosis; Loads (Forces); Monitors; Nonintrusive Measurement; Sewage Treatment

20070038673 Cincinnati Univ., OH USA

Bistability in Doped Organic Thin Film Transistors (Preprint)

Stricker, Jeffery T; Gudmundsdottir, Anna D; Smith, Adam P; Taylor, Barney E; Durstock, Michael F; Mar 2007; 25 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A472025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Organic thin film transistors (TFTs) with the conducting polymer poly(3,4-ethylenedioxythiophene):poly(styrene sulfonic acid), PEDOT:PSS, as the active layer and crosslinked, layer-by-layer assembled poly(allylamine hydrochloride)/poly(acrylic acid) (PAH/PAA) multilayers as the gate dielectric layer were investigated. A combination of spectroscopic data and device performance characteristics were used to study the behavior of these TFT devices under a variety of controlled environmental test conditions. It was shown that depletion and recovery of the device can be induced to occur in a means that is consistent with the electrochemical oxidation and reduction of water contained in the film. In addition to acting as a reactant, moisture also acts as a plasticizer to control the mobility of other species contained in the film and thereby permits bistable operation of these devices. Raman spectroscopy was used to show that the observed device switching behavior is due to a change in the PEDOT doping level.

DTIC

Doped Crystals; Thin Films; Transistors

20070039028 Ljubljana Univ., Ljubljana, Slovenia

Electrotechnical Review, Volume 74, Nos. 1-2

Zajc, Baldomir, Editor; Trost, Andrej, Editor, et al.; 2007; ISSN 0013-5852; 88 pp.; In English; In Slovene; See also 20070039029 - 20070039039; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The contents include: 1) Analysis of Electric and Magnetic Fields in the Vicinity of 400 Kv High-Voltage Power Lines; 2) Objective Assessment of Image Segmentation Algorithms; 3) Tracking Multiple Players in Sport Games Using the Visual Information; 4) Tracking Mouse Movements for Monitoring Users' Interaction with Websites: Implementation and Applications; 5) Choice of a Suitable Calibration Method for Automatic Vector Network Analyzers with Non-Standard Connectors; 6) Face Image Registration for Improving Face Recognition Rate; 7) Software Non-Repeatability Behaviour in Different Processors; 8) Population Size in Differential Evolution Algorithm; 9) Evaluation of Experimental Methods for Determining Magnetically Nonlinear Characteristics; 10) Application of the Direct Lyapunov Method for Transient-Stability Assessment of Electric-Power Systems with the Unified Power Flow Controller; and 11) A Hybrid Fuzzy Model for Model Predictive Control.

CASI

Electrical Engineering; Mathematical Models; Electromagnetism; Electric Power Transmission

20070039029 Maribor Univ., Maribor, Slovenia

Objective Assessment of Image Segmentation Algorithms

Heric, Dusan; Potocnik, Bozidar; Electrotechnical Review, Volume 74, Nos. 1-2; 2007, pp. 13-18; In English; See also 20070039028; Copyright; Avail.: Other Sources

An image segmentation algorithm quality assessment is usually visual, subjective and based on non-standard measures. Non-transparencies among assessment results present a problem in objective evaluation of segmentation algorithms accuracy. This paper introduces an image processing assessment tool (IPA-tool) for objective assessment with standard accuracy measures and reference annotations. These annotations are considered as a ground truth. It is difficult to get the ground truth of real-world images in practice. The IPA-tool, therefore, supports also a mean observer mechanism which creates the ground truth from several annotations. This paper proposes an assessment chain, mean observer mechanism and supported assessment measures inside the IPA-tool.

Author

Image Processing; Ground Truth; Algorithms; Imaging Techniques; Accuracy

20070039030 Maribor Univ., Maribor, Slovenia

Software Non-Repeatability Behaviour in Different Processors

Salamon, Matej; Dogsa, Tomaz; Electrotechnical Review, Volume 74, Nos. 1-2; 2007, pp. 49-54; In Slovene; See also 20070039028; Copyright; Avail.: Other Sources

When we run the same program on computers with the same or different processors, we expect its behaviour would be the same. When this is not the case, the program non-repeatability occurs. Non-repeatability can remain hidden to users, if differences between results of different processors are very small. If differences increase in time, execution code behaviour in different processors will no longer be the same. This paper deals with the software non-repeatability problem and its detection with a test program. In section 2 we propose a software repeatability criterion and present an example of circuit simulator nonrepeatability. The test program for the software nonrepeatability prediction, installed on a computer with different processors, is described in section 3. The test program contains different test cases which verify the processors compliance with IEEE 754 and IEEE 854 standards. Results in section 3 show that the reasons for software non-repeatability are errors in the program, compiler errors and execution differences of the same mathematical operations in different processors. The latter occur when the program is running on a computer with a processor whose characteristics do not comply with the above standards. Namely, processor manufacturers build additional functions in their processors in order to achieve better performance and attractiveness for their market, although their functionality is not always in accordance with the IEEE standards.

Author

Central Processing Units; Performance Tests; Software Engineering; Computer Systems Programs

20070039031 Elektro-Slovenija, d.o.o., Ljubljana, Slovenia

Analysis of Electric and Magnetic Fields in the Vicinity of 400 Kv High-Voltage Power Lines

Ferlic, Rado; Trlep, Mladen; Electrotechnical Review, Volume 74, Nos. 1-2; 2007, pp. 1-6; In Slovene; See also 20070039028; Copyright; Avail.: Other Sources

The paper describes the basic theory of electromagnetic radiation. The calculation results are compared with the

comparative measurement results. The calculation is made with the finite-element method based on the actual geometry and electrical parameters of the used power lines. The comparative measurements were made on the high-voltage power line (HVPL) 2 x 400kV Maribor-Krsko and Maribor-Podlog. When dealing with electromagnetic fields, we have to know the real voltage and current waveform. The amplitude of the electric field strength is namely affected by the actual voltage of the power line. For single voltage levels, the highest operating voltages can be 123 kV, 245 kV and 420 kV. The electric current that flows through a single phase conductor affects the amplitude of the magnetic field density. The highest permanently allowable current for the 400 kV power line is 1600 A. The voltage of the system does not change essentially during the operation of the power line, but the currents are directly dependent on the amplitude of electricity transmission at a specific moment. Therefore, the values are changed from zero to the highest possible line thermal rating. The paper shows the power line 2 x 400 kV Maribor - Krsko and Maribor - Podlog, where the direction of energy flow in the single power line is opposite to the other. However, at a particular moment we must take into consideration the phase angle between the voltage and currents in different systems.

Author

Electric Potential; Electromagnetic Fields; Electromagnetic Radiation; Finite Element Method; Power Lines

20070039032 Ljubljana Univ., Ljubljana, Slovenia

Face Image Registration for Improving Face Recognition Rate

Mrak, Tilen; Zaletelj, Janez; Tasic, Jurij F.; *Electrotechnical Review*, Volume 74, Nos. 1-2; 2007, pp. 43-48; In Slovene; See also [20070039028](#); Copyright; Avail.: Other Sources

Face recognition has become an active area in the field of pattern recognition. It has numerous commercial and law-enforcement applications including video surveillance, information security and entertainment [1]. One of the main advantages of face recognition, when compared to other identification techniques, is its non-intrusiveness. This means that users are not asked for any kind of cooperation while the system identifies them and may even fail to notice that the identification process is running. In this paper we present an algorithm for registration and normalization of digital face images. Using this algorithm we can either improve the recognition rate or make recognition possible in cases where this was not possible before. In the first phase we have to detect faces on the image. This is achieved by using a face detector that implements a set of Harr-like features and AdaBoost learning algorithm [5], [6]. In the next phase we have to detect selected characteristic points of the detected face, such as eyes. The proposed algorithm improves eye detection by transforming images from the RGB color space to YCbCr. In that space it can be seen that the eye area consists of pixels that have high Cb component value and pixels that have low Cr component value. By thresholding each channel using different thresholds and logically combining them, a mask which presents potential eyes objects is obtained. These objects are then accepted or rejected using contour analysis. Potential eye objects are accepted by minimizing objective function, which takes the contour size and position for input parameters. When the eye coordinates are known, the face image can be transformed into a coordinate space, created using these coordinates, by using methods such as shift and scale and rotation transformation. To further increase the face recognition rate, the images are photometrically normalized using histogram equalization. Once the image is processed using the proposed method, we can use it in the recognition process.

Author

Image Processing; Pattern Recognition; Algorithms; Surveillance; Pattern Registration; Histograms

20070039033 Maribor Univ., Maribor, Slovenia

Population Size in Differential Evolution Algorithm

Brest, Janez; Zumer, Viljem; Maucec, Mirjam Sepesy; *Electrotechnical Review*, Volume 74, Nos. 1-2; 2007, pp. 55-60; In Slovene; See also [20070039028](#); Copyright; Avail.: Other Sources

In this paper we present an experimental analysis showing that the population size NP is an important control parameter in the differential evolution algorithm. Differential Evolution (DE) [16, 17, 15, 11, 12, 10, 18] has been proven to be a powerful evolutionary algorithm for global optimization in many real problems [13, 14]. Although the DE algorithm has been proven to be a simple yet powerful evolutionary algorithm for optimizing continuous functions, users are still faced with the problem of preliminary testing and hand-tuning of the evolutionary parameters prior to commencing the actual optimization process [18]. Different problems usually require different settings for the control parameters. Self-adaptation allows an evolution strategy to adapt itself to any general class of problems by reconfiguring itself accordingly and without any user interaction [1, 2, 7]. Based on the experiment in [5], the necessity of changing control parameters during the optimization process is also confirmed. In literature, self-adaptation is usually applied to the F and CR control parameters [5, 4], where F is a scaling factor and CR is a crossover rate. In our previous paper [6], a performance of the self-adaptive differential evolution algorithm is evaluated on a set of 24 benchmark functions provided for the CEC2006 Special session on constrained real-parameter

optimization [9]. The method in [6] extends individuals that have not only decision variables but also control parameters F and CR. These parameters are changed/optimized by DE, too. The authors utilize lexicographic ordering in which the constraint violation precedes the objective function to solve constrained problems. In [6] the control parameter NP is set to 200.

Author

Algorithms; Populations; Scalers

20070039034 Ljubljana Univ., Ljubljana, Slovenia

A Hybrid Fuzzy Model for Model Predictive Control

Karer, Gorazd; Music, Gasper; Skrjanc, Igor; Zupancic, Borut; *Electrotechnical Review*, Volume 74, Nos. 1-2; 2007, pp. 73-78; In Slovene; See also [20070039028](#); Copyright; Avail.: Other Sources

Model predictive control (MPC) has become an important area of research and is also an approach that has been successfully used in many industrial applications. In order to implement an MPC algorithm, a model of the process we are dealing with is needed. Due to the complex hybrid and nonlinear nature of many industrial processes, obtaining a suitable model is often a difficult task. The basic idea of this paper is to present an efficient approach for obtaining a hybrid fuzzy model by means of identifying the unknown system. Some concepts from the literature are extended to non-linear hybrid systems. In the paper a formulation for a hybrid fuzzy model that is based on a hierarchical structure and can be written in a compact form is introduced. The formulation is based on the well-known NARX structure. The hybrid system hierarchy is explained and the Takagi-Sugeno fuzzy formulation for the hybrid fuzzy modelling purposes is presented. It is shown that the proposed formulation is also applicable to multivariable and higher-than-first-order processes. Next, an efficient method for identifying the hybrid fuzzy model is proposed. Since the model parameters are obtained by matrix inversion, a straightforward rule that ensures suitably conditioned matrices is also presented. The benefits of the MPC algorithm employing the hybrid fuzzy model are verified on a batch-reactor simulation example. Modelling and identification phases are discussed and the proposed methodology is applied in MPC. A comparison between the proposed modern intelligent (fuzzy) approach and a classic (linear) approach is made. It is established that the MPC algorithm employing the proposed hybrid fuzzy model clearly outperforms the approach where a hybrid linear model is used, which justifies the usability of the hybrid fuzzy model.

Author

Fuzzy Systems; Algorithms; Predictions; Matrices (Mathematics); Hierarchies

20070039035 Ljubljana Univ., Ljubljana, Slovenia

Tracking Mouse Movements for Monitoring Users' Interaction with Websites: Implementation and Applications

Sedlar, Urban; Bester, Janez; Kos, Andrej; *Electrotechnical Review*, Volume 74, Nos. 1-2; 2007, pp. 31-36; In English; See also [20070039028](#); Copyright; Avail.: Other Sources

The importance and ubiquity of the World Wide Web call for efficient design of websites and web-based applications, suitable both to inexperienced and possibly first-time users, as well as highly skilled users. However, assuring such design is not easy and is usually aided by some feedback mechanism, most commonly the monitoring of users' interaction with the site. With many methods in existence, there is a trade-off between accuracy and relevance on one hand versus the reach (the size of the population) and monitoring costs on the other. The most accurate method for monitoring user interaction is eye tracking, which provides detailed information on the distribution of user's attention, but is technically the most demanding. Based on earlier research, which provides evidence that mouse and eye movements on websites are highly correlated, we describe in this paper a method for tracking mouse movements on web sites. There are number of uses where the proposed method can provide relevant results. We describe three possible uses, demonstrating two of them by processing the data, collected on our website in a period of 200 days.

Author

World Wide Web; Eye Movements; Websites

20070039036 Ljubljana Univ., Ljubljana, Slovenia

Choice of a Suitable Calibration Method for Automatic Vector Network Analyzers with Non-Standard Connectors

Kostevc, Drago; *Electrotechnical Review*, Volume 74, Nos. 1-2; 2007, pp. 37-42; In Slovene; See also [20070039028](#); Copyright; Avail.: Other Sources

To calibrate automatic vector network analyzers (VANA), a certain number of calibration standards is needed. For standard connectors industry-made calibration standards are available, whereas for non-standard connectors we usually have to produce them ourselves. It is therefore very important to reduce the number of the required calibration standards when

calibrating VANA with non-standard connectors and to limit it to the number of standards that can be made with an adequate accuracy. It has been observed that none of the generally accepted calibration methods is useful for broadband measurements on VANA with non-standard connectors. In this paper we compare methods TLR [4], TMR [5] and TLRL [7]. Our comparison points out advantages of the TLRL method that is a combination of the TLR and TMR method extended with extrapolation of the measured results in the frequency domain.

Author

Calibrating; Analyzers; Automatic Control; Network Analysis; Electric Connectors

20070039037 Ljubljana Univ., Ljubljana, Slovenia

Tracking Multiple Players in Sport Games Using the Visual Information

Kristan, Matej; Perse, Matej; Kovacic, Stanislav; Pers, Janez; *Electrotechnical Review*, Volume 74, Nos. 1-2; 2007, pp. 19-24; In Slovene; See also [20070039028](#); Copyright; Avail.: Other Sources

In this paper we deal with the problem of tracking multiple players in indoor sports using the visual information obtained by the camera overlooking the court. In particular, we are interested in tracking multiple visually-identified targets as they interact. We propose a tracker based on a recursive estimator (Eqs. 1,2) of the posterior over the target's state, i.e., the player's position, which is implemented in the form of the well known particle filter [1], namely, the CONDENSATION algorithm [2]. Our tracker uses the probabilistic model of the player's appearance as well as the player's dynamical model (section 3). The player's appearance is modelled by an elliptical region, within which a color histogram, describing the texture, is sampled. A mask function is employed to make the appearance model robust to the clutter and an autoregressive scheme is used to update the model to the local changes in the appearance. The player's dynamical model is based on the assumption that the player cannot abruptly change his/hers velocity due to the effects of inertia.

Author

Algorithms; Games; Visual Perception; Targets; Cameras; Inertia

20070039038 Tehnoloski Center za Elektricne Stroje, Maribor, Slovenia

Evaluation of Experimental Methods for Determining Magnetically Nonlinear Characteristics

Slibar, Primoz; Stumberger, Gorazd; *Electrotechnical Review*, Volume 74, Nos. 1-2; 2007, pp. 61-66; In Slovene; See also [20070039028](#); Copyright; Avail.: Other Sources

The paper briefly presents six different methods suited for determining magnetically nonlinear characteristics of simple electromagnetic devices, like iron core inductors [1], [2] or for complex electromagnetic devices, such as linear synchronous reluctance motors [3]. The tested device was supplied by a controlled voltage source, which was built specially for this purpose [4] (figure 3). Stepwise changing voltages, sinusoidal voltages and sinusoidal voltages with offset were applied (Figures 4, 5 and 6.). A three-phase three-column laboratory transformer was chosen for the test device. The current dependent characteristics of flux linkages were determined from the measured currents and voltages either by numerical integration (2) or by Fourier analysis (Figure 2) and the calculation of impedances (5) and (9). Respectively, these characteristics are incorporated in the dynamic model of the tested device.

Author

Electric Potential; Dynamic Models; Reluctance; Sine Waves; Synchronous Motors; Transformers

20070039039 Ljubljana Univ., Ljubljana, Slovenia

Application of the Direct Lyapunov Method for Transient-Stability Assessment of Electric-Power Systems with the Unified Power Flow Controller

Azbe, Valentin; Mihalic, Rafael; *Electrotechnical Review*, Volume 74, Nos. 1-2; 2007, pp. 67-72; In Slovene; See also [20070039028](#); Copyright; Avail.: Other Sources

The paper deals with the direct Lyapunov method for transient-stability assessment of electric-power systems (EPS). To be able to successfully apply direct methods or other energy function-based calculations in EPSs that include flexible AC transmission system (FACTS) devices, the influence of these devices has to be properly considered. In power systems incorporating unified power-flow controllers (UPFCs) this is currently not always possible because the present EPS energy functions do not involve appropriate UPFC actions. This paper presents a method for incorporating the transient-stability improvement function of the most versatile FACTS device, i.e. the unified power-flow controller (UPFC), into the energy function for multi-machine systems. A UPFC is presented by the injection model. The model equations shown in the paper are the basis for construction of the energy function. These are modified in the same way as swing equations and summed together. The first integral of this sum is the energy function for a UPFC and can be obtained only by intuition. Assuming constant

controllable parameters, the energy function can be determined. It can be added to any existing structure-preserving energy function as an additional term that represents the effect of a UPFC. According to an enclosed figure, the energy function is equal to the sum of the reactive powers $Q_{(sub ii)}$ and $Q_{(sub v)}$, and represents the total reactive power injected into the power system by the UPFC. Comparing this energy function to those of some other FACTS devices, we see that they all correlate with the injected reactive powers. In the case of FACTS devices that do not act as current or voltage sources, e.g. the static var compensator (SVC), controllable series compensation (CSC) and phase-shifting transformer (PST), the energy function is equal to half the sum of the reactive powers. In the case of a static series synchronous compensator (SSSC) and UPFC, the energy function is equal to the sum of the reactive powers. Because constant controllable parameters of a WFC might not be suitable for studying the UPFC's contribution to the transient-stability enhancement, the application of the newly constructed energy function is extended to the application of sectional-constant controllable parameters using equation shown. Adequacy of the newly constructed energy function was tested for a UPFC in a longitudinal test system. Critical clearing times (CCTs) obtained by the direct Lyapunov method were equal to the CCTs obtained by simulation, consequently the energy function proved to be adequate. The application of sectional-constant controllable parameters was demonstrated in an IEEE nine-bus three-machine test system. The UPFC was controlled to act like an SSSC. From the results we see that the CCTs obtained by the direct method for both the SSSC from another work and the presented UPFC acting as an SSSC are identical. This proves that consideration of the sectional-constant UPFC parameters as described above can be applied in calculations to approximate various continuous (non-discrete) control strategies. Using the newly constructed energy function, the application of the direct Lyapunov method for an EPS that includes UPFCs is possible.

Author (revised)

Controllers; Electric Power Supplies; Reactivity; Stability

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*.

20070037492 Orbital Research, Inc., Cleveland, OH USA

On the Use of Miniature Actuator Bumps (MABs) for Nozzle Thrust Vectoring

Patel, Mehul P; Stucke, Russ; Ng, T T; Cain, Alan B; Oct 31, 2005; 16 pp.; In English

Contract(s)/Grant(s): FA9300-05-C-0010; F04611-03-M-3103; Proj-3005

Report No.(s): AD-A471097; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471097>

Experimental and Computational studies are conducted to investigate the use of miniature actuator bumps (MABs) for nozzle jet vectoring. The control concept features asymmetric deployment of MABs around the nozzle throat to subsonically skew the sonic plane and shift the throat for jet vectoring. Cold-flow jet studies are conducted to investigate the effects of actuator parameters (deployment height, location, and shape) on pitch vector control for axisymmetric and non-axisymmetric nozzles. Experiments are conducted in a Jet Facility at the University of Toledo and CFD simulations are conducted using a full, 3-D Navier-Stokes flow solver on select nozzle geometries. Measurements indicate that the thrust vector control can be achieved with small actuator deployment heights, and that the sensitivity is increased when the actuator is used near the nozzle throat. Also, MAB control is more effective for two-dimensional nozzles -- a result that is consistent with earlier studies conducted using fluidic actuators. The underlying mechanism of subsonic flow turning holds for a range of stagnation pressure and throat conditions. Thrust vectoring using the MAB concept offers distinct advantages over traditional control approaches by way of reducing the weight and cost of the control actuation system through proper design and integration of microelectromechanical systems (MEMS) actuation device for MAB deployment.

DTIC

Actuators; Miniaturization; Nozzles; Thrust Vector Control

20070037501 Air Force Research Lab., Edwards AFB, CA USA

Thrust Stand Mass Balance Measurements of Hybrid Motor Mass Flow (Preprint)

Olliges, J D; Killingsworth, M D; Lilly, T C; Ketsdever, A D; Jun 8, 2007; 9 pp.; In English

Contract(s)/Grant(s): Proj-5026

Report No.(s): AD-A471112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471112>

A novel diagnostic technique has been developed, utilizing the Thrust Stand Mass Balance, to directly measure a time

accurate mass flow from a solid-fuel thruster for systems where the mass flow rate is of the same order as the experimental error. The mass flow measurement technique has been verified using an idealized numerical simulation. Two calibration experiments have been performed to assess the dynamic response of the mass balance. First, a set of calibration weights were placed on the mass balance and removed in order to properly characterize the mass balance motion. Second, a known mass flow rate of water was deposited onto the test stand. As a proof of concept experiment, a 3.81cm diameter PMMA/GOx hybrid thruster core was burned and the propellant mass flow was measured. Variations in the GOx flow rate resulted in corresponding variations in the total propellant mass flow as expected, showing the utility of the Thrust Stand Mass Balance as a mass flow measurement device.

DTIC

Balance; Fuels; Mass Distribution; Mass Flow; Thrust Control

20070037509 Air Force Research Lab., Edwards AFB, CA USA

Dark Core Analysis of Coaxial Injectors at Sub-, Near-, and Supercritical Pressures in a Transverse Acoustic Field (Preprint)

Leyva, Ivett A; Talley, Douglas; Chehroudi, Bruce; Jun 13, 2007; 18 pp.; In English

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

Report No.(s): AD-A471122; AFRL-PR-ED-TP-2007-327; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471122>

An experimental study on the effects of an externally-imposed transverse acoustic field in a N₂ shear coaxial jets at sub-, near-, and supercritical pressures is presented. Such fields and their interaction with the jets (i.e., breakup, mixing, etc.) are believed to play a critical role during combustion instabilities in liquid rocket engines. The shear coaxial injector used here is similar to those used in cryogenic liquid rockets. By using N₂ as the working fluid, the chemistry effects on combustion instability are separated from the effects of a transverse acoustic field on coaxial jets. Furthermore, through this choice, ambiguities associated with composition dependence on mixtures critical properties are eliminated. The acoustic field is generated by a piezo-siren and the first resonant frequency is ~3kHz. The pressures in the chamber range from 215-716 psia to span subcritical to supercritical pressures. The outer to inner jet velocity ratio varies from ~1.2 to 23 and the momentum flux ratio (MR) varies from ~0.2 to 23. These ratios are mainly varied by changing the temperature and flow rates of the outer jet. At least 2000 backlit images were taken at 41kHz for each run. The main metric investigated is the length of the dark, or inner jet, core. This length is related to the mixing processes in a coaxial jet. The shorter the core length the faster the mixing occurs. Both the axial and the total, or curved, dark core lengths are studied. For momentum flux ratios $1 < MR < 4$ the differences in the axial and curved dark core lengths between acoustics on and off are statistically significant, which means acoustics do shorten the core for this range. For subcritical pressures the MR range where the jet is shortened is larger. Preliminary results on the frequency analysis of the dark core lengths and width is also presented.

DTIC

Acoustics; Injectors; Liquid Propellant Rocket Engines; Sound Fields; Supercritical Pressures

20070037557 Naval Research Lab., Washington, DC USA

Inverse Analysis of Cavitation Impact Phenomena on Structures

Lambrakos, S G; Tran, N E; Jul 2, 2007; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471244; NRL/MR/6390--07-9051; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471244>

A general methodology is presented for in situ detection of cavitation impact phenomena on structures based on inverse analysis of luminescent emissions resulting from the collapsing of bubbles onto surfaces. Following an inverse-analysis approach, luminescent emission signatures are correlated with the general structure of asymmetric bubble collapse onto a surface. This method suggests applications for detection of cavitation that can occur within different types of dynamic water environments of structures. Case study analyses using experimental data are used to demonstrate the fundamentals of various aspects of this methodology. The goal of this methodology is to establish a direct correlation of luminescent emissions with cavitation impact phenomena, and ultimately, with cavitation erosion of structures within turbulent water environments.

DTIC

Cavitation Flow; Emission Spectra

20070037817 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

Design of Gages for Direct Skin Friction Measurements in Complex Turbulent Flows with Shock Impingement Compensation

Rolling, August J; Jun 7, 2007; 133 pp.; In English

Report No.(s): AD-A471455; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research produced a new class of skin friction gages that measures wall shear even in shock environments. One test specimen separately measured wall shear and variable-pressure induced moment. Through the investigation of available computational modeling methods, techniques for accurately predicting gage physical responses were developed. The culmination of these model combinations was a design optimization procedure. This procedure was applied to three disparate test conditions: 1) short duration, high-enthalpy testing, 2) blow-down testing, and 3) flight testing. The resulting optimized gage designs were virtually tested against each set of nominal load conditions. The finalized designs each successfully met their respective test condition constraints while maximizing strain output due to wall shear. These gages limit sources of apparent strain: inertia, temperature gradient, and uniform pressure. A unique use of bellows provided a protective shroud for surface strain gages. Oil fill provided thermal and dynamic damping while eliminating uniform pressure as a source of output voltage. Two Wheatstone bridge configurations were developed to minimize temperature effects first from temperature gradient and then from spatially varying heat flux induced gradient. An inertia limiting technique was developed that parametrically investigated mass and center of gravity impact on strain output. Multiple disciplinary computational simulations of thermal, dynamic, shear, moment, inertia, and instrumentation interaction were developed. Examinations of instrumentation error, settling time, filtering, multiple input dynamic response, and strain gage placement to avoid thermal gradient were conducted. Detailed mechanical drawings for several gages were produced for fabrication and future testing.

DTIC

Friction Measurement; Impingement; Measuring Instruments; Skin Friction; Turbulent Flow

20070038137 Air Force Research Lab., Edwards AFB, CA USA

Experimental and Computational Observation of Radiometric Forces on a Plate (Preprint)

Selden, N; Ngalande, C; Gimelshein, S; Ketsdever, A; Jun 12, 2007; 13 pp.; In English

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

Report No.(s): AD-A471084; AFRL-PR-ED-TP-2007-322; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471084>

The radiometric force on several configurations of heated plates placed in a stagnant gas is examined experimentally on a high resolution thrust stand and numerically using the direct simulation Monte Carlo method. A wide range of pressures from 0.006Pa to 6Pa corresponding to Knudsen numbers from 20 to 0.02 is examined for nitrogen, argon, xenon, and helium test gases. It is shown that the force is maximum in the transition regime ($Kn \sim 0.1$) and is heavily dependent on the plate area. It is also shown that the force is strongly correlated with the chamber size, decreasing with increasing chamber size.

DTIC

Radiometers; Plates (Structural Members); Computation

20070038421 Stanford Univ., Stanford, CA USA

Large Eddy Simulation for Heat Transfer Prediction in a Gas Turbine Environment: Development of a High-Order Overset Mesh LES Solver

Lele, Sanjiva K; Bhaskaran, R; Xiong, Z; Mar 30, 2007; 65 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0031

Report No.(s): AD-A471704; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471704>

A thorough investigation of leading edge heat transfer on a model geometry has been performed using Large-eddy simulation (LES). with support from the current and a previous AFOSR grant. The results from the leading edge study are presented as a detailed Appendix in this report. To address the problem of solving the full three-dimensional turbulent flow in a turbine passage. including the effects of free-stream turbulence from the combustor, and the unsteady interactions between various blade rows in the form of moving wakes and shocks it was necessary to extend the LES solver. A high-order overset LES code suitable for the study of turbomachinery passages has been developed. This approach is summarized in this report. Some preliminary results have been obtained using this code, mostly as cases for code validation. The code is currently being

used to investigate flow in turbine passages under realistic conditions, and detailed comparisons with available experiments will be made.

DTIC

Combustion Chambers; Gas Turbines; Heat Transfer; Large Eddy Simulation; Simulation; Turbomachinery; Turbulence; Turbulent Flow; Vortices

20070038443 Army Engineer Research and Development Center, Vicksburg, MS USA

PAR3D: Numerical Model for Incompressible Flow with Application to Aerosol Dispersion in Complex Enclosures

Bernard, Robert S; Luong, Phu V; Sanchez, Mario J; Sep 2007; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471741; ERDC/CHL-TR-07-9; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471741>

Abstract: This report documents the development of the PAR3D numerical flow model, with emphasis on modifications incorporated to facilitate simulations of contaminant dispersion in complex buildings and other enclosures. PAR3D is a general-purpose computational fluid dynamics (CFD) code for predicting three-dimensional flow and transport in air, water, and other incompressible fluids. It includes a two-equation turbulence model with adjustments for buoyancy, as well as transport equations for suspended materials (contaminants), dissolved gases, and gas bubbles (in water). The code employs parallel processing with structured curvilinear grids, which may deform to accommodate quasistatic free-surface displacement in water. The CFD applications included here concern air flow and aerosol dispersion inside two different man-made enclosures. These consist of single chambers with complex internal geometry, but PAR3D is applicable to multi-chamber enclosures as well. The reported developments are part of a larger computational and experimental effort to characterize the dispersion of contaminants in multi-room, multi-story buildings. Comparison of PAR3D predictions with experimental data from a multiroom test facility will be presented in a separate report.

DTIC

Aerosols; Computational Fluid Dynamics; Contaminants; Incompressible Flow; Mathematical Models

20070038577 Department of the Navy, Washington, DC USA

Fairing for Articulated Tow Bodies

Dickinson, Stuart C, Inventor; Aug 3, 2007; 23 pp.; In English
Report No.(s): AD-D020308; No Copyright; Avail.: Other Sources
ONLINE: <http://hdl.handle.net/100.2/ADD020308>

A fairing assembly is provided for a towed body having multiple sections that are flexibly joined together. For each pair of sections, a fairing is joined to the first section and positioned over the space between the pairs of sections. The fairing has discrete tabs that extend from the first section across the space between the sections. The tabs are separated to allow angular displacement of the first section with respect to the second section. Two layers of overlapping tabs are provided for reducing hydrodynamic forces in between the sections.

DTIC

Fairings; Patent Applications

20070038593 Massachusetts Inst. of Tech., Cambridge, MA USA

Emulating the Fast-Start Swimming Performance of the Chain Pickerel (*Esox niger*) Using a Mechanical Fish Design

Watts, Matthew N; Sep 1, 2006; 72 pp.; In English

Contract(s)/Grant(s): N62271-97-G-0026

Report No.(s): AD-A471867; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Mean maximum start-up accelerations and velocities achieved by the fast-start specialist, northern pike, are reported at 120 m/s² and 4 m/s, respectively (Harper and Blake, 1990). In this thesis, a simple mechanical system was created to closely mimic the startle response that produces these extreme acceleration events. The system consisted of a thin metal beam covered by a urethane rubber fish body. The mechanical fish was held in curvature by a restraining line and released by a pneumatic cutting mechanism. The potential energy in the beam was transferred into the fluid, thereby accelerating the fish. The fish motion was recorded and the kinematics analyzed while using a number of different tail shapes and materials. Performance of the mechanical fish was determined by maximum acceleration, peak and averaged maximum velocity, and hydrodynamic efficiency. Maximum start-up acceleration was calculated at 48 m/s². Peak and averaged maximum velocity was calculated at 0.96 m/s and 0.8 m/s, respectively. The hydrodynamic efficiency of the fish, calculated by the transfer of energy, was 11%.

Flow visualization of the mechanical fast-start wake was also analyzed. The visualization uncovered two specific vortex-shedding patterns; a single and a doublevortex pattern are described.

DTIC

Bionics; Fishes; Hydrodynamics; Mechanical Engineering; Niger; Swimming

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*.

20070036806 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Standardization of XML Database Exchanges and the James Webb Space Telescope Experience

Gal-Edd, Jonathan; Detter, Ryan; Jones, Ron; Fatig, Curtis C.; [2007]; 6 pp.; In English; IEEE Aerospace Conference, 4-9 Mar. 2007, Big Sky, MT, USA; Original contains color illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070036806>

Personnel from the National Aeronautics and Space Administration (NASA) James Webb Space Telescope (JWST) Project have been working with various standard communities such the Object Management Group (OMG) and the Consultative Committee for Space Data Systems (CCSDS) to assist in the definition of a common extensible Markup Language (XML) for database exchange format. The CCSDS and OMG standards are intended for the exchange of core command and telemetry information, not for all database information needed to exercise a NASA space mission. The mission-specific database, containing all the information needed for a space mission, is translated from/to the standard using a translator. The standard is meant to provide a system that encompasses 90% of the information needed for command and telemetry processing. This paper will discuss standardization of the XML database exchange format, tools used, and the JWST experience, as well as future work with XML standard groups both commercial and government.

Author

Data Bases; James Webb Space Telescope; Telemetry; Document Markup Languages; Standardization

20070037472 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Voice and Video Capacity of a Secure Wireless System

Seyba, Jason R; Jun 2007; 114 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471065; AFIT/GCS/ENG/07-14; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471065>

Improving the security and availability of secure wireless multimedia systems is the purpose of this thesis. Specifically, this thesis answered research questions about the capacity of wireless multimedia systems and how three variables relate to this capacity. The effects of securing the voice signal, real-time traffic originating foreign to a wireless local area network and use of an audio-only signal compared with a combined signal were all studied. The research questions were answered through a comprehensive literature review in addition to an experiment which had thirty-six subjects using a secure wireless multimedia system which was developed as part of this thesis effort. Additionally, questions related to the techniques for deploying wireless multimedia system including the maturity and security of the technology were answered. The research identified weaknesses in existing analytical and computer models and the need for a concise and realistic model of wireless multimedia systems. The culmination of this effort was the integration of an audio-video system with an existing research platform which is actively collecting data for the Logistics Readiness Branch of the Air Force Research Laboratory.

DTIC

Video Signals; Voice Communication; Wireless Communication

20070037487 Army Research Lab., Adelphi, MD USA

Technical Note on Scale Conversion for the Synchronous Impulse Reconstruction (SIRE) Radar

Ranney, Kenneth; Nguyen, Lam; Sullivan, Anders; Jul 2007; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471089; ARL-TN-0286; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471089>

This technical note describes a calibration method used to convert measurements obtained with the U.S. Army Research Laboratory synchronous impulse reconstruction (SIRE) radar from an integer scale to an absolute, radar cross section (RCS)

scale. The required RCS reference point is obtained from highly accurate solutions of Maxwell's equations for a modeled reference target and scene. Electrical characteristics of this modeled target and scene are carefully selected to match those encountered in the actual data collection.

DTIC

Calibrating; Impulses; Radar Imagery; Synthetic Aperture Radar

20070037488 Army Research Lab., Adelphi, MD USA

Technical Note on Scale Conversion for the Synchronous Impulse Reconstruction (SIRE) Radar, a Second Method

Ranney, Kenneth; Nguyen, Lam; Sullivan, Anders; Jul 2007; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471090; ARL-TN-0287; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471090>

This technical note describes a calibration method used to convert measurements obtained with the U.S. Army Research Laboratory (ARL) synchronous impulse reconstruction (SIRE) radar from an integer scale to an absolute, radar cross section (RCS) scale. The required RCS reference point is obtained from highly accurate solutions of Maxwell's equations for a modeled reference target and scene. Electrical characteristics of this modeled target and scene are carefully selected to match those encountered in the actual data collection. The method described here differs slightly from that described in Technical Note on Scale Conversion for the Synchronous Impulse Reconstruction (SIRE) Radar, ARL-TR-0286. The newer method uses a peak-matching technique, while the earlier version used an energy-conservation technique.

DTIC

Calibrating; Impulses; Radar Imagery; Synthetic Aperture Radar

20070037499 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Target Discrimination in Polarimetric ISAR Data using Robust Feature Vectors

van den Broek, Bert; Dekker, Rob; May 1, 2005; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471110; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471110>

No abstract available

Polarimetry; Synthetic Aperture Radar; Target Recognition

20070037500 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Classification of Targets in SAR Images Using ISAR Data

de Wit, J J; Dekker, R J; van den Broek, A C; May 1, 2005; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471111; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471111>

No abstract available

Classifications; Image Classification; Radar Imagery; Synthetic Aperture Radar; Target Acquisition; Targets

20070038658 Defence Research and Development Canada, Valcartier, Quebec Canada

Step-Stare Image Gathering for High-Resolution Targeting

Lavigne, Valerie; Ricard, Benoit; May 1, 2005; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A472001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Cameras; High Resolution; Infrared Radiation

20070038661 Office of the Deputy Inspector General for Auditing, Arlington, VA USA

Logistics: Implementation of Performance-Based Logistics for the Joint Surveillance Target Attack Radar System

Scott, Wanda; Prinzbach, II, Robert F; Yancey, Keith A; Avers, Marc E; Emigh, Michelle; Schenck, Travis R; Trieschman, Jennifer L; Bowman, Joseph; Roark, Christopher; Boatwright, Brycandis; Aug 9, 2006; 28 pp.; In English

Contract(s)/Grant(s): Proj-D2005-D000LH-0046.000

Report No.(s): AD-A472007; IG/DOD-D-2006-105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

DoD personnel and Government contractors responsible for implementing performance-based logistics (PBL) should read this report. The report discusses implementation of PBL for the Joint Surveillance Target Attack Radar System (Joint STARS). The Joint STARS System Program Manager did not fully implement PBL initiatives for the Joint STARS weapon system. As

a result, the System Program Manager cannot support that the Joint STARS weapon system is achieving the desired outcomes of PBL, such as reducing life-cycle costs and increasing system availability. We recommend that the Assistant Secretary of the Air Force (Acquisition) distribute DoD policy memorandums and guides for implementing performance-based logistics. We also recommend that the System Program Manager develop performance-based agreements with the warfighter, develop a strategy that implements performance requirements, and analyze Joint STARS cost and resource data and develop baselines. Further, we recommend that the System Program Manager develop a business case analysis based on warfighter requirements and baselines, develop performance measures that promote the goal of increased system readiness and reductions in life-cycle costs and logistics footprints for Joint STARS, and analyze transitioning the total system support responsibility contract to a firm-fixed price contract. (See the Finding section for the detailed recommendations.)

DTIC

Life Cycle Costs; Logistics; Search Radar; Surveillance Radar; Targets

20070038729 Naval Research Lab., Washington, DC USA

High Frequency Radar Observations Made on Trailblazer 1G

Curley, S R; Headrick, J M; Morgan, G A; Utley, F H; Jun 1, 1961; 16 pp.; In English

Report No.(s): AD-A472097; NRL-MR-1176; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

High Frequencies; Radar Equipment; Radar Tracking

20070038910 Naval Research Lab., Washington, DC USA

Information on Over-the-Horizon Radar. Part 2

Boyd, F E; Gager, F M; Headrick, J M; Jensen, G K; Lurker, E; Morgan, G A; Zettle, E N; Sharki, P; Briggs, A; Montana, D; Jun 1, 1964; 86 pp.; In English

Report No.(s): AD-A472098; NRL-MR-1537; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Over-the-Horizon Radar; Radar Detection

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LASERS AND MASERS

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

20070037532 California Inst. of Tech., Pasadena, CA USA

Compact, Fiber-Compatible, Cascaded Raman Laser

Min, Bumki; Kippenberg, Tobias J; Vahala, Kerry J; Jun 1, 2005; 4 pp.; In English

Report No.(s): AD-A471163; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471163>

Cascaded Raman Stokes lasing in an ultrahigh-Q silica microsphere resonator coupled to a tapered fiber is demonstrated and analyzed. With less than 900 mW of pump power near 980 nm, five cascaded Stokes lasing lines are generated. In addition, a threshold power of 56.4 mW for the first-order Stokes lasing is achieved. The Stokes lasing lines exhibit distinct characteristics depending on their order, as predicted by theoretical analysis.

DTIC

Lasers; Raman Lasers

20070037545 California Inst. of Tech., Pasadena, CA USA

Ultralow-Threshold Raman Laser using a Spherical Dielectric Microcavity

Spillane, S M; Kippenberg, T J; Vahala, K J; Feb 2002; 4 pp.; In English

Report No.(s): AD-A471193; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471193>

The ability to confine and store optical energy in small volumes has implications in fields ranging from cavity quantum electrodynamics to photonics. Of all cavity geometries, micrometre-sized dielectric spherical resonators are the best in terms of their ability to store energy for long periods of time within small volumes. In the sphere, light orbits near the surface, where

long confinement times (high Q) effectively wrap a large interaction distance into a tiny volume. This characteristic makes such resonators uniquely suited for studies of nonlinear coupling of light with matter. Early work^{2,3} recognized these attributes through Raman excitation in microdroplets but microdroplets have not been used in practical applications. Here we demonstrate a micrometre-scale, nonlinear Raman source that has a highly efficient pump signal conversion (higher than 35%) and pump thresholds nearly 1,000 times lower than shown before. This represents a route to compact, ultralow-threshold sources for numerous wavelength bands that are usually difficult to access. Equally important, this system can provide a compact and simple building block for studying nonlinear optical effects and the quantum aspects of light.

DTIC

Dielectrics; Lasers; Raman Lasers

20070037552 Naval Research Lab., Washington, DC USA

Laser Noise and its Impact on the Performance of Intensity-Modulation with Direct-Detection Analog Photonic Links

Urlick, Vincent J; Devgan, Preetpaul S; McKinney, Jason D; Dexter, James L; Aug 10, 2007; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471219; NRL/MR/5652-07-9065; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471219>

The equations for radio-frequency gain, radio-frequency noise figure, compression dynamic range and spurious-free dynamic range are derived for an analog photonic link employing intensity modulation and direct detection. In particular, the impact of laser noise on the performance of an analog photonic link is demonstrated in terms of these metrics. We describe the experimental procedure for measuring laser noise and the measured laser noise spectra of lasers suitable for analog photonics are shown.

DTIC

Lasers; Modulation; Photonics

20070037568 University of Southern California, Los Angeles, CA USA

Room-Temperature Operation of VCSEL-Pumped Photonic Crystal Lasers

Lee, Po-Tsung; Cao, J R; Choi, Sang-Jun; Wei, Zhi-Jian; O'Brien, John D; Dapkus, P D; Jun 1, 2005; 4 pp.; In English

Contract(s)/Grant(s): MDA972-00-1-0019; N00014-00-C-8079

Report No.(s): AD-A471262; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471262>

Room-temperature operation of two-dimensional photonic crystal lasers optically pumped by a vertical-cavity surface-emitting laser emitting at 860 nm is reported. The photonic crystal membrane is surrounded by air on both sides and consists of four compressively strained quantum wells as the active region. The incident threshold pump power of an approximately 2.6- m-diameter hexagonal defect cavity laser operating at 1.6 m is 2.4 mW.

DTIC

Crystals; Laser Cavities; Lasers; Surface Emitting Lasers

20070037734 University of Southern California, Los Angeles, CA USA

Nanofabrication of Photonic Crystal Membrane Lasers

Cao, J R; Lee, Po-Tsung; Choi, Sang-Jun; Shafiha, Roshanak; Choi, Seung-June; O'Brien, John D; Dapkus, P D; Jan 14, 2002; 5 pp.; In English

Contract(s)/Grant(s): MDA972-00-1-0019; N00014-00-C-8079

Report No.(s): AD-A471287; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present techniques for fabricating photonic crystal ~PC! membrane defect lasers. These nanostructures operate as optically pumped lasers under pulsed conditions at room temperature. The thin membrane PC defect structures are formed by transferring an electron-beam lithographically defined lattice pattern into an epitaxial layer structure by a sequential process of ion beam etching, reactive ion etching, and electron cyclotron resonance etching steps. A V-shape undercut channel is formed by a wet chemical etching using a 4:1 mixture of HCl and H₂O to create the suspended membrane. We include a detailed description of a dependable and repeatable HCl undercut process for the PC structure.

DTIC

Crystals; Lasers; Membranes; Nanofabrication

20070037761 California Inst. of Tech., Pasadena, CA USA

Photonic Crystal Laser Sources for Chemical Detection

Loncar, Marko; Scherer, Axel; Qiu, Yueming; Jun 1, 2005; 4 pp.; In English

Contract(s)/Grant(s): F49620-01-6-0497; MDA972-00-1-0019

Report No.(s): AD-A471351; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have realized photonic crystal lasers that permit the introduction of analyte within the peak of the optical field of the lasing mode. We have explored the design compromises for developing such sensitive low-threshold spectroscopy sources, and demonstrate the operation of photonic crystal lasers in different ambient organic solutions. We show that nanocavity lasers can be used to perform spectroscopic tests on femtoliter volumes of analyte, and propose to use these lasers for high-resolution spectroscopy with single-molecule sensitivity.

DTIC

Crystals; Detection; Lasers; Optical Properties

20070037762 California Univ., San Diego, La Jolla, CA USA

Laser Tweezer Controlled Solid Immersion Lens for High Resolution Imaging in Microfluidic and Biological Samples

Birkbeck, Aaron L; Zlatanovic, Sanja; Ozkan, Mihrimah; Esener, Sadik C; Jun 1, 2005; 9 pp.; In English

Report No.(s): AD-A471352; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A novel technique is presented which integrates the capacity of a laser tweezer to optically trap and manipulate objects in three-dimensions with the resolution-enhanced imaging capabilities of a solid immersion lens (SIL). Up to now, solid immersion lens imaging systems have relied upon cantilever-mounted SILs that are difficult to integrate into microfluidic systems and require an extra alignment step with external optics. As an alternative to the current state-of-art, we introduce a device that consists of a free-floating SIL and a laser optical tweezer. In our design, the optical tweezer, created by focusing a laser beam through high numerical aperture microscope objective, acts in a two-fold manner: both as a trapping beam for the positioning and alignment of the SIL and as a near-field scanning beam to image the sample through the SIL. Combining the alignment, positioning, and imaging functions into a single device allows for the direct integration of a high resolution imaging system into microfluidic and biological environments.

DTIC

High Resolution; Imaging Techniques; Laser Beams; Lasers; Lenses; Microfluidic Devices; Near Fields; Sampling; Submerging

20070037773 Purdue Univ., West Lafayette, IN USA

Indirect Dominant Mode Rejection: A Solution to Low Sample Support Beamforming

Santos, Ernesto L; Zoltowski, Michael D>; Rangaswamy, Muralidhar; Jul 2007; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471377; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The work developed and described in this technical report deals with the problem of providing a statistical model of the backscattering from lake surface for low-grazing angle and high resolution radar systems. First described is a statistical analysis of the amplitude of the high-resolution polarimetric data characterized by different radar looking directions with respect to the wind blowing directions. Then, based on the electromagnetic two-scale model, analyzed were both the amplitude and frequency modulations induced on the small-scale Bragg resonant waves by the large-scale surface tilt and advection, due to the swell presence. Our results confirm the lake clutter non-stationary already found in previous analysis of other sea and lake clutter data. Moreover, the relationship between the variation of clutter spectral features, like texture, Doppler centroid and bandwidth, have been investigated by processing real recorded data. The data used for the research activity have been recorded by the IPIX radar of McMaster University in Grimsby, Ontario, Canada in 1998.

DTIC

Backscattering; Beamforming; Doppler Effect; Radar Equipment; Resonance

20070037782 University of Southern California, Los Angeles, CA USA

Operation of Photonic Crystal Membrane Lasers above Room Temperature

Lee, Po-Tsung; Cao, J R; Choi, Sang-Jun; Wei, Zhi-Jian; O'Brien, John D; Dapkus, P D; Jun 1, 2005; 4 pp.; In English

Report No.(s): AD-A471390; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Operation of photonic crystal lasers for substrate temperatures as high as 50 degrees C is reported. The temperature

dependence of the lasing wavelength and the threshold pump power is also investigated. The characteristic temperature T_0 is 37.7 K.

DTIC

Crystals; Lasers; Membranes; Room Temperature

20070037870 Air Force Research Lab., Kirkland AFB, NM USA

PLIF Flow Visualization of a Supersonic Coil Nozzle (Postprint)

Noren, Carrie A; Gothschopf, Gretchen; Perschbacher, Ty; Madden, Timothy J; Hager, Gordon D; Truman, C R; Vorobieff, Peter V; Oct 16, 2006; 9 pp.; In English

Contract(s)/Grant(s): Proj-4866

Report No.(s): AD-A471556; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes Planar Laser-Induced Fluorescence (PLIF) flow visualization of a supersonic nozzle with supersonic injection. The nozzle simulates Chemical Oxygen Iodine Laser (COIL) flow conditions with non-reacting, cold flows, where the injected flow was seeded with iodine. A laser sheet near 565nm excited the iodine, and the fluorescence was imaged with a gated, CCD camera. Spanwise and streamwise images were taken, where the relative concentration of the injected to primary flow, turbulent structures, and penetration distance of the injected flow were identified. These images qualitatively revealed a lack of mixing of the secondary (injected) and primary flows at the centerline of the nozzle, even far downstream of the throat. Quantitative data of the penetration of the secondary flow, with varying primary to secondary flow rate ratios, helped identify the shallow angle of the injectors as an inhibitor of secondary penetration even at relatively low primary flow rates. From the PLIF results, this nozzle is characterized as a poor mixer and would not be recommended as a nozzle that produces a well-mixed medium, as required with chemical lasers. This work precedes a project that will use PLIF results to design a well-mixed supersonic nozzle with supersonic injection. The results will be compared to and enable validation of computational fluid dynamics (CFD) predictions of the designed nozzle.

DTIC

Flow Visualization; Laser Induced Fluorescence; Supersonic Nozzles

20070037875 Air Force Research Lab., Kirkland AFB, NM USA

PLIF Visualization and Quantitative Mixing Measurements of a Supersonic Injection Nozzle

Noren, Carrie A; Truman, C R; Vorobieff, Peter V; Madden, Timothy J; Hager, Gordon D; Oct 16, 2006; 9 pp.; In English
Contract(s)/Grant(s): Proj-4866

Report No.(s): AD-A471563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Planar Laser-Induced Fluorescence (PLIF) was used to visualize the flow of a supersonic nozzle with a single supersonic injector. The nozzle simulates Chemical Oxygen Iodine Laser (COIL) flow conditions with non-reacting, cold flows, where the injected flow is seeded with iodine. A laser sheet near 565nm excites the iodine, and the fluorescence is imaged with a gated, CCD camera. Streamwise and semi-spanwise (oblique-view) images were taken, where the presence of injected flow is highlighted. With these images, the flow structures are identifiable and the mixing quality between the primary and injected flow can be quantitatively measured. Histograms of image ensembles were taken at varying downstream locations to quantify the mixing quality of the flow.

DTIC

Injection; Laser Induced Fluorescence; Supersonic Nozzles

20070038169 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Lasers in Space Applications

Asbury, Cheryl G.; October 30, 2006; 14 pp.; In English; International Conference on Applications of Lasers and Electro-optics (ICALEO), 30 Oct. - 2 Nov. 2006, Scottsdale, AZ, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40329>

This viewgraph presentation gives a general overview of the applications of lasers in space.

CASI

General Overviews; Laser Applications; Spaceborne Lasers; Aerospace Environments

20070038382 University of Southern California, Los Angeles, CA USA

Eight-Channel Microdisk CW Laser Arrays Vertically Coupled to Common Output Bus Waveguides

Choi, Seung J; Peng, Zhen; Yang, Qi; Choi, Sang J; Dapkus, P D; Jun 1, 2005; 4 pp.; In English
Report No.(s): AD-A471612; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471612>

1.6-nm spectrally spaced eight-channel semiconductor microdisk laser arrays are presented, where high- disk lasing modes are vertically coupled out through a common bus waveguide. The spectral channel spacing is achieved by varying the disk resonator radii from 10.6 to 10.95 micrometers. Typical linewidth of 0.25 nm and side-mode suppression ratio of -20 dB are observed under continuous-wave lasing operation near $\lambda = 1.51$ micrometers. This is the first demonstration of integrated microresonator laser arrays.

DTIC

Continuous Wave Lasers; Laser Arrays; Waveguides

20070038387 California Univ., San Diego, La Jolla, CA USA

High Frequency Oscillation in Photonic Crystal Nanolasers

Yoshie, Tomoyuki; Loncar, Marko; Scherer, Axel; Qui, Yueming; Apr 20, 2004; 4 pp.; In English
Report No.(s): AD-A471619; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471619>

We observed modulated oscillations in lasers of up to 130 GHz by conducting frequency domain measurements on photonic crystal lasers with built-in saturable absorbers. This is an example of how the small volumes of photonic crystal lasers lead to increases in the internal modulation frequencies and enables dramatic improvements of the laser modulation rate.

DTIC

Crystals; High Frequencies; Lasers; Oscillations

20070038390 University of Southern California, Los Angeles, CA USA

Modified Suspended Membrane Photonic Crystal D3 Laser Cavity With Improved Sidemode Suppression Ratio

Kuang, Wan; Cao, J R; Choi, Sang-Jun; O'Brien, John D; Dapkus, P D; Jun 1, 2005; 4 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0121
Report No.(s): AD-A471623; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471623>

We have demonstrated the ability to selectively modify the mode structure of a multimoded photonic crystal laser cavity, based on the detailed knowledge of resonant modes in a suspended membrane Da microcavity. We have designed a microcavity in which the margins between the highest Q mode and the next highest Q modes have been increased. This modified cavity has been shown to have an improved sidemode suppression ratio under high power pumping condition.

DTIC

Cavity Resonators; Crystals; Laser Cavities; Membranes

20070038450 Air Force Research Lab., Kirkland AFB, NM USA

High-Efficiency Diode-Pumped Rubidium Laser: Experimental Results (Preprint)

Perschbacher, Ty A; Hostutler, David A; Shay, Thomas M; Jan 29, 2007; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DF297832
Report No.(s): AD-A471772; AFRL-DE-PS-TP-2007-1005; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471772>

A diode-pumped rubidium laser with an optical slope efficiency of 69% has been constructed. This study utilized a narrow-line diode laser pump source for the experiments. The trade space study included optimization of various parameters such as lasing cell composition, temperature, and output coupler reflectivities. The results of the experimental study are given.

DTIC

Alkalies; Couplers; Diodes; Lasers; Reflectance; Rubidium; Semiconductor Lasers

20070038466 Air Force Research Lab., Kirkland AFB, NM USA

Closed-Loop Control Techniques for an Adaptive-Optical System with an Interferometric Wavefront Sensor (Postprint)

Klein, Laura M; Rhoadarmer, Troy A; Sep 1, 2006; 11 pp.; In English

Contract(s)/Grant(s): DF299962; Proj-JT00

Report No.(s): AD-A471804; AFRL-DE-PS-TP-2007-1007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471804>

The self-referencing interferometer (SRI) wavefront sensor (WRS) is being developed for applications requiring laser propagation in strong scintillation. Because it directly measures the optical field of the wavefront, the SRI WFS is less effected by scintillation than conventional WFSs. This feature also means the phase determined from the WRS measurements is limited to the range-pie to pie, due to the use of the arctangent function. If a segmented wavefront corrector is used, this constraint is not a problem. However, if a continuous facesheet deformable mirror is used, the resulting phase should be unwrapped in order to minimize fitting error. There are a couple of places in the adaptive-optical (AO) closed-loop control process where unwrapping algorithm can be inserted. Simulations of these configurations have shown that how and where the unwrapping options and the associated issues. A laboratory demonstration of two control loop configurations was carried out to test the validity of the simulation results. These experiments and their outcome are discussed.

DTIC

Adaptive Optics; Control Systems Design; Detectors; Feedback Control; Interferometers; Interferometry; Scintillation; Wave Fronts

20070038614 Naval Research Lab., Washington, DC USA

Wall-Plug Efficiencies of FEL Amplifiers and Oscillators Employing Energy Recovery Linacs

Sprangle, Phillip; Penano, Joseph; Hafizi, Bahman; Ben-Zvi, Ilan; Jun 6, 2007; 10 pp.; In English

Contract(s)/Grant(s): Proj-67-8419-07

Report No.(s): AD-A471897; NRL/MR/6790-07-9052; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In a high average power FEL, the wall-plug efficiency is of critical importance in determining the size, complexity, and cost of the overall system. The wall-plug efficiency for the FEL oscillator and amplifier (uniform and tapered wiggler) are obtained and compared. In general, we find that the wall-plug efficiency for the tapered wiggler FEL amplifier is more than a factor of two greater than that of the oscillator. For typical MW class FEL parameters, we find that the wall-plug efficiency for the oscillator is in the range of 5-10%. The wall-plug efficiency for the uniform wiggler amplifier is found to be 5-10%, and for the tapered wiggler amplifier, the wall-plug efficiency is 20-25%.

DTIC

Efficiency; Free Electron Lasers; Linear Accelerators; Oscillators; Plugs; Walls

20070038615 Air Force Research Lab., Kirkland AFB, NM USA

Development of the Self-Referencing Interferometer Wavefront Sensor (Postprint)

Rhoadarmer, Troy A; Jul 30, 2004; 17 pp.; In English

Contract(s)/Grant(s): DF299962; Proj-JT00

Report No.(s): AD-A471899; AFRL-DE-PS-TP-2007-1010; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The self-referencing Interferometer (SRI), is an innovative wavefront sensor (WFS) developed specifically for applications requiring laser propagation in strong scintillation. The performance of conventional gradient sensors, like a Shack-Hartmann WFS or lateral shearing interferometer are severely limited in these environments due to the presence of branch points in the wavefront phase. Unlike these sensors, the SRI WFS directly measures the wavefront field so that its performance is not affected by the presence of branch points. Over the last two years under funding from the High Energy Laser Joint Technology Office, the Starfire Optical Range has been developing a prototype SRI WFS to demonstrate its advantages in strong scintillation environments. This paper discusses practical lessons learned in building an operating a SRI WFS and presents initial results from laboratory tests.

DTIC

Detectors; Interferometers; Scintillation; Wave Fronts

20070038656 Air Force Research Lab., Kirkland AFB, NM USA

Laser Beam Control in Strong Turbulence (preprint)

Washburn, Don; Herrick, Dan; Rhoadarmer, Troy; Jamshidi, Mohammed; Finley, Charles; Aug 6, 2004; 5 pp.; In English
Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A471995; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall purpose of this task is to investigate control and diagnostic techniques that apply to laser propagation systems. The current emphasis is in two major areas: first to investigate full wave conjugation methods for optimal uplink efficiency from a laser source to a relay mirror; second, to investigate automatic diagnostic techniques that apply to complex systems Air Force systems.

DTIC

Laser Beams; Turbulence

20070038869 Army Engineer Research and Development Center, Vicksburg, MS USA

3D Laser Scanner Data Collection

Dove, Linda P; Jackson, Sam S; Ballard, Jerrell R; Berry, Thomas E; Lord, M E; Sep 2007; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471752; ERDC/EL-TR-07-15; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471752>

The objective of the Countermine Phenomenology Program is to increase the probability of detection and reduce false alarm rates by developing an understanding of the influences of the geo-environmental conditions on relevant mine and improvised explosive device signatures for sensor modalities. This involves the development and demonstration of more robust signal processing algorithms based on geo-environmental impacts. 3D laser scanner data were collected in order to obtain the high-resolution surface geometry necessary to determine subsequent impact on emitted thermal and reflective signatures. 3D laser scanner point clouds were used in the modeling and analysis for the computational testbed. Sites selected for the generation of high-resolution surface geometry consisted of widely varying environments at nine sites in desert and temperate environments. The primary purpose of this report was to document procedures and measurements of the 3D laser scanner data and secondarily to provide a digital collection of the data so that the data may be used by other Army researchers in future research studies such as the ERDC Near Surface Phenomenology Program and other proposed 6.2 programs. The point cloud data file(s) for each site have been archived and are available for limited distribution.

DTIC

Data Acquisition; Detection; False Alarms; Laser Applications; Lasers; Optical Scanners; Signal Processing

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*.

20070036804 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cryogenic System for Interferometric Measurement of Dimensional Changes at 40 K: Design and Performance

Blake, Peter; Miller, Franklin; Zukowski, Tim; Canavan, Edgar R.; Crane, Allen; Madison, Tim; Miller, David; [2007]; 10 pp.; In English; SPIE Conference, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

This report describes the facility, experimental methods, characterizations, and uncertainty analysis of the Cryo Distortion Measurement Facility (CDMF) at the Goddard Space Flight Center (GSFC). This facility is designed to measure thermal distortions of structural elements as the temperature is lowered from 320K to below 40 K over multiple cycles, and is capable of unattended running and data logging. The first measurement is to be the change in length and any bending of composite tubes with Invar end-fittings. The CDMF includes a chamber that is efficiently cooled with two cryo-coolers (one single-stage and one two-stage) rather than with liquid cryogenes. Five optical ports incorporate sapphire radiation shields - transparent to the interferometer - on each of two shrouds and a fused silica vacuum-port window. The change in length of composite tubes is monitored continuously with displacement-measuring interferometers; and the rotations, bending, and twisting are measured intermittently with theodolites and a surface-figure interferometer. Nickel-coated invar mirrors and attachment mechanisms

were developed and qualified by test in the CDMF. The uncertainty in measurement of length change of 0.4 m tubes is currently estimated at 0.9 micrometers.

Author

Interferometry; Dimensional Measurement; Metrology; Chambers; Cryogenic Cooling

20070037804 Sy-Klone International, Jacksonville, FL USA

Leap-Ahead Air Filtration Innovations and Technologies (LAAFIT)

Rumancik, Stephen; Mar 22, 2007; 14 pp.; In English

Contract(s)/Grant(s): W56HZV-07-C-0079

Report No.(s): AD-A471432; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Phase I objective was to prove that it is possible to create an air filtration system, with a non-barrier filter, that is capable of achieving 99.5% efficiency, in the lab, with either a fine or coarse dust. The proposed solution is to consider size, weight and power consumption. The underling goal is create a system that can be of use to a vehicle of military significance. The proposal and work that Sy-Klone has focused on during Phase I is to develop and optimize a version of our powered air cleaning system technology. Current offerings do not meet the efficiency nor the ultimate engine air flow ranges indicated in the topic. The proposal that Sy-Klone is developing incorporates a high efficiency brushless DC motor which offers reliable power in a compact design. It also incorporates a computer optimized, ducted, fan similar to what might be found in a modern turbojet engine. During this phase Sy-Klone has concentrated its in-house and contracted efforts on mathematical and computer modeling. Preliminary testing of significant milestone configurations of concept model-level prototypes has been done to support the theoretical predictions.

DTIC

Air Filters; Air Flow; Air Purification; Computational Fluid Dynamics; Filtration

38

QUALITY ASSURANCE AND RELIABILITY

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

20070038977 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Ultra Reliability

Napala, Phil; Barnes, Charles; Shapiro, Andrew A.; June 24, 2004; 39 pp.; In English; Ultra Reliability for Long Life Missions, 24 Jun. 2004, Pasadena, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40427>

This viewgraph presentation gives a general overview of NASA's ultra reliability areas. The contents include: 1) Objectives; 2) Approach; 3) Ultra Reliability Areas; 4) Plan Overview; 5) Work Flows; and 6) Customers.

CASI

General Overviews; Reliability Analysis; Management Planning; Aerospace Sciences; Space Missions; NASA Space Programs

39

STRUCTURAL MECHANICS

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

20070037494 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Border Interdiction in Counterinsurgency: A Look at Algeria, Rhodesia, and Iraq

Bairstow, Timothy M; Jun 15, 2007; 110 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471103>

One of the tools available to the counterinsurgent when devising a campaign is the interdiction of the insurgent's movement of men, materiel, and money at the border. This thesis examines three case studies of border interdiction in

insurgency: the French in Algeria from 1954 to 1962, the Rhodesian experience from 1965 to 1980, and the current Coalition experience in Iraq. In 1956, to counter insurgent infiltration of fighters and weapons, the French built the Morice Line, a barricade system built around an electronically charged fence. The Morice Line was remarkably effective in stopping insurgent infiltration. While the Rhodesians attempted similar border fortifications, they lacked the resources to successfully employ them. Instead, they found that employing highly mobile teams to track and kill insurgents was a more successful tactic, given their resource constraints. The U.S.-led Coalition in Iraq, after a slow start, employed small advisory teams to support Iraqi Security Forces working from border forts to secure Iraq's borders. The three case studies show that border interdiction is a relatively inexpensive component of a counterinsurgency campaign, but that it can be a vital component of that campaign if the counterinsurgent interdicts the right target (e.g., manpower, weapons, or funding).

DTIC

Algeria; Iraq; Security; Zimbabwe

20070037547 Army Research Lab., Aberdeen Proving Ground, MD USA

Demonstration of Military Composites With Low Hazardous Air Pollutant Content

La Scala, John J; Glodek, Theresa; Lochner, Caroline; Geng, Xing; Quabili, Ashiq; Patterson, Ken; Bruce, Frank; Bartling, Edward; Johnson, Charlie; Myers, Philip; Jul 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-7895

Report No.(s): AD-A471200; ARL-RP-185; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471200>

Liquid resins used for molding composite structures are a significant source of volatile organic compounds (VOC) and hazardous air pollutant (HAP) emissions. One method of reducing styrene emissions from vinyl ester (VE) resins is to replace some or all of the styrene with fatty acid-based monomers. Fatty acid monomers are ideal candidates because they are inexpensive, have low volatilities, and promote global sustainability because they are derived from renewable resources. This patent pending technology allows for the formulation of high performance composite resins with no more than 25 wt% styrene. These resins have low viscosities suitable for vacuum infusion methods, and have excellent polymer and composite properties. As a result, these resins are currently being demonstrated/validated for DoD use on Army tactical vehicles, including HMMWV hoods, HMMWV helmet hardtops, T-38 dorsal covers, and composite rudders for the Navy.

DTIC

Air Pollution; Composite Structures; Fatty Acids; Military Technology; Monomers; Organic Compounds; Resin Transfer Molding

20070038422 Colorado Superconductor, Inc., Fort Collins, CO USA

Energy Efficient Window Retrofits in Historic Facilities

Hendricks, Kent; Jan 2006; 52 pp.; In English

Report No.(s): AD-A471707; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471707>

Owing to an ever increasing emphasis on reducing energy usage in buildings, the older windows found in historic buildings are often in danger of being replaced during rehabilitation projects. These older windows are replaced with more energy efficient models that often do not match the existing historic appearance. It is well documented that windows are poor insulators causing increased heating or cooling load, depending on the weather conditions, and thus are the usual targets when trying to improve a building's thermal performance. This paper discusses the somewhat dissimilar goals of the federal government's energy management program and its historic preservation policies. The main purpose of the paper is to suggest and recommend alternative methods of improving the energy efficiency of existing historic windows while at the same time maintaining the significance and character of the window units. Several case studies are examined that support the repair and rehabilitation of windows to both retain historic materials and to also reduce energy consumption. Many owners and architects, impatient with the time consuming demands of preservation, forfeit valuable historic resources in favor of the expediency of window replacement. In most cases the alternative methods produce energy savings equal to or greater than the savings gained by replacing windows with newer models, at a lower cost.

DTIC

Energy Conservation; Maintenance; Preserving; Replacing

20070038607 Texas Univ., Austin, TX USA

Understanding the Relationships Between Stakeholder Success and Construction Project Characteristics and Technology Use

Breitenbach, Erik K; Aug 2004; 96 pp.; In English

Report No.(s): AD-A471888; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Achieving the successful delivery of a project is the goal of every project management team. Because of the multiplicity of personnel involved, a key element of construction project success is stakeholder success. In the final analysis, if a project is to be perceived as successful, then its stakeholders must be satisfied. The cost and schedule performance metrics associated with project success are typically not equally important to all stakeholders and are not adequate measures of stakeholder success. This thesis analyzes survey results by comparing stakeholder success with varying project characteristics and technology usage levels.

DTIC

Construction; Project Management; Success Project; Technology Utilization

20070038619 Purdue Univ., West Lafayette, IN USA

Design-Build vs Design-Bid-Build: A Procurement Method Selection Framework

Stauffer, Griffin K; Aug 2006; 77 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471905; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Proper procurement method selection is an integral part of project success. Better informed owners are able to more successfully select the project delivery systems that best suit their needs. This study utilizes utility theory to construct a framework to assist in the procurement decision making process. Through the use of expert weighting of important procurement criteria, real world projects were used to develop an overall threshold to which future owner's can compare their subsequent projects. This threshold, which marks the boundary between Design-Build and Design-Bid-Build, can be used to measure an owner's propensity to use either procurement method. It is fully tailorable to any owner, as owner-specific inputs are used. This ability for owners to objectify the largely subjective procurement decision making process allows owners to create a predictable, measurable trend, thereby improving their overall decision making ability.

DTIC

Construction; Decision Making; Game Theory; Procurement

20070038620 Purdue Univ., West Lafayette, IN USA

Profitability Implications of Sustainable Contracting

Underwood, Dude L; Aug 2006; 63 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471907; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Certain construction companies have adopted 'green' building methods and practices while most of the industry continues to provide traditional construction services in traditional ways. The green building methods include managing waste streams effectively, using environmentally friendly materials, and working with other green companies and groups. The benefits of green construction have been explored as they relate to the environment, society, and even building owners. Several logical benefits have been postulated for green contractors, from better brand name to reduced costs associated with waste and insurance. This research explores the correlation between green construction and the economic success of companies. Through financial data analysis of a study group of green companies in the construction industry, a control group of similar companies without a sustainability focus, and the construction industry as a whole, the connections between business strategy and profit are investigated. Qualitative and subjective data are employed to assist in the interpretation of the quantitative findings, and the entire study is placed into context by the use of a contractor survey which explores the current perceptions of green construction in the industry. The major conclusion of the study is that there is not a notable negative economic impact associated with being a green company in the construction industry.

DTIC

Construction; Construction Industry; Economic Impact; Environmental Engineering; Industries

20070038921 Texas Univ., Austin, TX USA

An Empirical Comparison of Design/Build and Design/Bid/Build Project Delivery Methods

Hale, Darren R; Aug 2005; 152 pp.; In English

Contract(s)/Grant(s): N62271-97-G-0073

Report No.(s): AD-A471763; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471763>

This thesis project compares the performance of a homogeneous sample of USA Navy Bachelor Enlisted Quarters built

using the Military Construction process. Projects will be broken into two sub-samples of design/bid/build and design/build projects to see if one project delivery method is superior in regards to time and cost. Project duration, project duration per bed, project time growth, cost growth and cost per bed will be statistically compared. Upon completion of the analysis the hypothesis that design/build projects are superior to design/bid/build projects in regards to time and cost will be tested.

DTIC

Construction; Military Technology

20070038923 Library of Congress, Washington, DC USA

Highway Bridges: Conditions and the Federal/State Role

Kirk, Robert S; Mallett, William J; Aug 10, 2007; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471760; CRS-RL34127; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471760>

The sudden failure and collapse of the I-35W Interstate System bridge in Minneapolis has raised policy concerns in Congress regarding the condition of the nation's transportation infrastructure in general, and in particular the federal role funding, building, maintaining, and ensuring the safety of roads and especially bridges in the USA. Highway bridges are of particular interest both because of the recent tragedy in Minneapolis and the catastrophic results of a major bridge failure, in terms of loss of life and economic impact.

DTIC

Highways; Bridges (Structures); Policies; Transportation

43

EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20070037760 Oktale SE Co., Toulouse, France

Specray EM/Fermat - A New Modelling Radar Approach from Numerical Models of Terrain to SAR Images

Latger, J; Mametsa, H J; Berges, A; May 1, 2005; 45 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471349; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Digital Simulation; Electromagnetic Properties; Mathematical Models; Radar Imagery; Synthetic Aperture Radar; Terrain

20070037861 Army War Coll., Carlisle Barracks, PA USA

European Energy Security: Wrestling the Russian Bear for Caspian Natural Gas

Winchester, Robert F; Apr 15, 2007; 35 pp.; In English

Report No.(s): AD-A471533; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Natural gas, and its accessibility, is a growing component of national security. In its March 2006 Green Paper on Energy Security, the European Commission committed itself to promoting energy source diversification. Nevertheless, 25 percent of the European Union's natural gas comes from Russia, a figure that is estimated to grow to over 50 percent by 2030 as European Union domestic production continues to decline. Unfortunately for European energy security, Russia has shown itself increasingly willing to flex its energy muscle by strong-arming both buyers and sellers on pricing and interrupting deliveries to send political messages. This paper examines the European Union's growing dependency on natural gas and Russia's reliability as a natural gas supplier in view of European Union strategic energy security needs. The study then examines the Caspian region as a diversifying source for European Union natural gas needs. Finally, based on the findings, policy suggestions are presented to improve the European Union's energy security framework.

DTIC

Caspian Sea; Natural Gas; Policies; Russian Federation; Security

20070037865 Army War Coll., Carlisle Barracks, PA USA

The Caspian Sea Pipeline: A Clear Strategic U.S. Interest

Marek, Larry T; May 9, 2007; 33 pp.; In English

Report No.(s): AD-A471547; No Copyright; Avail.: Defense Technical Information Center (DTIC)

From the spring of 1998 through the winter of 2002, during the debate and initial planning for the first major pipeline in the region, a host of policy articles were being written describing the coming storm of a potential geopolitical 'rivalry' between and among the Caspian superpowers. The policy arguments revolved around two distinct but related issues: first, who would be the winners and the losers in the struggle for pipeline routes and revenues, and how would the outcome affect the future battle for strategic advantage? Secondly, given the answer to the first question, how could American interests be realized without destabilizing the civil societies and fragile institutions of the Caspian region? The answer to the first question may not be fully determined, but this paper will look at how, after the pipeline's completion, the USA can still actively pursue its interests without destabilizing Central Asia. After reviewing articles and papers from regional experts and oil business experts, this study will describe what the region has to offer the world and what challenges the countries in the Caspian Sea region face in their pursuit of energy. Finally, recommendations will be proposed regarding how U.S. interests can be achieved in the Caspian region, and how the USA can serve as a stabilizing force in supporting the fragile institutions and civil societies of the region.

DTIC

Caspian Sea; Crude Oil; International Relations; Natural Gas; Pipelines; United States

20070038189 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Physical and Radiative Characteristics and Long Term Variability of the Okhotsk Sea Ice Cover

Nishio, Fumihiko; Comiso, Josefino C.; Gersten, Robert; Nakayama, Masashige; Ukita, Jinro; Gasiewski, Al; Stanko, Boba; Naoki, Kazuhiro; [2007]; 40 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.:

CASI: [A03](#), Hardcopy

Much of what we know about the large scale characteristics of the Okhotsk Sea ice cover comes from ice concentration maps derived from passive microwave data. To understand what these satellite data represents in a highly divergent and rapidly changing environment like the Okhotsk Sea, we analyzed concurrent satellite, aircraft, and ship data and characterized the sea ice cover at different scales from meters to tens of kilometers. Through comparative analysis of surface features using co-registered data from visible, infrared and microwave channels we evaluated how the general radiative and physical characteristics of the ice cover changes as well as quantify the distribution of different ice types in the region. Ice concentration maps from AMSR-E using the standard sets of channels, and also only the 89 GHz channel for optimal resolution, are compared with aircraft and high resolution visible data and while the standard set provides consistent results, the 89 GHz provides the means to observe mesoscale patterns and some unique features of the ice cover. Analysis of MODIS data reveals that thick ice types represents about 37% of the ice cover indicating that young and new ice represent a large fraction of the lice cover that averages about 90% ice concentration, according to passive microwave data. A rapid decline of -9% and -12 % per decade is observed suggesting warming signals but further studies are required because of aforementioned characteristics and because the length of the ice season is decreasing by only 2 to 4 days per decade.

Author

Sea Ice; Sea of Okhotsk; Variability; Physical Properties; Remote Sensing; Seasons; Annual Variations

20070038198 NASA Stennis Space Center, Stennis Space Center, MS, USA

Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop

Stanley, Thomas; Pagnutti, Mary; January 2007; In English; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop, 14-16 Mar. 2006, Laurel, MD, USA; See also 20070038199 - 20070038252

Contract(s)/Grant(s): NNS04AB54T

Report No.(s): SSTI-2220-0104; Copyright; Avail.: CASI: [C01](#), CD-ROM

The Joint Agency Commercial Imagery Evaluation (JACIE) team is a collaborative interagency working group formed to leverage different government agencies' capabilities for the characterization of commercial remote sensing products. The team is composed of staff from the National Aeronautics and Space Administration (NASA), the National Geospatial-Intelligence Agency (NGA), and the U.S. Geological Survey (USGS). Each JACIE agency has a vested interest in the purchase and use of commercial imagery to support government research and operational applications. The intent of the 2006 workshop is to exchange information regarding the characterization and application of commercial imagery used by the government. The main focus of previous workshops has been on high-resolution satellite imagery from systems; such as, IKONOS (Space

Imaging, Inc.), QuickBird (DigitalGlobe, Inc.), and OrbView-3 (ORBIMAGE). This workshop is being expanded to cover all civil medium- and high-resolution commercial imagery used by the government.

CASI

Earth Observations (From Space); Satellite Observation; Satellite Imagery; Remote Sensing; Conferences

20070038199 Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

SSC Geopositional Assessment of the Advanced Wide Field Sensor

Ross, Kenton; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 28 pp.; In English;

See also [20070038198](#); Original contains color illustrations

Contract(s)/Grant(s): NNS04AB54T; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The objective is to provide independent verification of IRS geopositional accuracy claims and of the internal geopositional characterization provided by Lutes (2005). Six sub-scenes (quads) were assessed; Three from each AWiFS camera. Check points were manually matched to digital orthophoto quarter quadrangle (DOQQ) reference (assumed accuracy approx. 5 m, RMSE) Check points were selected to meet or exceed Federal Geographic Data Committee's guidelines. Used ESRI ArcGIS for data collection and SSC-written MATLAB scripts for data analysis.

Derived from text

Data Acquisition; Cameras; Characterization; Imaging Techniques

20070038200 National Oceanic and Atmospheric Administration, USA

NOAA's National Geodetic Survey Utilization of Aerial Sensors for Emergency Response Efforts

White, Stephen; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 43 pp.; In English;

See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy;

Available from CASI on CD-ROM only as part of the entire parent document

Remote Sensing Division has a Coastal Mapping program and a Airport Survey program and research and development that support both programs. NOAA/NGS/RSD plans to acquire remotely sensed data to support the agency's homeland security and emergency response requirements.

Derived from text

Remote Sensing; Emergencies; Security; Airports; Mapping; Coasts

20070038201 GDA Corp., State College, PA, USA

Automated, per pixel Cloud Detection from High-Resolution VNIR Data

Varlyguin, Dmitry L.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 15 pp.; In

English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

CASA is a fully automated software program for the per-pixel detection of clouds and cloud shadows from medium- (e.g., Landsat, SPOT, AWiFS) and high- (e.g., IKONOS, QuickBird, OrbView) resolution imagery without the use of thermal data. CASA is an object-based feature extraction program which utilizes a complex combination of spectral, spatial, and contextual information available in the imagery and the hierarchical self-learning logic for accurate detection of clouds and their shadows.

Derived from text

Clouds (Meteorology); Pattern Recognition; Imagery; Landsat Satellites; High Resolution; Detection

20070038202 South Dakota State Univ., Brookings, SD, USA

Radiometric Calibration of the AWiFS Sensor and a Cross-calibration Enhanced Vicarious Calibration Technique

Aaron, David; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English;

See also [20070038198](#); Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Using vicarious calibration validation of moderate resolution sensors such as AWiFS is complicated by requiring more land area to ensure proper registration and sufficient pixel numbers. A trial AWiFS calibration was performed on a grass site that consisted of two dramatically different grass heights. Ground truth data was collected over relatively small areas representing only a few pixels. The radiometric gain results for each of these areas will be reported. To enhance this analysis, since a near coincidence high resolution image was collected, the high resolution data was effectively resized to produce pixels comparable to AWiFS and the atmospheric model was used to produce a top of canopy radiance map. Multiple uniform

vegetated areas of several radiances were then identified and subsequently propagated to the top of atmosphere viewpoint of the moderate resolution (AWiFS) satellite. The radiometric gain was then calculated based on the vendor high resolution satellite gains (for the 3 bands with comparable wavelengths). Band-to-band conversion was performed assuming a hyperspectral reflectance based on the standard vegetated site. The initial comparison produces AWiFS radiometric gain values that agree to better than 10% of the values measured using the standard vicarious gain technique.

Author

Calibrating; Radiometers; Atmospheric Models; Sensors

20070038203 GeoEye, Saint Louis, MO, USA

First Impressions of CARTOSAT-1

Lutes, James; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 39 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

CARTOSAT-1 RPCs need special handling. Absolute accuracy of uncontrolled scenes is poor (biases > 300 m). Noticeable cross-track scale error (+/- 3-4 m across stereo pair). Most errors are either biases or linear in line/sample (These are easier to correct with ground control).

Derived from text

Ground Based Control; Accuracy; Bias; Errors

20070038204 South Dakota State Univ., Brookings, SD, USA

Radiometric Calibration Assessment of Commercial High Spatial Resolution Multispectral Image Products

Aaron, David; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 44 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations

Contract(s)/Grant(s): NNS04AB66C; NCC5-588; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation reviews the radiometric calibration of commercial high spatial resolution multispectral image products.

CASI

Calibrating; High Resolution; Radiometers; Spatial Resolution; Imaging Techniques

20070038205 Mississippi Univ., MS, USA

Application of High Resolution Multispectral Imagery for Levee Slide Detection and Monitoring

Hossain, A. K. M. Azad; Easson, Greg; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 31 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The objective is to develop methods to detect and monitor levee slides using commercially available high resolution multispectral imagery. High resolution multispectral imagery like IKONOS and QuickBird are suitable for detecting and monitoring levee slides. IKONOS is suitable for visual inspection, image classification and Tasseled Cap transform based slide detection. Tasseled Cap based model was found to be the best method for slide detection. QuickBird was suitable for visual inspection and image classification.

Derived from text

Image Classification; Visual Observation; Inspection; High Resolution

20070038206 Geological Survey, Reston, VA, USA

Natural Resource Assessments in Afghanistan Through High Resolution Digital Elevation Modeling and Multi-spectral Image Analysis

Chirico, Peter G.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 12 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation provides USGS/USAID natural resource assessments in Afghanistan through the mapping of coal, oil and natural gas, minerals, hydrologic resources and earthquake and flood hazards.

CASI

High Resolution; Digital Elevation Models; Image Analysis; Remote Sensing; Earth Resources; Geological Surveys

20070038207 Geoeye, Saint Louis, MO, USA

OrbView-3 Technical Performance Evaluation 2005: Modulation Transfer Function

Cole, Aaron; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Technical performance evaluation of OrbView-3 using the Modulation Transfer Function (MTF) is presented. The contents include: 1) MTF Results and Methodology; 2) Radiometric Calibration Methodology; and 3) Relative Radiometric Assessment Results

CASI

Modulation Transfer Function; Performance Tests; Imaging Techniques

20070038208 GeoEye, Saint Louis, MO, USA

The GeoEye Satellite Constellation

Dial, Gene; Cole, Aaron; Lutes, James; McKune, John; Martinez, Mike; Rao, R. S.; Taylor, Martin; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 39 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The GeoEye Constellation consists of: a) IKONOS and OrbView-3 for high resolution; b) GeoEye with higher resolution 1Q2007; c) RESOURCESAT-1 for global crop assessment; d) OrbView-2 for ocean research and fish. IKONOS performance in 2005 included stable image quality, radiometry and geometric accuracy. reliability is 80% to 2008. Demonstrated capacity for high-volume, quick-response collection and production.

Derived from text

Constellations; Satellite Constellations; Radiometers; Image Resolution; High Resolution

20070038210 ITT Corp., USA

On-Orbit MTF Measurement and Product Quality Monitoring for Commercial Remote Sensing Systems

Person, Steven; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 20 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Initialization and opportunistic targets are chosen that represent the MTF on the spatial domain. Ideal targets have simple mathematical relationships. Determine the MTF of an on-orbit satellite using in-scene targets: Slant-Edge, Line Source, point Source, and Radial Target. Attempt to facilitate the MTF calculation by automatically locating targets of opportunity. Incorporate MTF results into a product quality monitoring architecture.

Derived from text

Point Sources; Space Commercialization; Targets

20070038211 Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

Radiometric Characterization Results for the OrbView-3 Sensor

Holekamp, Kara; Aaron, David; Thome, Kurtis; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Orbview-3 Sensor calibration summaries from the year 2004-2005 is presented.

CASI

Calibrating; Characterization; Radiometers; Sensors

20070038212 Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

Radiometric Characterization Results for the QuickBird Sensor

Holekamp, Kara; Aaron, David; Thome, Kurtis; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation shows the results for the Quickbird Sensor.

CASI

Characterization; Radiometers; Sensors

20070038213 South Dakota State Univ., Brookings, SD, USA

AWiFS Radiometric Assessment

Aaron, David; Leigh, Larry; Landau, Sara; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 45 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations
Contract(s)/Grant(s): NNS04AB66C; NCC5-588; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An Advanced Wide Field Sensor (AWiFS) radiometric assessment using a standard analysis technique is presented.

CASI

Radiometers; Remote Sensing; Imaging Techniques; Cameras

20070038214 South Dakota State Univ., Brookings, SD, USA

NASA/SDSU Geopositional Characterization

Helder, Dennis; Ross, Kenton; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 71 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A04](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation describes the geopositional characterization of IKONOS, QuickBird, and OrbView along with data collections and results.

CASI

Characterization; Imaging Techniques; General Overviews; Remote Sensors

20070038215 ITT Industries, Inc., USA

Correction to Method of Establishing the Absolute Radiometric Accuracy of Remote Sensing Systems While On-orbit Using Characterized Stellar Sources

Bowen, Howard S.; Cunningham, Douglas M.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 44 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The contents include: 1) Brief history of related events; 2) Overview of original method used to establish absolute radiometric accuracy of remote sensing instruments using stellar sources; and 3) Considerations to improve the stellar calibration approach.

CASI

Accuracy; Correction; Algorithms; General Overviews; Calibrating; Remote Sensing

20070038216 Lockheed Martin Integrated Systems and Solutions, USA

Spectral Dark Subtraction: A MODTRAN-Based Algorithm for Estimating Ground Reflectance without Atmospheric Information

Freedman, Ellis; Ryan, Robert; Pagnutti, Mary; Holekamp, Kara; Gasser, Gerald; Carver, David; Greer, Randy; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 56 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A04](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Spectral Dark Subtraction (SDS) provides good ground reflectance estimates across a variety of atmospheric conditions with no knowledge of those conditions. The algorithm may be sensitive to errors from stray light, calibration, and excessive haze/water vapor. SDS seems to provide better estimates than traditional algorithms using on-site atmospheric measurements much of the time.

Derived from text

Reflectance; Signal Processing; Estimates; Calibrating; Errors; Algorithms

20070038217 National Oceanic and Atmospheric Administration, USA

NOAA's Use of High-Resolution Imagery

Hund, Erik; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 23 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NOAA's use of high-resolution imagery consists of: a) Shoreline mapping and nautical chart revision; b) Coastal land

cover mapping; c) Benthic habitat mapping; d) Disaster response; and e) Imagery collection and support for coastal programs.
Derived from text

High Resolution; Imagery; Shorelines; Ocean Bottom; Mapping; Coasts

20070038218 3001, Inc., Fairfax, VA, USA

Leica ADS40 Sensor for Coastal Multispectral Imaging

Craig, John C.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 25 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Leica ADS40 Sensor as it is used for coastal multispectral imaging is presented. The contents include: 1) Project Area Overview; 2) Leica ADS40 Sensor; 3) Focal Plate Arrangements; 4) Trichroid Filter; 5) Gradient Correction; 6) Image Acquisition; 7) Remote Sensing and ADS40; 8) Band comparisons of Satellite and Airborne Sensors; 9) Impervious Surface Extraction; and 10) Impervious Surface Details.

Derived from text

Coasts; Imaging Techniques; Remote Sensing; Airborne Equipment

20070038219 Calgary Univ., Alberta, Canada

Multi-Sensor Triangulation of Multi-Source Spatial Data

Habib, Ayman; Kim, Chang-Jae; Bang, Ki-In; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 39 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The introduced methodologies are successful in: a) Using LIDAR features for photogrammetric geo-referencing; b) Delivering a geo-referenced imagery of the same quality as point-based geo-referencing procedures; c) Taking advantage of the synergistic characteristics of spatial data acquisition systems. The triangulation output can be used for the generation of 3-D perspective views.

Author

Data Acquisition; Photogrammetry; Triangulation; Imagery; Multisensor Applications

20070038220 NASA, Washington, DC, USA

NASA Overview

Sheffner, Edwin J.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 17 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Earth Science Division supports research projects that exploit the observations and measurements acquired by NASA Earth Observing missions and Applied Sciences projects that extend NASA research to the broader user community and address societal needs.

Derived from text

Earth Observations (From Space); Earth Sciences; NASA Programs; Earth Observing System (EOS)

20070038221 National Geospatial-Intelligence Agency, USA

NGA Commercial Imagery Overview

McGovern, Douglas; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 5 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A general overview of The National Geospatial Intelligence Agency (NGA) Commercial Imagery is presented.

CASI

Imagery; General Overviews; Geophysics; Artificial Intelligence

20070038222 DMC International Imaging Ltd., UK

High Quality - High Resolution, Rapid Revisit Wide Area Coverage EO Data Service

Stephens, J. Paul; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

DMC data is actively used in a wide range of international commercial and government applications that benefit from the

combination of high resolution, rapid revisit, spectral bands and coverage.

Derived from text

High Resolution; Spectral Bands; Imaging Techniques; Earth Observations (From Space); Data Acquisition

20070038223 Eidgenoessische Technische Hochschule, Zurich, Switzerland

High Accuracy 3D Processing of Satellite Imagery

Gruen, A.; Zhang, L.; Kocaman, S.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 55 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A04](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Automatic DSM/DTM generation reproduces not only general features, but also detailed features of the terrain relief. Height accuracy of around 1 pixel in cooperative terrain. RMSE values of 1.3-1.5 m (1.0-2.0 pixels) for IKONOS and RMSE values of 2.9-4.6 m (0.5-1.0 pixels) for SPOT5 HRS. For 3D city modeling, the manual and semi-automatic feature extraction capability of SAT-PP provides a good basis. The tools of SAT-PP allowed the stereo-measurements of points on the roofs in order to generate a 3D city model with CCM The results show that building models with main roof structures can be successfully extracted by HRSI. As expected, with Quickbird more details are visible.

Derived from text

Three Dimensional Models; Satellite Imagery; Pattern Recognition; Pixels

20070038224 NASA Stennis Space Center, Stennis Space Center, MS, USA

Emerging Techniques for Vicarious Calibration of Visible Through Short Wave Infrared Remote Sensing Systems

Ryan, Robert E.; Harrington, Gary; Holekamp, Kara; Pagnutti, Mary; Russell, Jeffrey; Frisbie, Troy; Stanley, Thomas; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Autonomous Visible to SWIR ground-based vicarious Cal/Val will be an essential Cal/Val component with such a large number of systems. Radiometrically calibrated spectroradiometers can improve confidence in current ground truth data through validation of radiometric modeling and validation or replacement of traditional sun photometer measurement. They also should enable significant reduction in deployed equipment such as equipment used in traditional sun photometer approaches. Simple, field-portable, white-light LED calibration source shows promise for visible range (420-750 nm). Prototype demonstrated <0.5% drift over 10-40 C temperature range. Additional complexity (more LEDs) will be necessary for extending spectral range into the NIR and SWIR. LED long lifetimes should produce at least several hundreds of hours or more of stability, minimizing the need for expensive calibrations and supporting long-duration field campaigns.

Derived from text

Calibrating; Spectroradiometers; Remote Sensing; Light Sources; Light Emitting Diodes; Ground Truth; Stability; Infrared Detectors

20070038225 Observera, Inc., Chantilly, VA, USA

Geolocation Accuracy Evaluations of OrbView-3, EROS-A, and SPOT-5 Imagery

Bresnahan, Paul; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 30 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation evaluates absolute geolocation accuracy of OrbView-3, EROS-A, and SPOT-5 by comparing test imagery-derived ground coordinates to Ground Control Points using SOCET set photogrammetric software.

CASI

Accuracy; Imagery; Position (Location); Remote Sensing; Eros (Satellites); Spot (French Satellite)

20070038226 Science Applications International Corp., Sious Falls, SD, USA

Viability of NLCD Products From IRS-P6, And From Landsat 7 Scan-gap Data

Coan, Michael; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 32 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Landcover test on Salt Lake test site illustrates potential issues with AWiFS/LISS-III for classification of certain land cover classes (evergreen, shrub/scrub, woody wetlands, emergent wetlands). Canopy and impervious graphs of product

differences from source indicate slightly lower overall accuracies (shorter peaks, wider bases) for AWiFS/LISS-III, compared to L5/L7. Inspection of individual products from canopy and impervious estimate tests revealed issues with combining AWiFS quadrants, and similar but less severe effects with combining multiple dates of L7 scan gap data.

Derived from text

Land Use; Classifications; Wetlands; Viability; Landsat 7; Quadrants

20070038227 Department of Agriculture, Washington, DC, USA

Access and Availability of Resourcesat-1 AWiFS Data for Agriculture

Tetrault, Robert; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 30 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

AWiFS data has elements for successful applications in agriculture. Low prices, rapid delivery, acquisition planning, and global coverage.

Derived from text

Agriculture; Remote Sensing; Satellite Observation

20070038228 Department of Agriculture, VA, USA

Crop Acreage Estimation: Landsat TM and Resourcesat-1 AWiFS Sensor Assessment of the Mississippi River Delta, 2005

Boryan, Claire; Johnson, Dave; Craig, Mike; Seffrin, Bob; Mueller, Rick; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 27 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

AWiFS data are appropriate for crop acreage estimation over large, spectrally homogenous, crop areas such as the Mid-West, the Delta and the Northern Great Plains. Regression and Kappa statistics for soybean, corn, cotton, rice and sorghum produced using both the Landsat TM and AWiFS data are very similar. AWiFS data appear to be a suitable alternative or supplement to Landsat TM data for production of NASS' Cropland Data Layer product.

Derived from text

Farm Crops; Satellite Imagery; Regression Analysis; Landsat Satellites; Great Plains Corridor (North America); Cotton; Corn

20070038229 BAE Systems, USA

Accuracy Analysis on Large Blocks of High Resolution Images

Passini, Richardo M.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 22 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Although high altitude frequencies effects are removed at the time of basic image generation, low altitude (Yaw) effects are still present in form of affinity/angular affinity. They are effectively removed by additional parameters. Bundle block adjustment based on properly weighted ephemeris/altitude quaternions (BBABEQ) are not enough to remove the systematic effect. Moreover, due to the narrow FOV of the HRSI, position and altitude are highly correlated making it almost impossible to separate and remove their systematic effects without extending the geometric model (Self-Calib.) The systematic effects gets evident on the increase of accuracy (in terms of RMSE at GCPs) for looser and relaxed ground control at the expense of large and strong block deformation with large residuals at check points. Systematic errors are most freely distributed and their effects propagated all over the block.

Derived from text

Systematic Errors; Accuracy; Quaternions; Yaw; High Altitude; High Resolution; Ground Based Control

20070038230 Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

Initial Radiometric Calibration of the AWiFS Using Vicarious Calibration Techniques

Pagnutti, Mary; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 20 pp.; In English; See also [20070038198](#); Original contains color illustrations

Contract(s)/Grant(s): NNX04AB54T; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NASA team of University of Arizona, South Dakota State University, and NASA SSC produce consistent results. The

AWiFS calibration coefficients agree reasonably well with the NASA team estimate. The NASA team will continue to assess AWiFS radiometric accuracy.

Derived from text

Calibrating; Coefficients; Radiometers; Radiometric Resolution; Data Acquisition

20070038231 NASA Stennis Space Center, Stennis Space Center, MS, USA

Spatial Resolution Characterization for AWiFS Multispectral Images

Blonski, Slawomir; Ryan, Robert E.; Pagnutti, Mary; Stanley, Thomas; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 11 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations

Contract(s)/Grant(s): NNS04AB54T; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation describes the spatial resolution of the AWiFS multispectral images characterized by an estimation of the Modulation Transfer Function (MTF) at Nyquist frequency. The contents include: 1) MTF Analysis; 2) Target Analysis; 3) 'Pulse Target'; 4) 'Pulse' Method; 5) Target Images; 6) Bridge Profiles; 7) MTF Calculation; 8) MTF Results; and 9) Results Summary.

CASI

Characterization; Spatial Resolution; Imaging Techniques

20070038232 Geological Survey, USA

Land Remote Sensing Overview

Byrnes, Ray; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 25 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A general overview of the USGS land remote sensing program is presented. The contents include: 1) Brief overview of USGS land remote sensing program; 2) Highlights of JACIE work at USGS; 3) Update on NASA/USGS Landsat Data Continuity Mission; and 4) Notes on alternative data sources.

CASI

General Overviews; Geological Surveys; Remote Sensing; Satellite Imagery; Landsat Satellites

20070038233 NASA Stennis Space Center, Stennis Space Center, MS, USA

Spatial Resolution Characterization for Aerial Digital Imagery

Blonski, Slawomir; Ross, Kentron; Pagnutti, Mary; Stanley, Thomas; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 10 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation reviews NASA and the U.S. Geological Survey (USGS)'s analysis of spatial characterization resolution for Aerial Digital Imagery.

CASI

Aerial Photography; Characterization; Spatial Resolution; Imagery; Geological Surveys; Remote Sensing; Digital Techniques

20070038234 Department of Agriculture, USA

Operational Use of Remote Sensing within USDA

Bethel, Glenn R.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 76 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A05](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A viewgraph presentation of remote sensing imagery within the USDA is shown. USDA Aerial Photography, Digital Sensors, Hurricane imagery, Remote Sensing Sources, Satellites used by Foreign Agricultural Service, Landsat Acquisitions, and Aerial Acquisitions are also shown.

CASI

Aerial Photography; Remote Sensing; Imagery; Satellite-Borne Instruments; MODIS (Radiometry); Landsat Satellites

20070038235 Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

Radiometric Characterization of the IKONOS, QuickBird, and OrbView-3 Sensors

Holekamp, Kara; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 41 pp.; In English; See also [20070038198](#); Original contains color illustrations

Contract(s)/Grant(s): NNS04AB54T; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NASA team of University of Arizona, South Dakota State University, and NASA SSC produce consistent results. The OrbView calibration coefficients do not appear to agree well with the NASA team estimate (approx. 20% difference). Discussions with GeoEye (TradeMark) (formerly ORBIMAGE(Registered TradeMark)) personnel are ongoing to update the calibration coefficients. The NASA team will continue to assess OrbView radiometric accuracy.

Derived from text

Radiometers; Coefficients; Calibrating; Accuracy

20070038236 DMC International Imaging Ltd., UK

Small Satellite Constellations: The Future for Operational Earth Observation

Stephens, J. Paul; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 67 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A04](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Nanosat, microsat and minisat are low-cost, rapid-response small-satellites built from advanced terrestrial technology. SSTL delivers the benefits of affordable access to space through low-cost, rapid response, small satellites designed and built with state-of-the-art COTS technologies by: a) reducing the cost of entry into space; b) Achieving more missions within fixed budgets; c) making constellations and formation flying financially viable; d) responding rapidly from initial concept to orbital operation; and e) bringing the latest industrial COTS component advances to space. Growth has been stimulated in constellations for high temporal revisit&persistent monitoring and military responsive space assets.

Derived from text

Nanosatellites; Cost Reduction; Constellations; Formation Flying; Satellite Observation; Earth Observations (From Space)

20070038237 DigitalGlobe, Bay Saint Louis, MS, USA

DigitalGlobe(TM) Incorporated Corporate and System Update

Thomassie, Brett; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 44 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation describes a system update of Quickbird, the world's highest resolution commercial imaging satellite, operated by DigitalGlobe (TM) Incorporated. A satellite comparison of Quickbird, WorldView-60, and WorldView-110 is also presented.

CASI

Imaging Techniques; Digital Techniques; Satellite Design; Imagery; Aerial Photography

20070038238 American Society for Photogrammetry and Remote Sensing, Bethesda, MD, USA

The ASPRS Remote Sensing Industry Forecast: Phase II & III - Digital Sensor Compilation

Mondello, Charles; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In August 1999, ASPRS and NASA's (then) Commercial Remote Sensing Program (CRSP) entered into a 5-year Space Act Agreement (SAA), combining resources and expertise to: (a) Baseline the Remote Sensing Industry (RSI) based on GEIA Model; (b) Develop a 10-Year RSI market forecast and attendant processes; and (c) Provide improved information for decision makers.

Author

Remote Sensing; Forecasting; Space Commercialization; Reusable Heat Shielding

20070038239 Geological Survey, Sioux Falls, SD, USA

Medium Spatial Resolution Satellite Characterization

Stensaas, Greg; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 22 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This project provides characterization and calibration of aerial and satellite systems in support of quality acquisition and understanding of remote sensing data, and verifies and validates the associated data products with respect to ground and atmospheric truth so that accurate value-added science can be performed. The project also provides assessment of new remote sensing technologies.

Derived from text

Remote Sensing; Ground Truth; Spatial Resolution; Calibrating; Characterization

20070038240 Geological Survey, Rolla, MO, USA

Evaluating the Horizontal Accuracy of GeoEye OrbView-3 Orthorectified Products Over the Kaintuck Hollow, Missouri, Test Site

Starbuck, Michael; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Data collected and horizontal accuracy calculations of GeoEye OrbView-3 Orthorectified panchromatic imagery over the Kaintuck Hollow, Missouri test site is presented.

Derived from text

Imagery; Accuracy; Thematic Mapping; Data Products

20070038241 Geological Survey, USA

Monitoring and Assuring the Quality of Digital Aerial Data

Christopherson, Jon; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 21 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation explains the USGS plan for monitoring and assuring the quality of digital aerial data. The contents include: 1) History of USGS Aerial Imaging Involvement; 2) USGS Research and Results; 3) Outline of USGS Quality Assurance Plan; 4) Other areas of Interest; and 5) Summary

CASI

Digital Data; Geological Surveys; Imaging Techniques; Aerial Photography; Quality Control; Technologies; Remote Sensing

20070038242 Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

Radiometric Characterization Results for the IKONOS Sensor

Holekamp, Kara; Aaron, David; Thome, Kurtis; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The radiometric characterization results of the IKONOS sensor is presented.

CASI

Characterization; Radiometers; Sensors; Calibrating

20070038243 Arizona Univ., Tucson, AZ, USA

Radiometric Calibration Assessment of Commercial High Spatial Resolution Multispectral Image Products

Thome, Kurt; Leisso, Nathan; Buchanan, John; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 18 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This paper describes the results of commercial high spatial resolution sensors. The topics include: 1) Reflectance-based approach; 2) U of A test sites; 3) Test Site Selection; 4) Resort Living; 5) Aerosol parameters; 6) Surface reflectance retrieval;

7) Accuracy/precision; 8) Data sets; 9) June 23, 2005 for Ikonos; 10) QuickBird Results; 11) Ikonos results; 12) Orbview results; 13) Ikonos redux; and 14) Overall results.

CASI

Calibrating; High Resolution; Radiometers; Spatial Resolution; Image Processing

20070038244 NASA Stennis Space Center, Stennis Space Center, MS, USA

Assessing Hurricane Katrina Damage to the Mississippi Gulf Coast Using IKONOS Imagery

Spruce, Joseph P.; McKellip, Rodney; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 29 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Hurricane Katrina hit southwestern Mississippi on August 29, 2005, at 10 a.m. CDT as a category 3 event with storm surges up to approximately 9 m and sustained winds of approximately 120 mph. The hurricane ravaged several coastal towns, destroying or severely damaging hundreds of homes. Hurricane Katrina deposited millions of tons of debris and caused severe damage to coastal forests. In response, several Federal agencies have been using a broad range of remotely sensed data (e.g., IKONOS) to aid damage assessment and disaster recovery efforts. This presentation discusses an effort to use IKONOS data for damage assessment, based on data collected over southwestern coastal Mississippi on September 2, 2005.

Derived from text

Damage Assessment; Hurricanes; Imagery; Mississippi; Remote Sensing

20070038245 GeoEye, Saint Louis, MO, USA

GeoEye(TradeMark) Corporate Overview

Jones, Dennis; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 19 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation gives a corporate overview of GeoEye, the world's largest commercial remote sensing company. The contents include: 1) About GeoEye; 2) GeoEye Mission; 3) The Company; 4) Company Summary; 5) U.S. Government Commitment; 6) GeoEye Constellation; 7) Other Imaging Resources; 8) OrbView-3 & OrbView-2; 9) OrbView-3 System Architecture; 10) OrbView-3; 11) OrbView-2; 12) IKONOS; 13) Largest Image Archive in the World; 14) GeoEye-1; 15) Best-In-Class Development Team; 16) Highest Performance Available in the Commercial Market; and 17) Key Themes

CASI

General Overviews; Remote Sensing; Satellite Imagery; Organizations

20070038246 Department of Agriculture, USA

Cropland Classifications of Coincident TM and AWiFS Imagery

Johnson, Dave; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Training and validation data is presented of approx. 100,000 acres from about 200 randomly distributed area visits during the 2005 NASS Agricultural Survey.

Derived from text

Agriculture; Classifications; Farmlands; Imagery; Crops

20070038247 Arizona Univ., AZ, USA

AWiFS Radiometric Assessment

Thome, Kurt; Aaron, David; Pagnutti, Mary; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 22 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An assessment of the Advanced Wide Field Sensor (AWiFS) is presented. The contents include: 1) Overview of AWiFS sensor; 2) Description of University of Arizona approach; 3) Description of South Dakota State approach and results; 4) Description of Stennis Space Center approach and results; 5) Summary of results for all groups.

CASI

Remote Sensors; Cameras; Radiometers; Infrared Radiation; General Overviews

20070038248 Pennsylvania State Univ., PA, USA

Poly-Pattern Compressive Segmentation of ASTER Data for GIS

Myers, Wayne; Warner, Eric; Tutwiler, Richard; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Pattern-based segmentation of multi-band image data, such as ASTER, produces one-byte and two-byte approximate compressions. This is a dual segmentation consisting of nested coarser and finer level pattern mappings called poly-patterns. The coarser A-level version is structured for direct incorporation into geographic information systems in the manner of a raster map. GIS renderings of this A-level approximation are called pattern pictures which have the appearance of color enhanced images. The two-byte version consisting of thousands of B-level segments provides a capability for approximate restoration of the multi-band data in selected areas or entire scenes. Poly-patterns are especially useful for purposes of change detection and landscape analysis at multiple scales. The primary author has implemented the segmentation methodology in a public domain software suite.

Author

Compressibility; Segments; Geographic Information Systems; Change Detection

20070038249 Geoeye, Saint Louis, MO, USA

OrbView-3 Technical Performance Evaluation 2005: OV-3 Specifications

Cole, Aaron; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 1 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The product specifications, geolocation accuracy, methodology, and test and evaluation are presented for Orbview-3.

CASI

Performance Tests; Specifications; Position (Location); Methodology

20070038250 Maryland Univ., MD, USA

Future of Land Remote Sensing: What is Needed

Goward, Samuel N.; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 15 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A viewgraph presentation describing the future of land remote sensing and the new technologies needed for clear views of the Earth is shown. The contents include: 1) Viewing the Earth; 2) Multi-Imagery; 3) May Missions and Sensors; 4) What is Needed; 5) Things to Think About; 6) Global Land Remote Sensing in Landsat 7 Era; 7) Seasonality; 8) Cloud Contamination; 9) NRC Decadal Study; 10) Atmospheric Attenuation; 11) Geo-Registration; 12) Orthorectification Required; 13) Band Registration with OLI; and 14) Things to Do. A viewgraph presentation describing the future of land remote sensing and the new technologies needed for clear views of the Earth is shown. The contents include: 1) Viewing the Earth; 2) Multi-Imagery; 3) May Missions and Sensors; 4) What is Needed; 5) Things to Think About; 6) Global Land Remote Sensing in Landsat 7 Era; 7) Seasonality; 8) Cloud Contamination; 9) NRC Decadal Study; 10) Atmospheric Attenuation; 11) Geo-Registration; 12) Orthorectification Required; 13) Band Registration with OLI; and 14) Things to Do.

Author

Landsat 7; Remote Sensing; Earth Surface; Imagery

20070038251 Geological Survey, Sioux Falls, SD, USA

An Overview of the CBERS-2 Satellite and Comparison of the CBERS-2 CCD Data with the L5 TM Data

Chandler, Gyanesh; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 36 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

CBERS satellite carries on-board a multi sensor payload with different spatial resolutions and collection frequencies. HRCCD (High Resolution CCD Camera), IRMSS (Infrared Multispectral Scanner), and WFI (Wide-Field Imager). The CCD and the WFI camera operate in the VNIR regions, while the IRMSS operates in SWIR and thermal region. In addition to the imaging payload, the satellite carries a Data Collection System (DCS) and Space Environment Monitor (SEM).

Derived from text

CCD Cameras; Satellite Observation; Multispectral Band Scanners; Imaging Techniques; Infrared Scanners; Charge Coupled Devices; Aerospace Environments; High Resolution

20070038252 South Dakota State Univ., Brookings, SD, USA

On-orbit Modulation Transfer Function (MTF) Measurements for IKONOS and QuickBird

Helde, Dennis; Choi, Jason; Anderson, Cody; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 31 pp.; In English; See also [20070038198](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Point Spread Function is a method of evaluation the spatial resolution of an imaging system. It is also a measure of the spread of a single point of light. Modulation Transfer Function (MTF) is a measure of the spatial frequency response. It is often calculated from the point spread function (PSF). System response at the Nyquist frequency (or 0.5 cycle/pixel) is often used as a figure of merit

Derived from text

Modulation Transfer Function; Frequency Response; Spatial Resolution; Nyquist Frequencies; Imaging Techniques

20070038279 NASA Stennis Space Center, Stennis Space Center, MS, USA

On the Use of Ocean Color Remote Sensing to Measure the Transport of Dissolved Organic Carbon by the Mississippi River Plume

DelCastillo, Carlos E.; Miller, Richard L.; [2007]; 18 pp.; In English; Original contains color and black and white illustrations Report No.(s): SSTI-2200-0089; Copyright; Avail.: CASI: [A03](#), Hardcopy

We investigated the use of ocean color remote sensing to measure transport of dissolved organic carbon (DOC) by the Mississippi River to the Gulf of Mexico. From 2000 to 2005 we recorded surface measurements of DOC, colored dissolved organic matter (CDOM), salinity, and water-leaving radiances during five cruises to the Mississippi River Plume. These measurements were used to develop empirical relationships to derive CDOM, DOC, and salinity from monthly composites of SeaWiFS imagery collected from 1998 through 2005. We used river flow data and a two-end-member mixing model to derive DOC concentrations in the river end-member, river flow, and DOC transport using remote sensing data. We compared our remote sensing estimates of river flow and DOC transport with data collected by the USA Geological Survey (USGS) from 1998 through 2005. Our remote sensing estimates of river flow and DOC transport correlated well ($r^2 \sim 0.70$) with the USGS data. Our remote sensing estimates and USGS field data showed low variability in DOC concentrations in the river end-member (7-11%), and high seasonal variability in river flow (~50%). Therefore, changes in river flow control the variability in DOC transport, indicating that the remote sensing estimate of river flow is the most critical element of our DOC transport measurement. We concluded that it is possible to use this method to estimate DOC transport by other large rivers if there are data on the relationship between CDOM, DOC, and salinity in the river plume.

Author

Dissolved Organic Matter; Gulf of Mexico; Mississippi River (US); Remote Sensing; Water Color; Carbon

20070038424 Library of Congress, Washington, DC USA

The Role of National Oil Companies in the International Oil Market

Pirog, Robert; Aug 21, 2007; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471710; CRS-RL34137; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471710>

In the USA, the term 'big oil companies' is likely to be taken to mean the major private international oil companies, largely based in Europe or America. However, while some of those companies are indeed among the largest in the world, a majority of the largest oil companies are state-owned, national oil companies. By conventional definitions, national oil companies hold the majority of petroleum reserves and produce the majority of the world's supply of crude oil. Since national oil companies generally hold exclusive rights to exploration and development of petroleum resources within the home country, they also can decide on the degree to which they require participation by private companies in those activities. The national oil companies typically do not operate strictly on the basis of market principles. Because of their close ties to the national government, their objectives might include wealth re-distribution, job creation, general economic development, economic and energy security, and vertical integration. Although these objectives might be desirable from the point of view of the nation's government, they are unlikely to be equivalent to the maximization of shareholder value, the stated objective of the private international oil companies. Many national oil companies have been found to be inefficient, with relatively low investment rates. They tend to exploit oil reserves for short-term gain, possibly damaging oil fields, reducing the longer term production potential. Some also have limited access to international capital markets because of poor business practices and a lack of transparency in their business deals. If the price of oil moderates, the potential supply constraint related to the inefficient

operations of national oil companies may be a destabilizing factor in the world oil market. This report discusses U.S. policy directions that can be taken to mitigate the potential challenge posed by the dominance of national oil companies.

DTIC

Crude Oil; Oils; Organizations; Policies; United States

20070038431 Army Engineer Research and Development Center, Vicksburg, MS USA

Geophysical Surveys for Assessing Levee Foundation Conditions, Feather River Levees, Marysville/Yuba City, California

Llopis, Jose L; Simms, Janet E; Sep 2007; 116 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471724; ERDC/GSL-TR-07-25; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471724>

Effective flood and coastal storm emergency response depends on the ability of emergency managers to obtain information on the condition of flood-damage reduction structures in near real-time. This report describes the results of a geophysical study performed to determine the potential for geophysical methods to provide supplemental geologic data between existing soil borings in a rapid fashion in an area of complex geology. The geophysical study was conducted along 10 km of landside levee toe adjacent to the Feather River, approximately 5 km south of Marysville/Yuba City, CA. Electromagnetic induction, capacitively coupled electrical resistivity, and direct current electrical resistivity survey methods were used to conduct the geophysical study. Survey results were used to classify soil type to depths of approximately 60 m.

DTIC

Geophysics; Rivers; Surveys

20070038439 Army Engineer Research and Development Center, Vicksburg, MS USA

Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing the Functions of Headwater Slope Wetlands on the Mississippi and Alabama Coastal Plains

Noble, Chris V; Wakeley, James S; Roberts, Thomas H; Henderson, Cindy; Aug 2007; 109 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471734; ERDC/EL-TR-07-9; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471734>

The Hydrogeomorphic (HGM) Approach is a collection of concepts and methods for developing functional indices and subsequently using them to assess the capacity of a wetland to perform functions relative to similar wetlands in a region. The approach was initially designed to be used in the context of the Clean Water Act Section 404 Regulatory Program permit review sequence. This Regional Guidebook (a) characterizes the Headwater Slope wetlands in southern Mississippi and Alabama, (b) describes and provides the rationale used to select functions for the Headwater Slope wetland subclass, (c) describes model variables and metrics, (d) describes the development of assessment models, (e) provides data from reference wetlands and documents their use in calibrating model variables and assessment models, and (f) outlines protocols for applying the functional indices to the assessment of wetland functions.

DTIC

Coasts; Geomorphology; Handbooks; Slopes; Wetlands

20070038447 Library of Congress, Washington, DC USA

Royalty Relief for U.S. Deepwater Oil and Gas Leases

Humphries, Marc; Aug 8, 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471761; CRS-RS22567; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471761>

The most common incentives for offshore oil and gas development include various forms of royalty relief. The Outer Continental Shelf Lands Act (OCSLA) authorizes the Secretary of the Interior to grant royalty relief to promote increased oil and gas production (43 U.S.C. 1337). The Deep Water Royalty Relief Act of 1995 (DWRRA) expanded the Secretary's royalty relief authority in the Gulf of Mexico outer continental shelf (OCS). Controversy over royalty relief currently focuses on the lack of price thresholds in Minerals Management Service (MMS) OCS lease sales held in 1998 and 1999. Without the price thresholds, deepwater producers continued to benefit from royalty relief, even as oil prices hit record levels. How these price thresholds were omitted is the subject of ongoing congressional and administrative investigations. In an unresolved issue over the Secretary of the Interior's authority and discretion to impose price thresholds, the Department of the Interior asserts that the Secretary of the Interior is not required to impose price thresholds in each lease (but has the discretion to do so). However,

all lease sales held since the enactment of DWRRA included price thresholds, except those held in 1998 and 1999. According to the MMS and the Government Accountability Office (GAO), omitting price thresholds for those two years could cost the federal government at least \$10 billion. This situation has prompted efforts to amend the 1998 and 1999 leases to include price thresholds. On January 12, 2007, Representative Rahall and others introduced H.R. 6, cited as the Creating Long-Term Energy Alternatives for the Nation Act of 2007. Under Title II, this bill would, among other things, deny new Gulf of Mexico oil and gas leases to lessees holding leases without price thresholds or payment of or agreement to pay newly established 'conservation of resources' fees. The bill also would repeal royalty relief provisions of the Energy Policy Act of 2005.

DTIC

Crude Oil; Deep Water; Drilling; Law (Jurisprudence); Natural Gas; Oils; Water Depth

20070038579 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Multi-Robot FastSLAM for Large Domains

Koperski, Choyong G; Mar 2007; 104 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471795; AFIT/GCE/ENG/07-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

For a robot to build a map of its surrounding area, it must have accurate position information within the area, and to obtain accurate position information within the area, the robot needs to have an accurate map of the area. This circular problem is the Simultaneous Localization and Mapping (SLAM) problem. An efficient algorithm to solve it is FastSLAM, which is based on the Rao-Blackwellized particle filter. FastSLAM solves the SLAM problem for single-robot mapping using particles to represent the posterior of the robot pose and the map. Each particle of the filter possesses its own global map which is likely to be a grid map. The memory space required for these maps poses a serious limitation to the algorithm's capability when the problem space is large. The problem will only get worse if the algorithm is adapted to multi-robot mapping. This thesis presents an alternate mapping algorithm that extends the single-robot FastSLAM algorithm to a multi-robot mapping algorithm that uses Absolute Space Representations (ASR) to represent the world. But each particle still maintains a local grid to map its vicinity and periodically this grid map is converted into an ASR. An ASR expresses a world in polygons requiring only a minimal amount of memory space. By using this altered mapping strategy, the problem faced in FastSLAM when mapping a large domain can be alleviated. In this algorithm, each robot maps separately, and when two robots encounter each other they exchange range and odometry readings from their last encounter to this encounter. Each robot then sets up another filter for the other robot's data and incrementally updates its own map, incorporating the passed data and its own data at the same time. The passed data is processed in reverse by the receiving robot as if a virtual robot is back-tracking the path of the other robot. The algorithm is demonstrated using three data sets collected using a single robot equipped with odometry and laser-range finder sensors.

DTIC

Algorithms; Autonomous Navigation; Domains; Mapping; Position (Location); Robots

20070038586 Library of Congress, Washington, DC USA

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

Jackson, James K; Aug 21, 2007; 7 pp.; In English

Report No.(s): AD-A471847; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Petroleum prices have risen sharply since early 2005. At the same time the average amount of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and \$50 billion in 2006. Imported energy prices moderated in early 2007, before rising again in April, May, and June, following a pattern of rising energy import prices in the spring and summer. This report provides an estimate of the initial impact of the rising oil prices on the nation's merchandise trade deficit. This report will be updated as warranted by events.

DTIC

Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States

20070038730 Library of Congress, Washington, DC USA

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

Jackson, James K; Sep 13, 2007; 7 pp.; In English

Report No.(s): AD-A472101; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Petroleum prices have risen sharply since early 2005. At the same time the average amount of imports of energy-related

petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and \$50 billion in 2006. Imported energy prices moderated in early 2007, before rising again through the summer, following a pattern of rising energy import prices in the spring and summer. This report provides an estimate of the initial impact of the rising oil prices on the nation's merchandise trade deficit. This report will be updated as warranted by events.

DTIC

Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States

20070038868 Army Engineer Research and Development Center, Vicksburg, MS USA

Geologic Setting of Mosul Dam and Its Engineering Implications

Kelley, Julie R; Wakeley, Lillian D; Broadfoot, Seth W; Pearson, Monte L; McGrath, Christian A; McGill, Thomas E; Jorgeson, Jeffrey D; Talbot, Cary A; Sep 2007; 58 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472047; ERDC-TR-07-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The geologic setting of Mosul Dam is critically important for its engineering implications and its usefulness and contribution to engineering and operational decisions about the dam. The dam was constructed on alternating and highly variable units of gypsum, anhydrite, marl, and limestone, each of which is soluble in water under the environmental and hydrogeologic conditions of the dam. From a geologic standpoint, the foundation is very poor, and the site geology is the principal cause of continuing intense concern about the safety of the structure. Mineralogic variability within rock units resulted from original depositional processes that created interfaces and zones of weakness within individual beds. These natural zones of weakness now function as ingress points for seep water and allow dissolution zones to move vertically and horizontally. Dissolution is occurring at a faster rate than natural geologic processes. Sinkholes that have reached the surface recently on the east abutment indicate large-scale dissolution in the subsurface. Rock quality, grout-curtain efficiency as related to piezometer data, sinkhole development, sinkhole retreatment, dissolution rates of rock material, and water chemistry (total dissolved solids) collectively indicate that the dissolution front is moving to the east and downstream. The rate of subsurface dissolution has been increased by the presence of the reservoir. The pattern of regrouting in and between recently grouted sections of the dam shows that grouting at one location causes the flow path (seepage) of subsurface water to move to another location, but does not stop the seepage. At or above a pool depth of 318 m above sea level, the rate of subsurface dissolution increases markedly, leading to the recommendation that the pool not be raised above 318 m.

DTIC

Dams; Geology

20070038908 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Environmental Assessment of Lead at Camp Edwards, Massachusetts, Small Arms Ranges

Clausen, Jay L; Korte, Nic; Bostick, Benjamin; Rice, Benjamin; Walsh, Matthew; Nelson, Andrew; Aug 2007; 136 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471626; ERDC/CRREL-TR-07-11; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471626>

Environmental issues for small arms training with lead projectiles are examined in this report for Camp Edwards, Massachusetts, in order to evaluate whether past or future use of lead in small arms has or will result in lead mobilization to groundwater. A review of relevant literature and case studies demonstrates lead is toxic to humans and wildlife and, therefore, exposure must be minimized. The literature also demonstrates lead mobilization occurs chiefly by wind and surface water erosion, generally not by dissolution and leaching through soil. Environmental conditions at Camp Edwards dictate that wind and surface water are not primary avenues of transport, due to extensive vegetative cover and highly permeable soils. Highly permeable soils limit corrosion of metallic lead but can facilitate transport for dissolved forms of lead. Because highly permeable soils favor transport, careful analysis of the geochemical conditions with respect to lead vertical transport to groundwater was a focus for this study. It is the conclusion of this study that lead has not contaminated the groundwater in any significant way based on the absence of lead plumes, and only one groundwater monitoring well associated with the small arms ranges had a single low lead detection < 2 ppb.

DTIC

Residues; Ammunition; Armed Forces (United States)

20070039071 NASA Marshall Space Flight Center, Huntsville, AL, USA

Earth Global Reference Atmospheric Model (GRAM99): Short Course

Leslie, Fred W.; Justus, C. G.; August 07, 2007; 15 pp.; In English; Earth Global Reference Atmospheric Model Workshop and Short Course, 7 Aug. 2007, Denver, CO, USA; Original contains black and white illustrations; Copyright; Avail.:

CASI: A03, Hardcopy

Earth-GRAM is a FORTRAN software package that can run on a variety of platforms including PC's. For any time and location in the Earth's atmosphere, Earth-GRAM provides values of atmospheric quantities such as temperature, pressure, density, winds, constituents, etc.. Dispersions (perturbations) of these parameters are also provided and have realistic correlations, means, and variances - useful for Monte Carlo analysis. Earth-GRAM is driven by observations including a tropospheric database available from the National Climatic Data Center. Although Earth-GRAM can be run in a 'stand-alone' mode, many users incorporate it into their trajectory codes. The source code is distributed free-of-charge to eligible recipients. Derived from text

Earth Atmosphere; Remote Sensing; Applications Programs (Computers); Monte Carlo Method; Thermal Protection; Climatology; Satellite Observation

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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*.

20070037543 Library of Congress, Washington, DC USA

The European Union's Energy Security Challenges

Belkin, Paul; May 7, 2007; 32 pp.; In English

Report No.(s): AD-A471184; CRS-RL33636; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471184>

Recent increases in energy prices and a steady escalation in global energy demand - expected to rise by nearly 60% over the next 20 years - have led U.S. policy-makers to engage in a wide ranging debate over how best to address the country's future energy requirements. Similarly, energy security has become a policy priority for the European Union (EU) and its 27 member states. Together, the USA and Europe represent the world's largest energy market. Although they produce approximately 23% of the world's energy, they consume almost 40% of the world's supply. The EU imports about 50% of its energy needs. Barring significant changes, the European Commission expects this figure to rise to 65% by 2030. Approximately half of the EU's imported energy in the form of oil and natural gas comes from Russia. Europe's growing dependence on Russian energy has fueled speculation that Moscow is using the energy weapon to try to influence European foreign and economic policy.

DTIC

Security

20070037833 Oregon State Univ., Corvallis, OR USA

Novel Power Conditioning Circuits for Piezoelectric Micro Power Generators

von Jouranne, Annette; Oct 31, 2003; 153 pp.; In English

Report No.(s): AD-A471486; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Advanced low power devices promote the development of micro power generators 'MPGs' to replace the batteries to power them. Due to the trend in decreasing integrated circuit 'IC' supply voltages, power supply designers are facing more and more serious challenges. The objective of this research is to design a power conditioning circuit 'PCC' for use in conjunction with low voltage microelectromechanical systems 'MEMS'-based Palouse Piezoelectric Power 'P3' micro heat engine power generation systems. The PCC enables maximum power extraction from a piezoelectric MPG. The proposed PCC includes a rectifier stage and a regulator stage. The rectifier stage is based on the synchronous rectification technique. The dc-dc regulator is a charge pump-based step-down converter. Interleaved discharge 'ID' is proposed to reduce the output voltage ripple significantly, without sacrificing the converter efficiency. The proposed step-down charge pump is analyzed with state-space averaging. In order to facilitate the PSpice simulation of the lead zirconate titanate 'PZT' membrane, a simplified PZT model was developed. Both the rectifier and the charge pump are simulated with PSpice. Simulations show that the interleaved discharge method takes full advantage of the step-down charge pump structure, and provides flexibilities to the

design of step-down charge pumps. The designed 200mW 5V/1.2V charge pump has an efficiency of 92.2%, with reduced output ripple. Proof-of-concept demonstration of the proposed PCC includes a 4-stage completely passive charge pump driving an analog wristwatch, proving proper operation of the entire P3 micro power system. A maximum output power of 18.8mW has been extracted from a single piezoelectric MPG, with 92% efficiency in the rectifier stage.

DTIC

Circuits; Electric Generators; Piezoelectricity; Power Conditioning

20070037855 Army War Coll., Carlisle Barracks, PA USA

Strategic Art and Energy: An Alternative Ends-Ways-Means View

Wissler, John B; May 9, 2007; 33 pp.; In English

Report No.(s): AD-A471525; No Copyright; Avail.: Defense Technical Information Center (DTIC)

With Hurricane Katrina, Americans tasted of a future defined by constrained energy supplies and a likely worldwide oil production peak sometime in the next 30 years. This paper will consider how energy should be viewed in a strategic context and takes the position that a truly strategic view must focus not only on energy supplies, but also on how and why the military uses that energy, particularly with regard to the systems it acquires. After briefly discussing the importance of energy to the USA and military operations, the paper then proposes an alternate Ends-Ways-Means approach that focuses on a three-pole construct comprised of effectiveness, efficiency, and energy. In this construct, one must take a systems perspective when it comes to analyzing and addressing military energy use. Because operational success is generally based on effectiveness, a balanced approach is needed in the quest to reduce energy consumption. This balance can be addressed in a variety of ways and this paper first develops a theoretical foundation, and then offers way of applying this theory, for example by lowering weight and applying the techniques of thermoconomics to military problems. The paper breaks up energy use into warfighting and non-warfighting domains and expresses that the Effectiveness-Efficiency-Energy balance will be different in each domain.

DTIC

Energy Consumption; System Effectiveness; Weapon Systems

20070037857 Army War Coll., Carlisle Barracks, PA USA

Energy Security: The Nexus of National Security Strategy and Energy Policy

McCaskill, John R; May 7, 2007; 27 pp.; In English

Report No.(s): AD-A471527; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Initiatives to ensure U.S. energy needs are met should be delineated within the framework of national security strategy. Energy, primarily in the form of petroleum, is the lifeblood of the economic engine that sustains western societies. The future of USA National Security is intertwined with that of a secure energy supply. Access to adequate energy supplies for all is necessary to build and sustain the favorable world order that is a cornerstone of USA National Security. There is no longer room in the current world and national economic reality to afford the partitioning of energy interests outside those of the USA National Security. Nor can the USA afford a lack of interagency cooperation in achieving these goals. From that perspective, policy recommendations are made to enhance USA National Security.

DTIC

Energy Policy; Petroleum Products; Policies; Security; Supplying

20070038605 North Carolina State Univ., Raleigh, NC USA

Analyzing, Evaluating, and Quantifying the Thermal Energy Contributions of the Passive Solar-Heating Elements Incorporated in the Design and Construction of the Plumlee Residence Located in Alamance County, NC

Terrell, Mark A; Aug 2004; 142 pp.; In English

Report No.(s): AD-A471885; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Currently, nationwide efforts are being made to help policymakers, construction professionals and consumers become more aware of the benefits of incorporating sustainable energy principles in residential building design and construction (Miller 1996). Any success in applying these principles is the result of effective communication by design professionals to builders and homeowners in understanding cost benefit tradeoffs for using sustainable energies in homes. The Gordon and Janice Plumlee Residence, located on 1742 Routh Road in Burlington, NC, is an example of how passive solar-heating design elements, along with simple conventional construction techniques, have created a comfortable, affordable, and low-energy consumption home. This report evaluates the passive solar and energy conservative elements incorporated in the Plumlee Home and quantifies the significance of each element energy contribution. A model of the thermal performance of the home is compared to the actual performance. The accuracy of the model is verified. The modeling software is used to perform a

sensitivity study of the thermal performance. An analysis of the construction methods and materials used is presented.
DTIC

Energy Conservation; Parasitic Elements (Antennas); Solar Heating; Thermal Energy

20070038657 Library of Congress, Washington, DC USA

Wave, Tidal, and In-Stream Energy Projects: Which Federal Agency Has the Lead?

Lane, Nic; Sep 12, 2007; 7 pp.; In English

Report No.(s): AD-A471999; CRS-RS22721; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Developments in wave, tidal, and in-stream energy generation technologies -- also referred to as hydrokinetic or marine energy -- are beginning to gain momentum. At the same time, their regulatory status is still evolving, as shown by recent changes in law aimed at clarifying the federal role in ocean wave and renewable energy. Two federal agencies currently appear to have a lead role in offshore renewable energy projects. The Department of the Interior's Minerals Management Service (MMS) indicates that the Energy Policy Act of 2005, 388, gave it authority as the lead agency for projects proposed on the Outer Continental Shelf (OCS). MMS is developing a regulatory framework and is not accepting applications for hydrokinetic (and other alternative energy) projects until its rulemaking process is complete. In advance of MMS final rulemaking, the Federal Energy Regulatory Commission (FERC) has issued preliminary permits and accepted license applications for hydrokinetic projects on the OCS and in the near-shore ocean environment. Also, FERC is developing its own licensing process specific to hydrokinetic projects. The issue of which agency has final regulatory authority over hydrokinetic projects that are partially or completely on the OCS is unresolved and may affect project development in this burgeoning industry.

DTIC

Continental Shelves; Electric Generators; Electric Power Plants; Hydroelectricity; Hydromechanics; Law (Jurisprudence); Tides; United States

20070038680 Army Research Lab., Aberdeen Proving Ground, MD USA

Multifunctional Structural Composite Batteries for U.S. Army Applications

Snyder, J F; Carter, R H; Xu, K; Wong, E I; Nguyen, P A; Hgo, E H; Wetzel, E D; Sep 2007; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472034; ARL-RP-193; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report is a reprint from the Proceedings of the 2006 Army Science Conference at Orlando, FL on 27 30 November 2006. We are developing structural polymeric composites with battery functionality. These devices both carry structural loads and store electrochemical energy. If designed with sufficient structural and energy efficiency, these materials could enable significant system-level weight reductions by replacing inert structural components while providing supplementary power for light load applications. To enable this concept, we have designed load-bearing properties directly into the battery electrodes and electrolyte such that each component is itself multifunctional. Carbon fiber fabric anodes, cathode-coated metal meshes, and solvent-free structural polymer electrolytes are each being developed to exhibit a desirable combination of mechanical strength and electrochemical performance. These components are being integrated using moldable, scalable, cost-effective composite processing techniques.

DTIC

Electric Batteries; Structural Design

20070038695 Army Research Lab., Aberdeen Proving Ground, MD USA

Integrating Structure with Power in Battery Materials

Snyder, James F; Carter, Robert H; Wetzel, Eric D; Sep 2007; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472053; ARL-RP-190; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report is a reprint from the Proceedings of the 2004 Army Science Conference at Orlando, Florida, in 2004. We have developed a multifunctional material concept that combines structural performance with power generation. Such devices would replace inert structural components in U.S. Army systems, such as a ground vehicle body or a soldier's helmet, and simultaneously provide supplementary power for light load applications. The emphasis of our research is two-fold. We are developing structural polymer electrolytes that exhibit desirable ion conductivity, and we are researching augmentation of overall mechanical properties in polymer based power generating devices.

DTIC

Electric Batteries; Systems Integration

20070038726 North American Energy Working Group, Washington, DC USA

North America - The Energy Picture II

Jan 2006; 95 pp.; In English

Report No.(s): AD-A472091; No Copyright; Avail.: Defense Technical Information Center (DTIC)

On March 23, 2005, Canadian Prime Minister Paul Martin, Mexican President Vicente Fox, and U.S. President George W. Bush announced the Security and Prosperity Partnership (SPP or the Partnership) in Waco, Texas. In order to achieve the SPP's broader commitment of ensuring security and enhancing development in North America, the SPP included six Security Working Groups and 10 Prosperity Working Groups, designed to promote greater cooperation and information sharing in various areas, including a prosperity working group focused on energy. In energy, it was agreed by all three countries that the cooperative efforts under the SPP would continue to occur under the ongoing North American Energy Working Group (NAEWG), with new initiatives to be added as part of the recently established Partnership.

DTIC

Images; North America; Supplying

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*.

20070037463 NASA Marshall Space Flight Center, Huntsville, AL, USA

Early Proterozoic (2.0 GA) Phosphorites from Pechenga Greenstone Belt and Their Origin

Rozanov, A. Yu.; Astafieva, M. M.; Melezhik, V. A.; Hoover, R. B.; Lepland, I.; August 26, 2007; 1 pp.; In English; SPIE Optics and Photonics 2007, 26-30 Aug. 2007, San Diego, CA, USA

Contract(s)/Grant(s): RFBR-05-04-48088; RFBR-03-05-64499; NSH-974.2003.5; Copyright; Avail.: Other Sources; Abstract Only

The period of 2500-2000 Ma is heralded by several other hallmark events, including onset and decline of the greatest positive excursion of Beta13Ccarb (Lomagundi-Jatuli Paradox), development of a significant seawater sulphate reservoir, abundant deposition of anomalously organic matter (OM)-rich sediments, the oldest known significant petroleum deposits (Shunga Event), and the appearance of first known marine phosphorites at 2000 Ma as reported here. They occur as numerous rounded, soft-deformed, clasts in fine-pebble intra-formational conglomerates, forming two separate c. 200 m-thick turbidite fans within the 1000 m-thick OM- and sulphide-rich turbiditic greywackes of the Pilgujaervi Formation in the Pechenga Greenstone Belt, NW Russia. Carbonate-fluorapatite is the main mineral in the phosphorite clasts. OM, framboidal and micronodular pyrite as well as inclusions of quartz and chlorite are additional components. Many clasts show microlayering with a variable degree of soft-deformation, implying that they were derived from non-lithified, bedded phosphorites. Numerous samples revealed diverse microbial microstructures interpreted as cyanobacterial mats consisting of filamentous (1-3 micrometer in diameter, 20 micrometers in length), coccoidal (0.8-1.0 micrometers) and ellipsoidal or rod-shaped microfossils (0.8 micrometers in diameter, around 2 micrometers in length) which morphologically resemble modern *Microcoleus* and *Syphonophycus*, *Thiocapsa*, and *Rhabdoderma*, respectively, reported from alkaline or saline environments. No principle differences have been found between microfossils described from Cambrian and Phanerozoic and the 2000 Ma phosphorites. The sequence of the early Palaeoproterozoic events which point to a significant oxidation of the hydrosphere, now including formation of phosphorites and change in the phosphorous cycle, mimics the sequence which was repeated once again at the Neoproterozoic-Cambrian transition, implying that oxidation of the terrestrial atmosphere-hydrosphere system experienced an irregular cyclic development.

Author

Carbonates; Organic Materials; Microorganisms; Minerals; Paleozoic Era

20070037535 Naval Research Lab., Washington, DC USA

NOGAPS-ALPHA Simulations of the 2002 Antarctic Stratospheric Major Warming

Allen, D R; Eckermann, S D; McCormack, J P; Coy, L; Manney, G L; Hogan, T F; Kim, Y -J; Dec 2005; 5 pp.; In English Report No.(s): AD-A471171; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471171>

A new high-altitude (~0-85 km) version of the Navy Operational Global Atmospheric Prediction System (NOGAPS) global spectral forecast model has been developed as a joint effort of NRL's Space Science, Remote Sensing, and Marine

Meteorology Divisions. This NOGAPS-Advanced Level Physics and High Altitude (NOGAPS-ALPHA) model is formulated with a higher top level than the operational NOGAPS model and with a new hybrid vertical coordinate that transitions from terrain-following in the lower atmosphere to constant pressure levels in the stratosphere. New physics packages were added to adequately simulate the higher altitudes. These include a new radiation scheme, new gravity wave drag parameterizations, and new prognostic ozone capability. In addition, a new initialization procedure was developed for the upper atmosphere, and capability for transporting multiple trace species was added. To assess the impact of these changes on model forecast skill, we examine NOGAPS-ALPHA hindcasts of the Southern Hemisphere (SH) during September to October 2002; this was an unusual period when the first ever Antarctic major stratospheric sudden warming was observed.

DTIC

Antarctic Regions; Atmospheric Models; Simulation; Stratospheric Warming

20070037900 Air Force Research Lab., Hanscom AFB, MA USA

Reply to the Comment by M. Lockwood et al. on the IDV Index: Its Derivation and Use in Inferring Long-Term Variations

Svalgaard, L; Cliver, E W; Sep 21, 2006; 9 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A471600; AFRL-VS-HA-TR-2007-1085; No Copyright; Avail.: Defense Technical Information Center (DTIC)

From an analysis of geomagnetic and solar wind data, Lockwood et al (1999) (hereinafter referred to as LSW99) reported that The solar coronal magnetic field had increased by more than a factor of two during the last century. If true, this would be an important discovery. Recently, Svalgaard and Cliver (2006) (hereinafter referred to as SCOS) reported an analysis based on our newly developed interdiurnal variability (IDV) index of geomagnetic activity which indicated that cycle averages of the solar field varied no more than -25% over the same time interval and are now decreasing. Here, we answer the criticisms of Lockwood et al (2006) (hereafter referred to as LRFSO6) to our paper. In sum, we find their objections without merit. If our prediction that the next solar cycle will be the smallest in 100 years (Svalgaard et al. 2005) bears out, this debate may be settled by direct solar wind measurements within the next few years. In the following sections, we respond to the various points raised by LRFSO6: percentage change, $B_{sub r}$ versus B , regression technique including the effect of missing data), and analysis procedures.

DTIC

Geomagnetism; Magnetic Fields

20070038599 Naval Research Lab., Washington, DC USA

Design of a Compact, Optically Guided, Pinched, Megawatt Class Free-Electron Laser

Sprangle, Phillip; Penano, Joseph; Hafizi, Bahman; Jun 8, 2007; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-67-8915-07

Report No.(s): AD-A471877; NRL/MR/6790--07-9043; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A conceptual design for a compact megawatt class FEL operating within atmospheric transmission windows is presented. The proposed FEL consists of an optically guided, pinched amplifier configuration driven by an RF linac. The gain length, efficiency, electron pulse slippage and the distance between the wiggler and first relay mirror are determined for a megawatt class design. Of particular concern in the design is the overall length of the optical system, i.e., wiggler length and distance to the first relay mirror. In the present design the wiggler length is -2 meters and the distance between the first relay mirror and the wiggler is determined by the average intensity damage threshold on the mirror. By focusing the electron beam, the optical beam can be pinched upon exiting the wiggler. The pinched optical beam has a reduced Rayleigh length which permits the first relay mirror to be relatively close to the wiggler. By pinching the optical beam and employing grazing incidence the first relay mirror can be located with -3 meters of the wiggler. It is shown that frequency detuning can more than double the FEL efficiency. In addition, electron pulse slippage is shown to be substantially reduced in a high-gain amplifier.

DTIC

Atmospheric Physics; Electron Beams; Free Electron Lasers

20070038601 Naval Research Lab., Washington, DC USA

Propagation of High Energy Laser Beams in Various Environments

Sprangle, Phillip; Penano, Joseph; Hafizi, Bahman; Jun 8, 2007; 61 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-67-8352-A7

Report No.(s): AD-A471880; NRL/MR/6790--07-9032; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report the results of our theoretical study on the key physical processes that affect the propagation of high energy lasers in the atmosphere. The main objective of this study is to discuss the optimum laser wavelength and power for efficient propagation in maritime, desert, rural and urban atmospheric environments. The theoretical/numerical model used in this study includes the effects of aerosol and molecular scattering, aerosol heating and vaporization, thermal blooming due to aerosol and molecular absorption, atmospheric turbulence, and beam quality. These processes are modeled in a fully three-dimensional and time-dependent manner. It is found that aerosol particles are particularly important because they result in laser scattering, absorption and enhanced thermal blooming. In the water vapor transmission windows, the total absorption coefficient driving thermal blooming can be caused mainly by aerosols and not water vapor. In certain maritime environments the deleterious effects of aerosols can be reduced by vaporization. Aerosol particles which cannot be vaporized, such as those consisting of dust, soot, etc., can significantly increase thermal blooming. The optimum wavelength and power for propagation are found for each atmospheric environment.

DTIC

Atmospheric Circulation; High Power Lasers; Laser Beams; Light Scattering; Thermal Blooming

20070038668 Air Force Research Lab., Kirkland AFB, NM USA

Refractivity Turbulence Observation Using a New Balloon-Ring Platform (Preprint)

Eaton, Frank D; Kelly, Patrick R; Kyrakis, Demos T; Stokes, Sheldon S; Mar 12, 2002; 9 pp.; In English

Contract(s)/Grant(s): DF297422; Proj-SMCO

Report No.(s): AD-A472019; AFRL-DE-PS-TP-2007-1008; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper presents new methodology to address critical refractivity turbulence issues for laser propagation using a new measurement system—a portable ‘balloon-ring’ platform with multiple fine wire sensors at several separations. All ‘raw’ data is transmitted to ground station—allowing spectra to be calculated. The new platform is discussed and preliminary examples of observations, including artifacts, are shown and discussed. This new platform provides capabilities during the daytime as well as nighttime—unlike conventional thermosondes that are used only at night. Such all time observations are important due to the pronounced diurnal variation in the planetary boundary layer where many laser systems are operated. Plans to address the longstanding concern of wake contamination on systems suspended below a balloon quantitatively will be presented. The objective of this effort is to develop the capability that can address several questions related to laser propagation such as: 1. Is the isotropic for the scales of interest? 2. Is the turbulence Kolmogorov under various atmospheric conditions or how often is the structure function represented by the $r^{2/3}$ law? 3. What are the profiles of inner and outer scale? 4. To what degree does wake contamination affect conventional thermosonde measurements? 5. Does fine structure within the scattering volume sensed by radar affect refractive index structure parameter and eddy dissipation rate estimates? These questions and concerns will be addressed by making the appropriate observations using the balloon-ring platform. Many of the measurements will be taken at Vandenberg AFB since the Western Test Range operates a ground receiving station, balloon launch facility. This effort provides an observation platform that will ultimately lead to the development and validation of conceptual/statistical/physical models.

DTIC

Atmospheric Circulation; Balloon-Borne Instruments; Refractivity; SODAR; Sound Waves; Turbulence; Wave Reflection

20070038696 Library of Congress, Washington, DC USA

Climate Change: Action by States to Address Greenhouse Gas Emissions

Ramseur, Jonathan L; Aug 29, 2007; 28 pp.; In English

Report No.(s): AD-A472055; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the absence of a federal climate change program, a number of states have taken actions that directly address greenhouse gases (GHGs). States efforts cover a wide range of policies. Although much of the early activity was largely symbolic, the more recent state actions have been more pragmatic. The states’ motivations may be as diverse as the actions themselves. Some states are motivated by projections of climatic changes, while others expect their policies to provide economic opportunities or other co-benefits, such as improvements in air quality, traffic congestion, and energy security. Another driver

behind state action is the possibility of catalyzing federal legislation. Three states California, Hawaii, and New Jersey have passed laws establishing mandatory, statewide GHG emission limits. However, the critical elements of these programs are still being developed. The Regional Greenhouse Gas Initiative (RGGI), a partnership of nine Northeast and Mid-Atlantic states, sets up a cap-and-trade system aimed at limiting carbon dioxide emissions from power plants. RGGI takes effect in 2009. Six western states (and two Canadian provinces) have formed the Western Climate Initiative, and are in the early stages of developing a regional GHG emission reduction program. California has addressed GHG emissions on several fronts. To complement its statewide emissions reduction regime, California established GHG performance standards that would effectively limit the use of coal-generated electricity in California (Washington passed similar legislation in 2007). In 2004, California issued regulations to reduce greenhouse gases from motor vehicles. At least 12 other states have indicated they intend to follow California's new vehicle requirements. In addition, the state has also taken action to reduce the carbon intensity in its transportation fuels.

DTIC

Air Quality; Carbon Dioxide; Climate; Exhaust Emission; Exhaust Gases; Greenhouse Effect

20070038697 Congressional Budget Office, Washington, DC USA

The Potential for Carbon Sequestration in the USA

Tawil, Natalie; Sep 2007; 32 pp.; In English

Report No.(s): AD-A472056; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Various analyses suggest that avoiding future climate-related damage by starting to reduce the atmospheric concentration of CO₂ would have greater benefits than costs. Options for doing that include not only curbing activities that generate emissions but also sequestering CO₂ for example, by encouraging its absorption from the atmosphere into vegetation and soil (biological sequestration) and by trapping CO₂ at power plants and industrial facilities before it is emitted and injecting it into underground storage sites (a process known as carbon dioxide capture and storage, or CCS). This paper looks at the methods, potential scale, and possible costs of both types of carbon sequestration. It also examines the particular role that sequestration could play in the context of the full range of possible actions to mitigate greenhouse-gas emissions.

DTIC

Absorption; Carbon; Carbon Dioxide; United States; Vegetation

20070038700 Library of Congress, Washington, DC USA

Greenhouse Gas Reductions: California Action and the Regional Greenhouse Gas Initiative

Ramseur, Jonathan L; Aug 31, 2007; 24 pp.; In English

Report No.(s): AD-A472060; CRS-RL33962; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the absence of a federal program requiring greenhouse gas (GHG) emission reductions, a growing group of U.S. states are taking action in this arena. Significant actions have been undertaken in California and by a coalition of states from the Northeast and Mid-Atlantic regions. California has undertaken several initiatives that seek to reduce GHG emissions. In 2004, the state issued regulations to reduce GHG emissions from motor vehicles. At least 14 other states have indicated that they plan to implement California's new vehicle requirements. In 2006, California passed two climate change statutes. The first establishes a statewide cap on GHG emissions. The second, once it becomes applicable, effectively limits the use of coal-generated electricity in California. The state has also taken action to reduce the carbon intensity in its transportation fuels. The Regional Greenhouse Gas Initiative (RGGI), a partnership of 10 Northeast and Mid-Atlantic states, sets up a cap-and-trade system aimed at limiting carbon dioxide emissions from power plants. The cap is scheduled to take effect in January 2009 and cap carbon dioxide emissions at 188 million short tons through the end of 2014. In 2015, the cap would begin to decrease, so that by 2018, emissions would be capped at 10% below the initial level. Because some observers see RGGI as a possible model for a federal cap-and-trade program, several of RGGI's design elements are generating interest and debate. Predicting the precise consequences of these state-led climate change actions is difficult. The actions may affect energy markets to some degree by encouraging the use of fewer carbon-intensive fuels. Many observers suggest that the range of state actions will catalyze federal activity. Industry stakeholders are especially concerned that the states will create a patchwork of climate change regulations across the nation. This prospect is causing some industry leaders to call for a federal climate change program.

DTIC

Carbon Dioxide; Exhaust Emission; Exhaust Gases; Greenhouse Effect; Regulations

20070039055 Hokkaido Univ., Sapporo, Japan

Geophysical Bulletin of Hokkaido University, No. 70

Koyama, Junji, Editor; Hayashi, Yoshiyuki, Editor; Heiki, Kosuke, Editor; Ikeda, Ryuji, Editor; Kasahara, Minoru, Editor; Minobe, Shoshiro, Editor; Mogi, Toru, Editor; Okada, Hiromu, Editor; Watanabe, Shigeto, Editor; Yomogida, Kiyoshi, Editor; March 2007; ISSN 0439-3503; 183 pp.; In Japanese; See also 20070039056 - 20070039068; Original contains color illustrations; Copyright; Avail.: Other Sources

The contents include: 1) Geothermal Structure of the Crust and the Upper Mantle in Hokkaido, Japan: A Review; 2) Ion Upflow Observed in the Polar Ionosphere; 3) Gravity Survey in and Around the Focal Area of 2004 Rumoi-nanbu Earthquake, Northern Hokkaido, Northern Japan; 4) Self-potential Survey on Usu Volcano, 2006 Campaign; 5) Reconsideration of Volcanic Block Kinematics (1) - Equation of Motion for Ejected Volcanic Blocks; 6) Reconsideration of Volcanic Block Kinematics (2) - Air Resistance to Volcanic Blocks and Inclination Effect of Explosion Principal Axis; 7) Development of a Radial Diffusion Model for Earth's Radiation Belts; 8) Mathematical Simulation of Magma-hydrothermal System in Iwodake Volcano; 9) Micro-earthquake Activity at Usu Volcano Revealed by Temporary Dense Observation; 10) Geomagnetic Changes due to Doming - The 2000 Eruption of Usu Volcano; 11) Long-term Prediction of Usu Volcano 2000 Eruptive Activity Based on the Measurements of Heat Discharge Rate; 12) Deep Magma Chamber Inferred from the Leveling Survey Near and Around Mt. Hokkaido-Komagatake; and 13) Analysis of the eruption columns formed by the 1977 eruption of Mt.Usu

CASI

Geophysics; Seismology; Volcanology; Earth Surface

20070039056 Hokkaido Univ., Sapporo, Japan

Self-potential Survey on Usu Volcano, 2006 Campaign

Hase, Hideaki; Hashimoto, Takeshi; Nishida, Yasunori; Utsugi, Mitsuru; Inoue, Hiroyuki; Saba, Mizue; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 43-52; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

We conducted self-potential (SP) surveys on Usu volcano since July to December 2006. The compiled SP map reveals positive anomalies around Ko-Usu lava dome and at the foot of the volcano, and a negative anomaly on the top of O-Usu lava dome. The SP profile on the summit caldera shows the same pattern of 1985's. However, the peak-to-peak variation of the SP value is different: the 1985's of that shows 1000 mV while the 2006's shows 1400 mV. Topographic effect is clearly shown along the southwestern foot of the volcano, in which coefficient is about -2.5 mV/m. The SP profile corrected of the topographic effect reveals a large and extensive positive anomaly over +600mV and several local positive anomalies over +1000 mV on the summit caldera. The corrected SP also reveals that a positive anomaly at the south part of KO-Usu lava dome and a negative anomaly at the O-Usu lava dome do not exist. The revealed positive SP anomalies are likely to be affected by an extensive altered layer, located beneath the summit caldera. The largest positive anomaly is shown on the ridge of Usu-Shinzan cryptodome after topographic correction. This anomaly is not regarded to be formed by hydrothermal upwelling, because any indications of fumarolic and geothermal activities have not been observed on the ridge of the volcano. The SP anomaly may be affected by intruded material into the volcano. The SP amplitude in the northwestern part of Nishiyama is very small in spite of rugged topography. An extensive low resistivity layer (< 10 ohm x m) located in the shallow part in the northwestern of Nishiyama probably shields the SP variation.

Author

Volcanoes; Topography; Calderas; Upwelling Water; Geopotential; Geothermal Anomalies; Hydrothermal Systems

20070039057 Hokkaido Univ., Sapporo, Japan

Ion Upflow Observed in the Polar Ionosphere

Sato, Soga; Liu, Huixin; Watanabe, Shigeto; Ogawa, Yasunobu; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 13-25; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

Ion upflow has been investigated by use of ESR (EISCAT Svalbard Radar), SuperDARN, ACE satellite and CHAMP satellite. The field-aligned ion upflows were observed by ESR, which occurred in night-time between 16 and 17, April 2002, and 19 June 2004. However, ESR didn't show remarkable increase of electron density, electron temperature and ion temperature, which are generated by auroral particle precipitation or frictional heating. The Solar wind parameters were obtained by ACE satellite. SuperDARN showed variation of convection electric field depending on By component of Interplanetary Magnetic Field. CHAMP satellite observed also variations of neutral density, neutral wind, ion density and electron temperature along the satellite orbits. At the time, ESR was in the polar cap region. Our analyses may suggest that

the ion upflow observed by ESR was generated in the upwind region of plasma convection in the high-latitude ionosphere and was moving to ESR station by the convection.

Author

Convection; Solar Wind; Ion Distribution; Interplanetary Magnetic Fields; Polar Regions; Earth Ionosphere

20070039058 Hokkaido Univ., Sapporo, Japan

Gravity Survey in and Around the Focal Area of 2004 Rumoi-nanbu Earthquake, Northern Hokkaido, Northern Japan

Honda, Ryo; Kamiyama, Hiroyuki; Yamaguchi, Teruhiro; Ichihara, Hiroshi; Mogi, Toru; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 27-41; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

An earthquake (MJMA 6.1), occurred in December 14, 2004, at southern area of Rumoi sub-prefecture, northern Hokkaido, Japan. The earthquake intensity was assumed to 6 in Obira town. In Hokkaido, this is the first inland earthquake larger than M6 since Teshikaga earthquake (MJMA 6.5, 1967). Detailed aftershock distribution shows that the aftershocks occur on an eastward dipping plane of 10 km square, depth of which 5 km. The mainshock assumed to have occurred near the southern end of this plane. Despite the sparseness of existing gravity stations over the focal region, it was found that the aftershocks occur just above the gravitational rise of about 20 mGals. So the gravity survey was operated in Nov. 2005 to Aug. 2006, to make a detailed Bouguer anomaly map and to explicate the subsurface structure of the focal region. The measurement was done with CG-3 type gravimeter. Measurement positions were carefully decided by operating differential GPS observation. The accuracy of altitude decision is within 1 meter in all of the measurement points. Besides, data provided by Japan Petroleum Exploration Co. Ltd. was very helpful. The appropriate assumed density was detected to 2300 kg/m³, using density log of deep borehole near the focal region, and the correlations of gravity correction terms. The Bouguer anomaly map by current dataset also shows good coincidence with aftershock distribution.

Author

Earthquakes; Gravitation; Anomalies; Seismic Waves

20070039059 Hokkaido Univ., Sapporo, Japan

Geothermal Structure of the Crust and the Upper Mantle in Hokkaido, Japan: A Review

Nishida, Yasunori; Hashimoto, Takeshi; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 1-12; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

Many researchers have studied the thermal state of the crust and the upper mantle and its tectonic implications in Hokkaido, Japan. Terrestrial heat flow data have revealed the following characteristic features: (1) High heat flow (84 to approximately 125 mW/m²) is observed in the backarc side of the volcanic front, while low heat flow (less than 42 mW/m²) is observed in the forearc side, showing the typical thermal aspects of the island arc. (2) The central axis zone of Hokkaido (the Kamuikotan and Hidaka metamorphic belts) shows relatively low heat flow (42 to approximately 80 mW/m²). The low heat flow zone extends for Sakhalin. (3) Extremely low (25 to approximately 34 mW/m²) and high (125 to approximately 210 mW/m²) heat flow is distributed locally on the Ishikari-Tomakomai low land and its neighbor on the west, respectively. Based on the heat flow data and other geophysical data, such as the seismic velocity structure, aeromagnetic data, and so on, the Curie point depth, the solidus temperature depth, temperature at the Moho, and the mantle heat flow have been estimated. The estimated thermal structure implies the temperature of the lower crust comes to the solidus temperature beneath the backarc side of Hokkaido. The result is well supported by the electrical resistivity soundings: the low resistive layer (10 to approximately 40 ohm x m) develops in the lower crust and is ascribed to the effect of partial melting of the crustal rocks.

Author

Electrical Resistivity; Heat Transmission; Metamorphism (Geology); Solidus; Temperature Distribution; Volcanoes; Earth Crust

20070039060 National Inst. of Advanced Industrial Science and Technology, Japan

Mathematical Simulation of Magma-hydrothermal System in Iwodake Volcano

Matsushima, Nobuo; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 95-105; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

The thermal activity of Iwodake volcano is characterized by the predominant volcanic gas ejection at the summit crater and the heat discharge from high ground temperature area which is distributed widely from the summit crater to hillside of the mountain. The volcanic gas at the summit crater is of magmatic origin and its temperature is observed to be 880 C in maximum. The total amount of the volcanic gas discharged from the summit area is estimated to be 150kg/sec from the SO₂

measurement and the chemical composition of the volcanic gas. The heat discharge rate from the high ground temperature area at the hillside, which is distributed around the fumaroles is estimated to be 50MW from the surface temperature measurement. These thermal activities of Iwodake volcano are thought to be continued for more than 800 years. A plausible model to explain the long degassing of large amount of volcanic gas is magma circulation in a conduit which extended from the deep-seated magma reservoir. The continuous active degassing probably causes the hydrothermal system within the volcano because the volcanic gas ascending the conduit from the top of the magma to the surface is diffused to the surrounding formation. The development of such hydrothermal system is studied using the mathematical simulation. The result shows that the overall thermal activity of Iwodake volcano such as the volcanic gas ejection at the summit crater, widely distributed ground temperature anomaly at hillside and hot springs along the coast can be caused by the degassing activity. The important factors in order to induce the wide-ranging hydrothermal system are permeability of the volcanic edifice and the depth of the degassing. The simulations indicate that the permeability of $10(\text{exp } -13)\text{sq m}$ and the degassing at sea level are suitable conditions for the Iwodake thermal activity.

Author

Degassing; Hydrothermal Systems; Simulation; Volcanoes

20070039061 Hokkaido Tokai Univ., Tokyo, Japan

Micro-earthquake Activity at Usu Volcano Revealed by Temporary Dense Observation

Aoyama, Hiroshi; Onizawa, Shin'ya; Tameguri, Takeshi; Suzuki, Atsuo; Maekawa, Tokumitsu; Oshima, Hiromitsu; Mori, Hitoshi; Hashimoto, Takeshi; Shiga, Toru; Koyama, Hiroshi; Nakahashi, Masaki; Yoshikawa, Akifumi; Fukuyama, Yoshirou; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 107-121; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

We performed temporary dense observation at Usu volcano in summer 2006, aiming to reveal micro-earthquake activity under the summit crater during dormant period of the volcanic activity. During about 80 days of temporary observation, more than 330 volcanic earthquakes were observed. Of these earthquakes, well-recorded 142 events are selected for relocation analysis assuming the 3D-velocity structure model which is a result of the explosion seismic experiment at Usu volcano in 2001. Following the result of relocation, we estimated focal mechanism of 7 earthquakes whose magnitudes are more than 1.0. The temporal observation and analyses gave us three new insights about seismic activity; 1) Continuous activity of volcanic earthquake is seen at the shallow part under the southern crater floor; 2) Hypocentral regions are distributed along the SW end of the U-shaped fault which was built in the 1977-1982 eruption associated with the uplift of Usu-Shinzan crypt dome, 3) Strike direction of the 7 major earthquakes are almost parallel to the U-shaped fault, and dominant mechanism is dip-slip type which suggests subsidence of summit domes relative to the southern crater floor.

Author

Volcanoes; Earthquakes; Craters; Seismic Waves; Mapping

20070039062 Tohoku Univ., Japan

Long-term Prediction of Usu Volcano 2000 Eruptive Activity Based on the Measurements of Heat Discharge Rate

Goto, Akio; Kagiya, Tsuneomi; Miyamoto, Tsuyoshi; Yokoo, Akihiko; Taniguchi, Hiromitsu; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 137-144; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

The energy source of volcanic activity is the heat of magma. Heat discharge rate on the initial stage of Usu 2000 eruptive activity was estimated to be around 1×10^9 J/sec, that was over one order higher than that on the initial stage of the 1977 activity, and comparable to its peak release rate observed after two years from the beginning of the eruptive activity. Compared to the 1977 activity, much shorter duration of the 2000 activity may be the result of rapid cooling of the intruded magma. Abundant ground water supplied from Lake Toya might remove the heat effectively through active vapor plume rise.

Author

Magma; Plumes; Volcanoes; Heat; Cooling; Volcanic Eruptions

20070039063 Hokkaido Univ., Sapporo, Japan

Deep Magma Chamber Inferred from the Leveling Survey Near and Around Mt. Hokkaido-Komagatake

Mori, Hitoshi Y.; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 145-152; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

Mt. Hokkaido-Komagatake is located at the southwestern part of Hokkaido and one of the most active volcanoes in Japan. The volcano had made one of the largest eruptions in the 20th century in Japan. But the usual seismic activity of the volcano

is extremely low, and only few earthquakes observed before the each small phreatic eruption in 1996, 1998 and 2000. Wide area and long range geodetic measurements, therefore, are important to infer the long term activity of the volcano. The first order leveling survey, which is administered by Geographical Survey Institute Japan, is the only one geodetic method having the good accuracy and the long term data enough to investigate the long term volcanic activity. In Hokkaido, the distribution of the first order leveling routes is sparse compared with that in the other part of Japan. Mt. Hokkaido-Komagatake and Mt. Usu are the only two volcanoes, which were passed by the first order leveling routes at the foot of them, and the leveling routes extended in more than two directions. The trend of regional deformation is found in the leveling results, and that is corrected. After this correction, the area of volcanic deformation is extended to about 50km far from the center of the deformation. The location of the wide area deformation center estimated by the isotropic pressure source (Mogi's model) is situated at the southwestern foot of Mt. Hokkaido-Komagatake. Its horizontal distance from the central crater of the volcano is about 7km and its depth ranges from 15 to 24km. The rate of magma accumulation is supposed 1.4 to approximately $2.6 \times 10^{(exp 6)m(exp 3)/year}$.

Author

Craters; Deformation; Leveling; Volcanoes; Seismic Waves

20070039064 Polytechnical Univ., Japan

Reconsideration of Volcanic Block Kinematics (1) - Equation of Motion for Ejected Volcanic Blocks

Suzuki, Takeo; Niida, Kiyooki; Nishida, Yasunori; Oshima, Hiromitsu; Murofushi, Makoto; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 53-65; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

Many authors have discussed the eruption time sequence and the mechanism of volcanic eruptions by estimating the ejected velocity of the volcanic blocks, with the aid of other factors of eruptive phenomena. Equations of motion for the volcanic blocks have been proposed by considering the factors, such as the air resistance, the influence of the wind, the inclination of the explosion principal axis and so on. However, the equation of motion and its solution has not been considered that the air resistance power was vector quantity for the flight of volcanic blocks. In this paper a new equation of motion for the ejected volcanic blocks is proposed by considering the air resistance power as vector quantity.

Author

Equations of Motion; Volcanoes; Wind Effects; Volcanic Eruptions; Ejecta; Air Currents

20070039065 Hokkaido Univ., Sapporo, Japan

Geomagnetic Changes Due to Doming - The 2000 Eruption of Usu Volcano

Hashimoto, Takeshi; Mogi, Tohru; Nishida, Yasunori; Takada, Masamitsu; Suzuki, Atsuo; Maekawa, Tokumitsu; Satoh, Hideyuki; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 123-135; In English; See also [20070039055](#); Copyright; Avail.: Other Sources

We investigated geomagnetic changes due to dome-like deformation by using a truncated circular cone model. In the case of the normal magnetization, magnetic total field decreases in the northern side of the uplift center; while it increases in the southern side. We found that the original topography prior to the mound formation does not affect the pattern of this magnetic change. We then apply this calculation to the mound-forming activity in the 2000 eruption of Usu Volcano to infer the magnetic change on the foot of the mound. The expected range of magnetic total field change at the station U01 is -80 to -800 nT which is in the opposite sense to the observed actual change (+70 nT). We examined some alternative mechanisms to compensate this decrease due to the deformation. None of them, however, can be a promising candidate. The most reasonable explanation so far for this contradiction is the reversed magnetization of the Tertiary lava that may comprise the mound.

Author

Circular Cones; Geomagnetism; Topography; Volcanic Eruptions; Domes (Geology)

20070039066 Hokkaido Univ., Sapporo, Japan

Development of a Radial Diffusion Model for Earth's Radiation Belts

Komatsu, Kengo; Watanabe, Shigeto; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 85-93; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

The radiation belts are the region that energetic charged particles are trapped by Earth's magnetic field. It is well known that the energetic particles flux are varied during geomagnetic disturbances. Many researchers have studied about the flux variation of radiation belt, but the mechanism of the variation has not been understood in detail. A radial diffusion model can reproduce a basic structure of the radiation belts. Radiation belt particles are supplied from the outer boundary of the radiation belt, and the flux is arranged by the balance of intensity of the diffusion and the loss due to pitch-angle scattering. An intensity

and a distribution of the electrostatic field and the whistler waves which determine the magnitude of the diffusion and the loss of radiation belt particles are uncertain. Cornwall (1968) derived the radial diffusion coefficient due to substorm convection electrostatic field. Brautigam and Albert (2000) derived the root mean square of electrostatic field which is a linear function of Kp index from observations. Lyons et al. (1972) calculated the pitch-angle diffusion within the plasmasphere and the lifetime of the particles. Solving the radial diffusion equations using these functions, the slot region is not formed and the flux near the Earth region is too large. Diffusion coefficient is reduced by 1/100 at L is less than Lpp, the slot is formed and too much flux injection from outer belt is suppressed. The change of radial diffusion coefficient at the plasmapause location may affect the structure of radiation belts.

Author

Diffusion Coefficient; Geomagnetism; Magnetic Disturbances; Radiation Belts; Models; Particle Diffusion; Charged Particles

20070039067 Hokkaido Univ., Sapporo, Japan

Analysis of the Eruption Columns Formed by the 1977 Eruption of Mt.Usu

Ono, Shinobu; Oshima, Hiromitsu; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 153-161; In Italian; See also [20070039055](#); Copyright; Avail.: Other Sources

The 1977 eruption of Mt.Usu generated four high-altitude eruption columns which produce BIG I ,BIG II, BIGIII and BIGIV tephra-fall deposits respectively. Expressing the initial eruption velocity in terms of the solid mass eruption rate, the initial temperature, the initial radius and the initial gas fraction from the conservation of solid particles, we apply a steady plume model to the four eruption columns. The initial velocity increases with initial gas mass fraction and initial temperature for the solid mass eruption rate estimated from the volume of deposits, the apparent density of tephra and the eruption duration. For three eruption columns depositing BIG I, BIGII and BIGIII, the initial temperature and initial gas mass fraction are estimated at 600K and greater than 0.11. The eruption column depositing BIGIV is formed at 800K and greater than 0.15. The estimated initial temperatures are low and initial gas mass fractions are high in comparison with general physical properties of dacitic magma. These inadequate values suggest that the growth of eruption columns take the influence of pyroclasts fallout from the column and thermal disequilibrium between pyroclasts and gases.

Author

Volcanic Eruptions; Magma; Plumes

20070039068 Polytechnical Univ., Japan

Reconsideration of Volcanic Block Kinematics (2) - Air Resistance to Volcanic Blocks and Inclination Effect of Explosion Principal Axis

Suzuki, Takeo; Niida, Kiyooki; Nishida, Yasunori; Oshima, Hiromitsu; Murofushi, Makoto; Geophysical Bulletin of Hokkaido University, No. 70; March 2007, pp. 67-83; In Japanese; See also [20070039055](#); Copyright; Avail.: Other Sources

The present authors pointed out, in the last paper; a mistake in the equation of motion for volcanic blocks. Reliable assumption of the air resistance to the blocks is required for accurate estimation of initial velocity of volcanic blocks. However, little attention has been given to the point. This paper organizes the problems about the estimation of the air resistance and proposes a new method of the estimation. Also this paper organizes the effect of factors on the distribution of volcanic blocks. Model calculations revealed the effect of the atmospheric air density cannot be ignored. For the effect of explosion principal axis on the distribution of volcanic blocks, this paper proposes an extended equation which volcanic blocks eject to all the directions around the crater.

Author

Aerodynamic Drag; Atmospheric Density; Equations of Motion; Volcanoes; Volcanic Eruptions

20070039069 NASA Marshall Space Flight Center, Huntsville, AL, USA

Image RPI Reawakens Plasmaspheric Refilling Research

Gallagher, D. L.; Smith, Z. B.; September 16, 2007; 43 pp.; In English; Workshop on the Plasmasphere: The Earth's Plasmasphere; a Cluster, IMAGE and Modelling Perspective, 19-21 Sep. 2007, Brussels, Belgium; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070039069>

The plasmasphere is a toroidal region of cold plasma surrounding the Earth that results from ionospheric outflow and accumulation. The physics of refilling and the dynamics of this region have been studied for nearly 50-years. During that time many models have been proposed, but little has been done to test these models due to a lack of observational information. With the launch of the IMAGE Mission in March 2000 the Radio Plasma Imager has provided true field aligned density

measurements that uniquely enable the testing of these models and a final determination of the physical processes important for the plasmasphere's recovery from storm-time conditions.

Author

Plasmasphere; Toroidal Plasmas; Earth Ionosphere; Refilling; Hydrodynamics

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20070037459 NASA Marshall Space Flight Center, Huntsville, AL, USA

Electric Field and Lightning Observations in the Core of Category 5 Hurricane Emily

Blakeslee, Richard; Mach, Doug M.; Bateman, Monte G.; Bailey, Jeff C.; August 13, 2007; 1 pp.; In English; International Conferences on Atmospheric Electricity (ICAE)/International Commission on Atmospheric Electricity, 13-17 Aug. 2007, Beijing, China; Copyright; Avail.: Other Sources; Abstract Only

Significant electric fields and lightning activity associated with Hurricane Emily were observed from a NASA high-altitude ER-2 aircraft on July 17, 2005 while this storm developed as a compact but intense category 5 hurricane in the Caribbean south of Cuba. The electrical measurements were acquired as part of the NASA sponsored Tropical Cloud Systems and Processes (TCSP) experiment. In addition to the electrical measurements, the aircraft's remote sensing instrument complement also included active radars, passive microwave, visible and infrared radiometers, and a temperature sounder providing details on the dynamical, microphysical, and environmental structure, characteristics and development of this intense storm. Cloud-to-ground lightning location data from Vaisala's long range lightning detection network were also acquired and displayed in real-time along with electric fields measured at the aircraft. These data and associated display also supported aircraft guidance and vectoring during the mission. During the observing period, flash rates in excess of 3 to 5 flashes per minute, as well as large electric field and field change values were observed as the storm appeared to undergo periods of intensification, especially in the northwest quadrant in the core eyewall regions. This is in contrast to most hurricanes that tend to be characterized by weak electrification and little or no lightning activity except in the outer rain bands. It should be noted that this storm also had significant lightning associated with its rain bands.

Author

Hurricanes; Lightning; Remote Sensing; Electric Fields; Cloud Physics

20070037460 NASA Marshall Space Flight Center, Huntsville, AL, USA

Electric Field Profiles over Hurricanes, Tropical Cyclones, and Thunderstorms with an Instrumented ER-2 Aircraft

Mach, Doug M.; Blakeslee, Richard J.; Bateman, Monte G.; Bailey, Jeff C.; August 13, 2007; 1 pp.; In English; International Conferences on Atmospheric Electricity (ICAE)/International Commission on Atmospheric Electricity, 13-17 Aug. 2007, Beijing, China; Copyright; Avail.: Other Sources; Abstract Only

Over the past several years, we have flown a set of calibrated electric field meters (FMs) on the NASA high altitude ER-2 aircraft over oceanic and landbased storms in a number of locations. These included tropical oceanic cyclones and hurricanes in the Caribbean and Atlantic ocean during the Third and Fourth Convection And Moisture EXperiment (CAMEX-3,1998; CAMEX-4, 2001), thunderstorms in Florida during the TEXas FLorida UNderflight (TEFLUN, 1998) experiment, tropical thunderstorms in Brazil during the Tropical Rainfall Measuring Mission - Large Scale Biosphere-Atmosphere Experiment in Amazonia (TRMM LBA, 1999), and finally, hurricanes and tropical cyclones in the Caribbean and Western Pacific and thunderstorms in Central America during the Tropical Cloud Systems and Processes (TCSP, 2005) mission. Between these various missions we have well over 50 sorties that provide a unique insights on the different electrical environment, evolution and activity occurring in and around these various types of storms. In general, the electric fields over the tropical oceanic storms and hurricanes were less than a few kilovolts per meter at the ER-2 altitude, while the lightning rates were low. Land-based thunderstorms often produced high lightning activity and correspondingly higher electric fields.

Author

U-2 Aircraft; Tropical Storms; Storms (Meteorology); Lightning; Electric Fields; Cloud Physics

20070037461 NASA Marshall Space Flight Center, Huntsville, AL, USA

High-Resolution WRF Forecasts of Lightning Threat

Goodman, S. J.; McCaul, E. W., Jr.; LaCasse, K.; August 13, 2007; 1 pp.; In English; International Conferences on

Atmospheric Electricity (ICAE)/International Commission on Atmospheric Electricity, 13-17 Aug. 2007, Beijing, China; Copyright; Avail.: Other Sources; Abstract Only

Tropical Rainfall Measuring Mission (TRMM) lightning and precipitation observations have confirmed the existence of a robust relationship between lightning flash rates and the amount of large precipitating ice hydrometeors in storms. This relationship is exploited, in conjunction with the capabilities of the Weather Research and Forecast (WRF) model, to forecast the threat of lightning from convective storms using the output fields from the model forecasts. The simulated vertical flux of graupel at -15C is used in this study as a proxy for charge separation processes and their associated lightning risk. Initial experiments using 6-h simulations are conducted for a number of case studies for which three-dimensional lightning validation data from the North Alabama Lightning Mapping Array are available. The WRF has been initialized on a 2 km grid using Eta boundary conditions, Doppler radar radial velocity and reflectivity fields, and METAR and ACARS data. An array of subjective and objective statistical metrics is employed to document the utility of the WRF forecasts. The simulation results are also compared to other more traditional means of forecasting convective storms, such as those based on inspection of the convective available potential energy field.

Author

Forecasting; Lightning; Hydrometeors; Atmospheric Models

20070037477 Naval Postgraduate School, Monterey, CA USA

A Satellite Based Fog Study of the Korean Peninsula

McDonald, David K; Jun 2007; 137 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471074>

Fog has always been a difficult phenomenon to forecast. Its unpredictable nature and propensity to quickly decrease visibilities have had adverse effects on military operations for many years across the Korean peninsula. It is particularly difficult to prepare forecasts or plan operations for remote locations with limited fog detection ability. For detection at night, over large areas, and in remote locations, satellite observations are the best solution. This thesis used NASA MODIS satellite imagery to create an abbreviated climatology data set for remote areas across the Korean peninsula. Imagery from the Terra and Aqua near-polar orbiting satellites was used, providing four images per day: one daytime and one nighttime pass for each satellite. Two decision trees were developed to use as guidelines for fog detection by daytime and nighttime satellite images. It was not always possible to unambiguously determine if fog was in each scene, so various categories were created to supplement a fog or no fog decision. The four mid-season months (October 2005, January 2006, April 2006, and July 2006), were analyzed to create a climatology database. The results are tabulated using different variables to make useful comparisons, like day-versus-night or Terra-versus-Aqua. The new totals are compared visually with bar charts and statistically to identify trends that might give insight to planners and forecasters. Seasonal and nocturnal patterns are very evident while differences between the results from two satellites are less obvious. Future work is needed to expand the climatology and increase the statistical results from this study.

DTIC

Artificial Satellites; Fog; Korea; Peninsulas; Satellite Imagery

20070037805 Naval Research Lab., Bay Saint Louis, MS USA

Modeling the Northern Adriatic Double-Gyre Response to Intense Bora Wind: A Revisit

Kuzmic, Milivoj; Janekovic, Ivica; Book, Jeffrey W; Martin, Paul J; Doyle, James D; Dec 27, 2006; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471433; NRL/JA/7330-05-5312; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A combination of recent intensive observations and simulations with two numerical models is used to revisit the issue of the northern Adriatic response to strong bora episodes. New observed and simulated data reinforce the view that an episode of a strong bora wind provokes a double-gyre (cyclonic, Trieste, and anticyclonic, Rovinj) response north of the Po Delta-Pula line. During an intense bora episode, both measured and modeled statistics picture a downwind, highly polarized, and almost depth-independent flow within the Trieste gyre NW arm. Its NE arm maintains a sharp polarization and strong depth dependence while exhibiting lower speeds, with models in good accord with observations. The current statistics for Rovinj gyre provide lower maximum and average speed values and less polarized but still rather depth-independent flow, while exhibiting clockwise rotation. The north arm of the Senj gyre (positioned south of the Po Delta-Pula line) enjoys more lateral freedom, and exhibits less rectilinear flow. Our review reinforces the notion that modeling studies based on ECMWF wind forcing fail to properly take into account the orographic control of the Dinaric Alps, and to produce correct bora-induced gyral pattern. The OAMPSR model successfully simulated the onset, duration, and decay of the wind peaks, but exhibited a

tendency to over predict the strength of the bora wind. Our simulations have identified the shallow NW coastal strip as an important source of colder water observed in a sequence of remotely sensed SST fields derived from AVHRR data.

DTIC

Adriatic Sea; Gyres; Mathematical Models; Wind (Meteorology)

20070037991 Meteorological Satellite Center, Kiyose, Japan

Monthly Report of the Meteorological Satellite Center: August 2007

August 2007; In English; Copyright; Avail.: Other Sources

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

Derived from text

Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20070038186 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Issues Regarding the Assimilation of Cloud and Precipitation Data

Errico, Ronald M.; Bauer, Peter; Mahfouf, Jean-Francois; [2007]; 28 pp.; In English

Contract(s)/Grant(s): MAP/04-0000-0080; N00014-0310554; NSF ATM-03-51938; Copyright; Avail.: Other Sources

The assimilation of observations indicative of quantitative cloud and precipitation characteristics is desirable for improving weather forecasts. For many fundamental reasons, it is a more difficult problem than the assimilation of conventional or clear-sky satellite radiance data. These reasons concern nonlinearity of the required observation operator (forward model), non-normality and large variances of representativeness, retrieval, or observation-operator errors, validation using new measures, dynamic and thermodynamic balances, possible limited predictability, etc. Some operational weather prediction systems already assimilate precipitation observations, but much more research and development remains. The apparently critical, fundamental, and peculiar nature of many issues regarding cloud and precipitation assimilation implies that their more careful examination will be required for accelerating progress.

Author

Weather Forecasting; Data Processing; Clouds (Meteorology); Precipitation (Meteorology); Errors

20070038191 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Frequency Distribution of Daily ITCZ Patterns over the Western/Central Pacific

Chen, Baode; Lin, Xin; Bacmeister, Julio; [2007]; 45 pp.; In English; Original contains color illustrations; Copyright;

Avail.: Other Sources

This study attempts to explore a comprehensive and compact approach to delineate the multi-scale and multi-variate characteristics of the ITCZ over the western-central Pacific based on daily satellite observations on precipitation, SSTs, and surface winds. Essentially, six distinct ITCZ spatial patterns, namely, the North ITCZ, the South ITCZ, the Equator ITCZ, the Double ITCZ, the Full ITCZ, and the Weak ITCZ, are identified according to the daily percentage coverage of deep convection within different latitudinal bands on and off the equator over the western-central Pacific. The evolving structure of the ITCZ over the western-central Pacific is investigated with focuses on the transient statistical characteristics. The relationship between these daily ITCZ patterns and SSTs, as well as near-surface winds, is also examined. The North ITCZ (37%), the South ITCZ (24%), and the Weak ITCZ (24%) represent three major ITCZ daily patterns over the western-central Pacific and they combined account to almost 85% of the total number of days within a 10-year period. The other three ITCZ patterns, namely, the Equator ITCZ (3%), the Double ITCZ (6%), and the Full ITCZ (5%), only occur infrequently. The climatology of the ITCZ, such as monthly, seasonal and annual means, can be approximately determined by how often and how intense these ITCZ daily spatial patterns occur within a specified period. Taking the long-term mean statistics for each ITCZ daily type into account, the double ITCZ deep convection typically observed over the western-central Pacific in monthly, seasonal, and annual mean plots appears to be mainly associated with the frequent occurrence of the North ITCZ and the South ITCZ patterns, instead of the Double ITCZ pattern in which an ITCZ appears on each side of the equator simultaneously on a daily basis. Consistent with the strong seasonality in their frequency of occurrence, the three 2 major ITCZ patterns indicate a

dominant correspondence with the seasonal meridional migration of warm SSTs. In contrast, the three less frequent ITCZ patterns show a close relationship with the positive or negative SST anomaly over the equatorial central and eastern Pacific, namely, the extension and retraction of the equatorial cool tongue and its strength. Surface wind divergence/convergence does not show any distinct patterns for these ITCZ spatial patterns, suggesting that little relationship between low-level convergence and precipitation can be discerned from daily data. As an application of the method proposed, the frequency distribution of daily ITCZ patterns as derived from a recent version of the National Aeronautics and Space Administration (NASA) Goddard Earth Observing System (GEOS) general circulation model (GCM) is evaluated against observations. Preliminary comparisons indicate that the GEOS-5 GCM is capable of simulating the correct ITCZ spatial patterns, but their occurrence frequencies can be further improved, in particular, the Weak ITCZ and the patterns with fewer occurrence, which may be associated with significantly different control mechanisms and/or feedbacks.

Author

Frequency Distribution; Intertropical Convergent Zones; Climatology; Atmospheric General Circulation Models; Pacific Ocean

20070038197 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Goddard Earth Observing System Chemistry-Climate Model Simulations of Stratospheric Ozone-Temperature Coupling Between 1950 and 2005

Pawson, Steven; Stolarski, Richard S.; Douglass, Anne R.; Newman, Paul A.; Nielsen, J. Eric; Frith, Stacey M.; Gupta, Mohan L.; [2007]; 68 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Links between the stratospheric thermal structure and the ozone distribution are explored in a chemistry-climate model (CCM) and the underlying general-circulation model (GCM). It is shown how changes in the ozone distribution impact the modeled thermal structure of the GCM. A low bias in the upper stratospheric ozone from the chemistry modules leads to a cooler stratopause region than when observed ozone is used in the GCM. This reduction in stratopause temperature improves the agreement with meteorological analyses. Near 5hPa, the global-mean ozone profile is biased high in the chemistry-transport model but is close to observations in the CCM, which suggests that the temperature feedbacks on the ozone distribution are an important mechanism in the middle stratosphere. In the low stratosphere there is a high bias in simulated ozone that leads to an overestimate in total column ozone of several tens of Dobson Units in the polar regions. In the late part of the 20th Century the seasonal activation of chlorine, especially over Antarctica, destroys ozone as expected, so that chlorine-induced ozone decreases are overestimated in the CCM compared to the real atmosphere. Ozone-change experiments reveal that the thermal structure of the GCM and CCM respond in a similar manner to ozone differences between 1980 and 2000, with a peak ozone induced temperature change of about 1.5K (over 20 years) near the stratopause, which is at the low end of the range computed by other models. Greenhouse-gas induced cooling increases with altitude and contributes an additional 1K to the cooling between 1980 and 2000. In the Antarctic, the ozone hole is simulated with some success by the CCM. As with many other models, the polar vortex is too persistent in late winter but, counteracting this, the CCM undergoes too much mid-winter variability, meaning the ozone hole is not as pervasive as in the real atmosphere. Temperature decreases associated with the ozone hole in the CCM are similar to those computed with other models.

Author

Climate Models; Earth Observing System (EOS); Simulation; Stratosphere; Climatology; Atmospheric Chemistry; Annual Variations; Atmospheric Temperature

20070038265 NASA Marshall Space Flight Center, Huntsville, AL, USA

Response of Global Lightning Activity Observed by the TRMM/LIS During Warm and Cold ENSO Phases

Chronis, Themis G.; Cecil, Dan; Goodman, Steven J.; Buechler, Dennis; August 13, 2007; 2 pp.; In English; International Conferences on Atmospheric Electricity/International Commission on Atmospheric Electricity, 13-17 Aug. 2007, Beijing; Copyright; Avail.: Other Sources; Abstract Only

This paper investigates the response of global lightning activity to the transition from the warm (January-February-March-JFM 1998) to the cold (JFM 1999) ENSO phase. The nine-year global lightning climatology for these months from the Tropical Rainfall Measuring Mission (TRMM) Lightning Imaging Sensor (LIS) provides the observational baseline. Flash rate density is computed on a 5.0x5.0 degree lat/lon grid within the LIS coverage area (between approx. 37.5 N and S) for each three month period. The flash rate density anomalies from this climatology are examined for these months in 1998 and 1999. The observed lightning anomalies spatially match the documented general circulation features that accompany the warm and cold ENSO events. During the warm ENSO phase the dominant positive lightning anomalies are located mostly over the Western Hemisphere and more specifically over Gulf of Mexico, Caribbean and Northern Mid-Atlantic. We further investigate specifically the Northern Mid-Atlantic related anomaly features since these show strong relation to the North Atlantic

Oscillation (NAO). Furthermore these observed anomaly patterns show strong spatial agreement with anomalous upper level (200 mb) cold core cyclonic circulations. Positive sea surface temperature anomalies during the warm ENSO phase also affect the lightning activity, but this is mostly observed near coastal environments. Over the open tropical oceans, there is climatologically less lightning and the anomalies are less pronounced. Warm ENSO related anomalies over the Eastern Hemisphere are most prominent over the South China coast. The transition to the cold ENSO phase illustrates the detected lightning anomalies to be more pronounced over East and West Pacific. A comparison of total global lightning between warm and cold ENSO phase reveals no significant difference, although prominent regional anomalies are located over mostly oceanic environments. All three tropical 'chimneys' (Maritime Continent, Central Africa, and Amazon Basin) do not show any particular response to this transition.

Author

Lightning; TRMM Satellite; Marine Environments; Tropical Regions; Climatology

20070038268 National Space Science and Technology Center, Huntsville, AL, USA

OTD Observations of Continental US Ground and Cloud Flashes

Koshak, William; August 13, 2007; 4 pp.; In English; 13th International Conference on Atmospheric Electricity, 13-17 Aug. 2007, Beijing, China; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038268>

Lightning optical flash parameters (e.g., radiance, area, duration, number of optical groups, and number of optical events) derived from almost five years of Optical Transient Detector (OTD) data are analyzed. Hundreds of thousands of OTD flashes occurring over the continental US are categorized according to flash type (ground or cloud flash) using US National Lightning Detection Network TM (NLDN) data. The statistics of the optical characteristics of the ground and cloud flashes are inter-compared on an overall basis, and as a function of ground flash polarity. A standard two-distribution hypothesis test is used to inter-compare the population means of a given lightning parameter for the two flash types. Given the differences in the statistics of the optical characteristics, it is suggested that statistical analyses (e.g., Bayesian Inference) of the space-based optical measurements might make it possible to successfully discriminate ground and cloud flashes a reasonable percentage of the time.

Author

Lightning; Optical Properties; Remote Sensing; Optical Measuring Instruments

20070038289 NASA Marshall Space Flight Center, Huntsville, AL, USA

Geostationary Lightning Mapper for GOES-R

Goodman, Steven; Blakeslee, Richard; Koshak, William; September 24, 2007; 1 pp.; In English; 2007 EUMETSAT-AMS Satellite Conference, 24-28 Sep. 2007, Amsterdam, Netherlands; No Copyright; Avail.: Other Sources; Abstract Only

The Geostationary Lightning Mapper (GLM) is a single channel, near-IR optical detector, used to detect, locate and measure total lightning activity over the full-disk as part of a 3-axis stabilized, geostationary weather satellite system. The next generation NOAA Geostationary Operational Environmental Satellite (GOES-R) series with a planned launch in 2014 will carry a GLM that will provide continuous day and night observations of lightning from the west coast of Africa (GOES-E) to New Zealand (GOES-W) when the constellation is fully operational. The mission objectives for the GLM are to 1) provide continuous, full-disk lightning measurements for storm warning and Nowcasting, 2) provide early warning of tornadic activity, and 3) accumulate a long-term database to track decadal changes of lightning. The GLM owes its heritage to the NASA Lightning Imaging Sensor (1997-Present) and the Optical Transient Detector (1995-2000), which were developed for the Earth Observing System and have produced a combined 11 year data record of global lightning activity. Instrument formulation studies begun in January 2006 will be completed in March 2007, with implementation expected to begin in September 2007. Proxy total lightning data from the NASA Lightning Imaging Sensor on the Tropical Rainfall Measuring Mission (TRMM) satellite, airborne science missions (e.g., African Monsoon Multi-disciplinary Analysis, AMMA), and regional test beds (e.g., Lightning Mapping Arrays) are being used to develop the pre-launch algorithms and applications, and also improve our knowledge of thunderstorm initiation and evolution. Real time lightning mapping data now being provided to selected forecast offices will lead to improved understanding of the application of these data in the severe storm warning process and accelerate the development of the pre-launch algorithms and Nowcasting applications. Proxy data combined with MODIS and Meteosat Second Generation SEVERI observations will also lead to new applications (e.g., multi-sensor precipitation algorithms blending the GLM with the Advanced Baseline Imager, convective cloud initiation and identification, early warnings of lightning threat, storm tracking, and data assimilation).

Author

Geosynchronous Orbits; GOES Satellites; Lightning; Meteosat Satellite; Weather Forecasting

20070038348 NASA Langley Research Center, Hampton, VA, USA

On the Quality of the Nimbus 7 LIMS Version 6 Ozone for Studies of the Middle Atmosphere

Remsberg, Ellis; Lingenfelter, Gretchen; Natarajan, Murali; Gordley, Larry; Thompson, Earl; March 2006; 65 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy

The Nimbus 7 Limb Infrared Monitor of the Stratosphere (LIMS) radiance profile dataset of 1978/79 was reconditioned and reprocessed to Version 6 (V6) profiles of temperature and species that are improved significantly over those from Version 5 (V5). The LIMS V6 dataset was archived for public use in 2002. Improvements for its ozone include: (1) a more accurate accounting for instrument and spacecraft motion effects in the radiances, (2) the use of better spectroscopic line parameters for its ozone forward model, (3) retrievals of all its scans, (4) more accurate and compatible temperature versus pressure profiles (or T(p)), which are needed for the registration of the ozone radiances and for the removal of temperature effects from them, and (5) a better accounting for interfering species in the lower stratosphere. The retrieved V6 ozone profiles extend from near cloud top altitudes to about 80 km and from 64S to 84N latitude with better sampling along the orbit than for the V5 dataset. Calculated estimates of the single-profile precision and accuracy are provided for the V6 ozone from this study. Precision estimates based on the data themselves are of order 3% or better from 1 to 30 hPa. Estimates of total systematic error for a single profile are hard to generalize because the separate sources of error may not all be of the same sign and they depend somewhat on the atmospheric state. It is estimated that the V6 zonal mean ozone distributions are accurate to within 9% to 7% from 50 hPa to 3 hPa, respectively. Effects of a temperature bias can be significant and may be present at 1 to 2 hPa though. There may be ozone biases of order 10% at those levels due to possible biases of up to +2 K, but there is no indication of a similar problem elsewhere in the stratosphere. Simulation studies show that the LIMS retrievals are also underestimating slightly the small amplitudes of the atmospheric temperature tides, which affect its retrieved day/night ozone differences. There are small biases in the middle to lower stratosphere for the ascending versus descending node LIMS ozone, due principally to not accounting for the asymmetric weighting of its radiances across the tangent layer. The estimates of total accuracy were assessed by comparing the daily zonal mean LIMS ozone distributions against those from the Nimbus 7 SBUV Version 8 (V8) dataset for the same period. Generally, the LIMS V6 ozone agrees well with SBUV, except perhaps in the tropical lower stratosphere where the LIMS ozone is less. Still, the accuracy for LIMS V6 ozone in the lower stratosphere is improved over that found for LIMS V5, as indicated by several LIMS comparisons with ECC ozonesonde profiles. The LIMS V6 ozone is considered especially suitable for detailed studies of large-scale stratospheric processes above the 100-hPa level. Comparison of diurnal, photochemical model calculations with the monthly-averaged, upper stratospheric ozone observed from LIMS V6 indicates only a slight ozone deficit for the model at about 2 hPa. However, that deficit exhibits little to no seasonal variation and is in good agreement with similar model comparisons for a seasonal time series of ozone obtained with ground-based microwave instruments. Because the LIMS V6 ozone in the lower stratosphere has improved accuracy and sampling versus that of V5, it should now be possible to conduct quantitative studies of ozone transport and chemistry for the northern hemisphere, polar stratospheric winter of 1978/79 a time period when the catalytic loss of ozone due to reactive chlorine should not have been a major factor for the Arctic region.

Author

Microwave Sensors; Middle Atmosphere; Nimbus 7 Satellite; Ozone; Stratosphere; Solar Backscatter UV Spectrometer

20070038367 National Space Science and Technology Center, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

Diurnal Lightning Distributions as Observed by the Optical Transient Detector (OTD) and the Lightning Imaging Sensor (LIS)

Bailey, Jeff C.; Blakeslee, Richard J.; Buechler, Dennis E.; Christian, Hugh J.; August 13, 2007; 4 pp.; In English; 13th International Conference on Atmospheric Electricity, 13-17 Aug. 2007, Beijing, China; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038367>

Data obtained from the Optical Transient Detector (April 1995 to March 2000) and the Lightning Imaging Sensor (December 1997 to December 2005) satellites (70 and 35 inclination low earth orbits, respectively) are used to statistically determine the number of flashes in the annual and seasonal diurnal cycle as a function of local and universal time. The data are further subdivided by season, land versus ocean, northern versus southern hemisphere, and other spatial (e.g., continents) and temporal (e.g., time of peak diurnal amplitude) categories. The data include corrections for detection efficiency and instrument view time. Continental results display strong diurnal variation, with a lightning peak in the late afternoon and a minimum in late morning. In regions of the world dominated by large mesoscale convective systems the peak in the diurnal curve shifts toward late evening or early morning hours. The maximum diurnal flash rate occurs in June-August, corresponding to the Northern Hemisphere summer, while the minimum occurs in December-February. Summer lightning

dominates over winter activity and springtime lightning dominates over autumn activity at most continental locations. This latter behavior occurs especially strongly over the Amazon region in South America in September-November. Oceanic lightning activity in winter and autumn tends to exceed that in summer and spring. Global lightning is well correlated in phase but not in amplitude with the Carnegie curve. The diurnal flash rate varies about 4-35 percent about the mean, while the Carnegie curve varies around 4-15 percent.

Author

Lightning; Optical Measuring Instruments; Diurnal Variations; Northern Hemisphere; Southern Hemisphere

20070038455 United Nations Educational, Scientific and Cultural Organization, Delft, Netherlands

Modeling of Hurricane Impacts

Roelvink, Dano; Reniers, Ad; Dongeren, Ap van; Thiel de Vries, Jaap van; Sep 1, 2007; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62558-06-C-2006

Report No.(s): AD-A471781; XB-NAREGCOC/2W; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471781>

This fourth interim report describes ongoing development and validation of the XBeach model as part of the MORPHOS project and other activities over the period March-August 2007 (period extended due to late approval to continue)

DTIC

Hurricanes; Wave Propagation

20070038595 Massachusetts Inst. of Tech., Cambridge, MA USA

The Feasibility of Sodar Wind Profile Measurements from an Oceanographic Buoy

Berg, Allison M; Sep 2006; 115 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62271-97-G-0026

Report No.(s): AD-A471871; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis explores the feasibility of making wind speed profile measurements from an oceanographic buoy using a Doppler sodar. In the fall of 2005, we deployed a Scintec SFAS sodar on an ASIS buoy. Roughly one week of buoy motion data and one day of sodar observations were collected. Data from both this deployment, and the Martha's Vineyard Coastal Observatory, were used in conjunction with models to predict sodar performance. Results are compared for an ASIS and a 3-meter discus buoy. We also predict the yearly average probability of sodar data availability in the presence of buoy motion. We show that buoy tilting in response to wave forcing is the main factor affecting sodar performance. Our results strongly suggest that ASIS is a suitable platform for sodar measurements at sea.

DTIC

Buoys; Doppler Effect; Doppler Radar; Oceanography; SODAR; Sonar; Sound Ranging; Wind Profiles; Wind Velocity

20070038608 Army Engineer Research and Development Center, Vicksburg, MS USA

Wave and Beach Processes Modeling for Sabine Pass to Galveston Bay, Texas, Shoreline Erosion Feasibility Study

King, David B; Aug 2007; 164 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471889; ERDC/CHL TR-07-6; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the STWAVE/GENESIS modeling, the SBEACH modeling, and the related technical analysis that the U.S. Army Engineer Research and Development Center's Coastal and Hydraulics Laboratory has provided the U.S. Army Engineer District, Galveston, in support of their feasibility project: Sabine Pass to Galveston Bay, Texas Shoreline Erosion Feasibility Study. The main goal of this effort has been to set up and calibrate the numerical models so that they can provide a predictive capability that will be used to objectively evaluate alternative measures for beach restoration/protection projects within the study area. The predictive capabilities address both long-term performance, evaluated using GENESIS, and short-term storm-induced performance, evaluated using SBEACH. The setup of the GENESIS model proved to be particularly challenging. As had been found by previous researchers, the use of standard procedures led to the model's prediction of an unrealistic net sediment transport direction on Galveston Island. However, a careful analysis of the important forcing functions, particularly the effects of the local wind field, led to the development of an appropriate alternative procedure which produced GENESIS results in agreement with observations.

DTIC

Beaches; Computerized Simulation; Erosion; Feasibility; Protection; Sediment Transport; Shorelines; Water Erosion

20070038919 Army Engineer Research and Development Center, Vicksburg, MS USA

Environmental Evaluation of Dust Stabilizer Products

Steevens, Jeffery; Suedel, Burton; Gibson, Alfreda; Kennedy, Alan; Blackburn, William; Splichal, David; Pierce, J T; Aug 2007; 69 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471771; ERDC/EL-TR-07-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471771>

Personnel of the U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS, and Navy Environmental Health Center (NEHC), Portsmouth, VA, evaluated the environmental fate and effects of six commercially available dust stabilizer products. As part of the evaluation, a relative risk comparison was made of the six materials to other materials that have been used historically to control dusts (i.e., diesel, crude oil, fuel oil). Data for this evaluation were obtained primarily through literature review, communication with the manufacturers of the products, and through some limited analytical chemistry. Data gaps and uncertainties were also identified and described. Conclusions were derived from the results of the evaluation, with each stabilizer group presented separately along with general conclusions applicable to all stabilizers studied.

DTIC

Dust; Environment Effects; Stabilizers (Agents); Environmental Chemistry

20070038990 Meteorological Satellite Center, Tokyo, Japan

Meteorological Satellite Center, Technical Note No. 48

January 2007; ISSN 0388-9653; 59 pp.; In English; In Japanese; See also 20070038991 - 20070038993; Original contains color illustrations; Copyright; Avail.: Other Sources

The following topics were discussed: Characteristics and Effectiveness of Atmospheric Motion Vector Product (AMV) in Japanese Long-Term Reanalysis Project (JRA-25); Strengthening of the Ground Equipment in Data Collection System for the Geostationary Meteorological Satellite; and The Accuracy Verification of 'Discriminating Method of Cloud Systems Which Develop into Tropical Cyclone in the Early Stage' and the Elapsed Time of Develop into Tropical Cyclone.

Derived from text

Atmospheric Circulation; Meteorological Satellites; Cyclones; Tropical Storms; Geosynchronous Orbits; Data Acquisition; Accuracy

20070038991 Meteorological Satellite Center, Tokyo, Japan

Strengthening of the Ground Equipment in Data Collection System for the Geostationary Meteorological Satellite

Sakanaka, Hitoshi; Meteorological Satellite Center, Technical Note No. 48; January 2007, pp. 37-44; In Japanese; See also [20070038990](#); Copyright; Avail.: Other Sources

Since the destructive disaster of Indian Ocean Tsunami (2004 December), serious requirement for an accurate and reliable International Early Tsunami Warning System has increased. JMA is responsible for the collection of tidal/tsunami data by using MTSAT series. This situation led JMA to an attempt to realize a quality control of tidal/tsunami data collection via MTSAT together with improving weak aspect on ground equipment of DCS. JMA improved the performance of DCS and started to operate this system from 2006 (March). In this article, the improvements on this ground equipment of DCS are described.

Author

Ground Support Equipment; Data Acquisition; Geosynchronous Orbits; Meteorological Satellites; Tsunami Waves; Synchronous Platforms; Tides; Disasters

20070038992 Meteorological Satellite Center, Tokyo, Japan

The Accuracy Verification of 'Discriminating Method of Cloud Systems Which Develop into Tropical Cyclone in the Early Stage' and the Elapsed Time of Developing into a Tropical Cyclone

Terasaka, Yoshiyuki; Nakanishi, Tatsuro; Nishimura, Syuuji; Meteorological Satellite Center, Technical Note No. 48; January 2007, pp. 45-54; In Japanese; See also [20070038990](#); Copyright; Avail.: Other Sources

The Meteorological Satellite Center (MSC) has been discriminating if the tropical cloud systems develop into a tropical cyclone (TC) in its early stage. It is called 'Discriminating method of the cloud systems which develops into tropical cyclone in the early stage', hereafter we call this discriminating method 'The early discriminating method'. The early discriminating method is based on the intensity analysis of the cloud system by Dvorak's Technique in its early stage of development and statistical analysis of its intensity history of the cloud system. We examined the accuracy of the early discrimination method

using the data for 6 years from 2000 to 2005. As the result of the survey, it showed that 67% of the cloud systems satisfied with the decision conditions of the early discriminating method could develop into TC. The decision condition of the early discriminating method is the cloud systems develop into Tropical number (T-number) 1.0 within 24 hours after started the early discriminating method. In addition, T-number 1.0 is the intensity of the weakest tropical depression (TD). Furthermore, we examined the time elapsing of cloud systems between the time of after started their early discriminating method and the time of developed into TC. Consequently, it showed that there was a peak rate about 2 days after started their early discriminating method, and there was also a peak rate about 1 day after the cloud systems satisfied with T-number 1.0. (The mean value of the time elapsing of cloud systems between the time of after started their early discriminating method and the time of developed into TC was 2.5 days. It was 1.6 days after the cloud systems satisfied with T-number 1.0)

Author

Tropical Storms; Statistical Analysis; Meteorological Satellites; Cyclones; Clouds (Meteorology); Accuracy

20070038993 Meteorological Satellite Center, Tokyo, Japan

Characteristics and Effectiveness of Atmospheric Motion Vector Product (AMV) in Japanese Long-Term Reanalysis Project (JRA-25)

Oyama, Ryo; Meteorological Satellite Center, Technical Note No. 48; January 2007, pp. 1-36; In English; See also [20070038990](#); Copyright; Avail.: Other Sources

The Japan 25-year reanalysis (JRA-25) is a project to produce a global and consistent data set of global weather analyses for the years 1979 to 2004. JRA-25 is conducted through collaboration between the Japan Meteorological Agency (JMA) and the Central Research Institute of the Electric Power Industry (CRIEPI). The analysis data would enable users to acquire accurate global climate changes, to enhance seasonal prediction models and to investigate the past global climate and meteorological events via three-dimensional and spatially uniform approach. This paper reports the quality and characteristics of Atmospheric Motion Vector (AMV) data and AMV impacts on the analysis fields of wind and other physical values in JRA-25. It is recognized that Meteorological Satellite Center (MSC) AMVs, the Meteorology Satellite (METEOSAT) AMVs over the entire period and the Geostationary Operational Environmental Satellite (GOES) AMVs before 1995 contain wind speed slow biases in the upper troposphere, particularly in the winter hemisphere, and that the slow biases decrease year by year. These characteristics correspond to those seen in the ECMWF 15-year reanalysis project (ERA-15). To verify the impacts of the AMVs on the reanalysis fields, some observation system experiments (OSE) for July 2003 are performed. Through the assimilation of AMVs over the tropical Indian Ocean, upper tropospheric easterly winds and anti-clockwise circulation are modified so that the upper and lower tropospheric horizontal divergence field are changed. Over the tropical eastern Pacific Ocean, upper and lower tropospheric wind fields are modified so that lower tropospheric convergence around the Intertropical Convergence Zone (ITCZ) is strengthened. The modifications of the lower tropospheric convergence over both regions mainly induce changes in the precipitation fields. Evaluation of the precipitation fields by the Climate Prediction Center (CPC) Merged Analysis Precipitation (CMAP) data shows that the impact on precipitation fields is neutral over the tropical Indian Ocean, and contains a slightly positive bias around the ITCZ over the tropical eastern Pacific Ocean, respectively.

Author

Weather Forecasting; Meteorological Satellites; Climate Change; Wind Velocity; Meteorology; Meteosat Satellite

20070038994 Meteorological Satellite Center, Tokyo, Japan

Meteorological Satellite Center Technical Note No.49

March 2007; ISSN 0388-9653; 130 pp.; In English; In Japanese; See also 20070038995 - 20070039001; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The following topics were covered: Development of 'Kosa Monitoring Product' from Infrared Data of the Geostationary Meteorological Satellite (MTSAT-1R); Outline of MetOp Satellite and its Useplan At MSC; Asia-Pacific Regional ATOVS Retransmission Service (AP-RARS); MTSAT-2 Systems; MTSAT-2 Ground System; Summary of the Polar-Orbit Meteorological Satellite Receiving System; and Analysis of Tropical Cyclones with Microwave Satellite Imagery.

Derived from text

Geosynchronous Orbits; Meteorological Satellites; Microwave Imagery; Tropical Storms; Synchronous Platforms; Satellite Imagery; Cyclones; Infrared Radiation

20070038995 Meteorological Satellite Center, Tokyo, Japan

Outline of MetOp Satellite and its Useplan At MSC

Yoshizaki, Yoshito; Murata, Hidehiko; Kato, Koji; Meteorological Satellite Center Technical Note No.49; March 2007, pp. 19-32; In Japanese; See also [20070038994](#); Copyright; Avail.: Other Sources

The first European operational polar orbital meteorological satellites, MetOp, was launched on 19 October 2006. The MetOp spacecraft carries the new sensor payloads, IASI, ASCAT, GRAS, and GOME-2, in addition to AVHRR, HIRS, AMSU-A, and MHS onboarded the NOAA spacecrafts. The Meteorological Satellite Center plans to directly receive MetOp real-time observing data, process them immediately and supply MetOp products to users, as well as NOAA data.

Author

Meteorological Satellites; Remote Sensing; Polar Orbits; European Space Programs; Satellite-Borne Instruments

20070038996 Meteorological Satellite Center, Tokyo, Japan

Asia-Pacific Regional ATOVS Retransmission Service (AP-RARS)

Murata, Hidehiko; Meteorological Satellite Center Technical Note No.49; March 2007, pp. 33-54; In English; See also [20070038994](#); Copyright; Avail.: Other Sources

Regional ATOVS Retransmission Service in Asia-Pacific Region (AP-RARS) commenced its operation in June 2006. The aim of AP-RARS is to provide the users with ATOVS data from the NOAA satellites with a timeliness, meeting the requirements of Numerical Weather Prediction (NWP) model. RARS is recommended by CGMS after the success of EARS in Europe and North America Region. AP-RARS provides the users with ATOVS level 1C data in BUFR format through GTS. JMA provides data received at two HRPT direct readout stations, Kiyose and Syowa Station (Antarctica). Member countries of APRARS (and the number of its HRPT direct readout stations) are, Japan(2), China(3), Australia(4), and Korea(1). Data from these stations are available within about one hour. The accuracy of NWP is expected to be improved by the increase of available ATOVS data.

Author

Asia; Europe; Mathematical Models; Numerical Weather Forecasting; Pacific Ocean

20070038997 Meteorological Satellite Center, Tokyo, Japan

Summary of the Polar-Orbit Meteorological Satellite Receiving System

Yamashita, Akifumi; Meteorological Satellite Center Technical Note No.49; March 2007, pp. 81-90; In Japanese; See also [20070038994](#); Copyright; Avail.: Other Sources

Meteorological Satellite Center has received HRPT sent from polar orbit meteorological satellite NOAA that National Oceanic and Atmospheric Administration is doing operations maintenance as the polar orbit meteorological satellite reception service over many years. The European Organization for the Exploitation of Meteorological Satellites newly launched polar orbit operational meteorological satellite METOP last October. METOP renewed the polar orbit meteorological satellite receiving system that became superannuated to receive HRPT and AHRPT from the offer of the data observed with the on-boarded sensor to the user by advanced high resolution picture transmission AHRPT as well as NOAA.

Author

Meteorological Satellites; Polar Orbits; Satellite Observation; Polar Meteorology

20070038998 Meteorological Satellite Center, Tokyo, Japan

Development of ‘Kosa Monitoring Product’ from Infrared Data of the Geostationary Meteorological Satellite (MTSAT-1R)

Hashimoto, Toru; Ohkawara, Nozomu; Meteorological Satellite Center Technical Note No.49; March 2007, pp. 1-18; In Japanese; See also [20070038994](#); Copyright; Avail.: Other Sources

Kosa (Yellow sand) monitoring product retrieved from MTSAT-1R infrared split window (11 μm and 12 μm) measurements was developed at MSC in cooperation with the Atmospheric Environmental Division and the Meteorological Research Institute of JMA. This product detects Kosa concentrated area and provides information on its concentration as Kosa index in East Asia. The algorithm of the retrieval is based on the split windows technique which is based on optical characteristics of Kosa particles in the wavelength region. In this product, Kosa concentrated area is detected even over the land and in the nighttime, while aerosol information over the land and in the nighttime cannot be included in the existing aerosol products. The comparisons between Kosa monitoring product and the ground observations were performed for some notable Kosa events in April 2006 to evaluate the effectiveness of the product in monitoring Kosa. The results show Kosa concentrated area is detected well and its move can be tracked day and night in the product. The effectiveness of the product

in Kosa monitoring is confirmed. This product has been operationally retrieved once an hour since February 2006. It has been provided for the Atmospheric Environmental Division.

Author

Aerosols; Infrared Radiation; Meteorological Satellites

20070038999 Meteorological Satellite Center, Tokyo, Japan

MTSAT-2 Systems

Miyamura, Kiyoji; Meteorological Satellite Center Technical Note No.49; March 2007, pp. 55-58; In Japanese; See also [20070038994](#); Copyright; Avail.: Other Sources

MTSAT-2 fulfills two functions: a meteorological function by the Japan Meteorological Agency and an aviation control function by the Civil Aviation Bureau of the Ministry of Land, Infrastructure and Transport.

Author

Meteorology; Civil Aviation; Meteorological Satellites; Systems Engineering

20070039000 Meteorological Satellite Center, Tokyo, Japan

MTSAT-2 Ground System

Tahara, Motoyuki; Meteorological Satellite Center Technical Note No.49; March 2007, pp. 59-80; In Japanese; See also [20070038994](#); Copyright; Avail.: Other Sources

The Meteorological Satellite Center (MSC) installed new ground system for MTSAT-2 satellite. MSC put the system in Command and Data Acquisition Station (CDAS) and Data Processing Center (DPC). This system has some feature: 1. The system is designed to cooperate with Japan Civil Aviation Bureau (JCAB), because Japan Meteorological Agency (JNIA) and JCAB use the satellite together. 2. The satellite monitor-control function of the system uses client-server model. So CDAS in Saitama prefecture and DPC in Tokyo use the function in the same way. 3. The function of MTSAT-2's Imager Data Acquisition and Control System (IDACS) is the same as that of MTSAT-1R's IDACS, except that MTSAT-2's IDACS can create LRIT data by itself.

Author

Meteorological Satellites; Satellite Control; Data Acquisition; Data Processing

20070039001 Meteorological Satellite Center, Tokyo, Japan

Analysis of Tropical Cyclones with Microwave Satellite Imagery

Nishimura, Shuuji; Kato, Koji; Mouri, Kouki; Asano, Jun'ichi; Saitoh, Sadao; Yoshida, Shiro; Endo, Takeshi; Ootubo, Kohei; Shimizu, Akihiro; Oyama, Ryo; Meteorological Satellite Center Technical Note No.49; March 2007, pp. 91-125; In Japanese; See also [20070038994](#); Copyright; Avail.: Other Sources

Estimations of center positions and intensities of tropical cyclones by 'Dvorak method,' which uses infrared and visible imagery from the geostational satellite 'Himawari,' have been being done in MSC. 'Dvorak method' is the most popular method to analyze tropical cyclones with infrared and visible imagery. It is, however, difficult to estimate center positions of tropical cyclones which don't have eyes clearly and are covered by upper cirrus cloud in the developing stage, especially when visible imagery are not available. Microwave imagery from 'AMSR-E' on an earth observing satellite 'Aqua' can be used for analyzing the inner structures of tropical cyclones, which can't be seen in infrared or visible imagery. We developed a method to estimate center positions of tropical cyclones. And with this method, we investigated the accuracies of center positions of tropical cyclones from 2003 to 2005. As the result, the accuracies by microwave imagery is almost same as those by radar observations, and it is possible for our method to correct center positions only by 'Dvorak method'

Author

Cyclones; Microwave Imagery; Satellite Imagery; Tropical Storms

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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*.

20070038262 NASA Marshall Space Flight Center, Huntsville, AL, USA

Interannual and Decadal Variability of Ocean Surface Latent Heat Flux as Seen from Passive Microwave Satellite Algorithms

Robertson, Franklin R.; Jackson, Darren L.; Wick, Gary A.; Roberts, Brent; Miller, Tim L.; September 24, 2007; 1 pp.; In

English; Joint 2007 EUMETSAT Meteorological Satellite Conference, 24-28 Sep. 2007, Amsterdam, Netherlands; Copyright; Avail.: Other Sources; Abstract Only

Ocean surface turbulent fluxes are critical links in the climate system since they mediate energy exchange between the two fluid systems (ocean and atmosphere) whose combined heat transport determines the basic character of Earth's climate. Deriving physically-based latent and sensible heat fluxes from satellite is dependent on inferences of near surface moisture and temperature from coarser layer retrievals or satellite radiances. Uncertainties in these 'retrievals' propagate through bulk aerodynamic algorithms, interacting as well with error properties of surface wind speed, also provided by satellite. By systematically evaluating an array of passive microwave satellite algorithms, the SEAFLUX project is providing improved understanding of these errors and finding pathways for reducing or eliminating them. In this study we focus on evaluating the interannual variability of several passive microwave-based estimates of latent heat flux starting from monthly mean gridded data. The algorithms considered range from those based essentially on SSM/I (e.g. HOAPS) to newer approaches that consider additional moisture information from SSM/T-2 or AMSU-B and lower tropospheric temperature data from AMSU-A. On interannual scales, variability arising from ENSO events and time-lagged responses of ocean turbulent and radiative fluxes in other ocean basins (as well as the extratropical Pacific) is widely recognized, but still not well quantified. Locally, these flux anomalies are of order 10-20 W/sq m and present a relevant 'target' with which to verify algorithm performance in a climate context. On decadal time scales there is some evidence from reanalyses and remotely-sensed fluxes alike that tropical ocean-averaged latent heat fluxes have increased 5-10 W/sq m since the early 1990s. However, significant uncertainty surrounds this estimate. Our work addresses the origin of these uncertainties and provides statistics on time series of tropical ocean averages, regional space / time correlation analysis, and separation of contributions by variations in wind and near surface humidity deficit. Comparison to variations in reanalysis data sets is also provided for reference.

Author

Latent Heat; Heat Flux; Ocean Surface; Periodic Variations; Air Water Interactions; Atmospheric Temperature; Energy Transfer; Wind Velocity; Surface Temperature; Remote Sensing

20070038316 Science Systems and Applications, Inc., Bay Saint Louis, MS, USA

Solutions Network Formulation Report: Improving NOAA's PORTS(R) Through Enhanced Data Inputs from NASA's Ocean Surface Topography Mission

Guest, DeNeice; February 2007; 5 pp.; In English

Contract(s)/Grant(s): NNS04AB54T; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038316>

The Nation uses water-level data for a variety of practical purposes, including nautical charting, maritime navigation, hydrography, coastal engineering, and tsunami and storm surge warnings. Long-term applications include marine boundary determinations, tidal predictions, sea-level trend monitoring, oceanographic research, and climate research. Accurate and timely information concerning sea-level height, tide, and ocean current is needed to understand their impact on coastal management, disaster management, and public health. Satellite altimeter data products are currently used by hundreds of researchers and operational users to monitor ocean circulation and to improve scientists understanding of the role of the oceans in climate and weather. The NOAA (National Oceanic and Atmospheric Administration) National Ocean Service has been monitoring sea-level variations for many years. NOAA's PORTS (Physical Oceanographic Real-Time System) DST (decision support tool), managed by the Center for Operational Oceanographic Products and Services, supports safe and cost-efficient navigation by providing ship masters and pilots with accurate real-time information required to avoid groundings and collisions. This report assesses the capacity of NASA's satellite altimeter data to meet societal decision support needs through incorporation into NOAA's PORTS. NASA has a long heritage of collecting data for ocean research, including its current Terra and Aqua missions. Numerous other missions provide additional important information for coastal management issues, and data collection will continue in the coming decade with such missions as the OSTM (Ocean Surface Topography Mission). OSTM will provide data on sea-surface heights for determining ocean circulation, climate change, and sea-level rise. We suggest that NASA incorporate OSTM altimeter data (C- and Ku-band) into NOAA's PORTS DST in support of NASA's Coastal Management National Application with secondary support to the Disaster Management and Public Health National Applications.

Author

Ocean Surface; Topography; Hydrography; Climate Change; Storm Surges; Real Time Operation

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*.

20070037479 Duke Univ., Durham, NC USA

Image Processing and Computer Aided Diagnosis in Computed Tomography of the Breast

Xia, Jessie Q; Lo, Joseph Y; Mar 2007; 53 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0278

Report No.(s): AD-A471079; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471079>

Dedicated breast CT imaging is a promising technique for breast cancer imaging. Since it can totally remove the overlapping of tissues it will be even more beneficial for women with dense breasts. Still there is a lot to be done for advancing the breast CT technology. One direction of development is to improve the image quality via some post-acquisition processing techniques which is the goal of this project. Specifically two subtasks are considered: 1) to remove scattered radiation and 2) to remove noise. So far the Gaussian noise model has been proposed and the corresponding Bayesian version is constructed for scatter compensation. A PDEtomo denoising technique has been proposed and implemented which takes into account the relationship between the variance of line integrals through different region of breast and the number of photons hitting the detector. Results show that they are effective for the specific tasks. In addition some other techniques are being explored or under further evaluation. The project has progressed to the stage where a computer aided diagnosis tool is under development for the assessment of mass detectability based on the original breast CT volumes and those with image processing.

DTIC

Breast; Cancer; Computer Aided Tomography; Computer Techniques; Diagnosis; Image Processing; Imaging Techniques; Mammary Glands; Tomography

20070037482 Illinois Univ. at Urbana-Champaign, Urbana, IL USA

Control of Transformation and Invasiveness of Breast Cancer Cells by Estrogen Regulation of Proteinase Inhibitor 9

Antonaci, Francesca C; Apr 2005; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0410

Report No.(s): AD-A471083; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471083>

Thrombosis, or the abnormal clotting of the blood, is the leading cause of death in breast cancer patients. Thrombus formation is triggered factor VIIa from circulating blood encounters tissue factor (TF) on the surface of a cell, including many breast cancer cells and tumor-associated cells. It is important, therefore, to increase our understanding of the mechanisms by which TF activates the clotting cascade in breast cancer. The blood protein, antithrombin (AT), has long been thought to be the most important natural anticoagulant that targets steps of the clotting cascade downstream from TF:VIIa, but more recent work has suggested that AT can also inactivate factor VIIa bound to TF. Goals of this project included determining if AT can efficiently inhibit TF:VIIa complexes and if resulting factor VIIa-antithrombin (VIIa-AT) complexes can be detected in blood. The project was successful in determining that the TF:VIIa complex can efficiently be inactivated by AT, and furthermore was successful in quantifying VIIa-AT levels in blood.

DTIC

Blood Coagulation; Breast; Cancer; Estrogens; Inhibitors; Mammary Glands; Proteins

20070037483 Pennsylvania Univ., Philadelphia, PA USA

Harnessing Novel Secreted Inhibitors of EGF Receptor Signaling for Breast Cancer Treatment

Lemmon, Mark A; Apr 2007; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0289

Report No.(s): AD-A471085; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471085>

We aim to develop protein therapeutics that neutralize growth factors that activate EGF receptor family members in breast cancer. Rather than targeting receptors themselves (as do Herceptin, Iressa, etc), we propose to target the activating ligands. Our model is Argos from *Drosophila*, which we showed naturally inhibits EGF receptor signaling in fruit flies by inactivating the ligand. We hope to effectively humanize Argos - making it bind human EGFR ligands and/or to use human protein

scaffolds for this. In the past year, we crystallized a complex between the minimal functional fragment of Argos and its target (Spitz), and are about to complete structure determination which will provide critical information for therapeutic design. We also established an experimental approach for screening libraries of Argos variants for those that bind human EGF-like ligands (our therapeutic aim). This approach employs yeast surface (rather than phage) display. We are now poised to combine our technical position and new structural information to identify Argos (and Dkk) variants that bind human EGFs and represent starting points for developing new therapeutics.

DTIC

Breast; Cancer; Epidermis; Inhibitors; Mammary Glands

20070037485 Georgetown Univ., Washington, DC USA

Role of the Stem Cell Niche in Hormone-induced Tumorigenesis in Fetal Mouse Mammary Epithelium

Chepko, Gloria; Hilakivi-Clarke, Leena; Aug 2006; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0719

Report No.(s): AD-A471087; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471087>

Develop an immunohistochemical method for identifying stem cells and stem cell niches, and to use this to determine if in utero estrogenic overstimulation causes changes in the number of stem cells or their niches. To extend the power of ex vivo stem cell isolation and enumeration by providing a way to identify functional cell types in situ. This identification method should ultimately provide a diagnostic refinement for mammary cancers. We had marginal success due primarily to 1) most antibodies previously reputed to be stem cell specific turned out to be present in differentiated mammary cell types as well as putative progenitor cells; 2) some of these antibodies stained all cell types but not all members of each subset; 3) technical limitations: our inability to detect 2 to 3 antibodies simultaneously with hematoxylin counterstain. Due to these events, as with ex vivo characterization, we were unable to discover definitive markers for any cell type, however we did show that P63, originally thought to be a stem cell marker, but shown later to be an epithelial stratification organizer, is expressed differentially in the basal and luminal cells depending on the stage of estrus cycle, and whether the tissue is tumorigenic. Due to the technical challenges the main animal study was not realized.

DTIC

Breast; Cancer; Epithelium; Hormones; Mammary Glands; Mice; Stem Cells

20070037496 State Univ. of New York, Amherst, NY USA

Structure Optimization of 21,23-Core-Modified Porphyrins Absorbing Long-Wavelength Light as Potential Photosensitizers Against Breast Cancer Cells

Detty, Michael R; Apr 2007; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0500

Report No.(s): AD-A471105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471105>

In the first year, we made eighteen new 21,23-core modified porphyrins, determined their photophysical properties, and evaluated the biological properties of them. In the second year, the research focused on 1) analyzing quantitative structure activity relationships (QSAR) establishing new synthetic methods to prepare eleven new second generation derivatives with novel structures. During the past (third) year, we have evaluated the new derivatives structurally, photophysically, and biologically. The structures of two derivatives were determined unambiguously by x-ray crystallography including the structure of a cis-ABCC meso-substituted derivative and the structure of a cis-AB disubstituted derivative. A series of carboxylic acid substituted dithiaporphyrins was prepared with different length aliphatic spacers between porphyrin and acid. In a collaborative study with Prof. Benny Ehrenberg at Bar Ilan University in Israel, we found that the efficiency of photooxidizing a membrane-residing singlet oxygen target decreases as the side chains become longer. This has implications for fine-tuning optimal structures for PDT sensitizers. The most promising dithiaporphyrin from in vitro studies is being evaluated in toxicity studies in vivo.

DTIC

Breast; Cancer; Cores; Mammary Glands; Photosensitivity; Porphyrins

20070037497 McMaster Univ., Hamilton, Ontario Canada

The Role of the POZ-ZF Transcription Factor Kaiso in Breast Cell Proliferation and Tumorigenesis

Anstey, Michelle I; Apr 2007; 16 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0263

Report No.(s): AD-A471106; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471106>

Kaiso is a novel member of the POZ-ZF family of transcription factors, first identified as a binding partner to the p120ctn cell adhesion co-factor. Preliminary work in our laboratory indicated that Kaiso was misexpressed in ~40% of human breast tumors and identified cyclin D1 as a putative Kaiso target gene. The objective of this project is to determine the mechanism by which Kaiso regulates cyclin D1 expression and how this affects breast cell proliferation and tumorigenesis. Using techniques such as artificial promoter assays, electrophoretic mobility shift assays and semi-quantitative PCR we sought to determine how Kaiso regulates cyclin D1 promoter binding and expression. Our work to date demonstrates that Kaiso transcriptionally represses the cyclin D1 promoter through its bimodal binding properties (binding to both sequence specific sites and methylated CpG sites within the promoter). We have also demonstrated that Kaiso and p120ctn activity may be modulating canonical Wnt signaling and activation of cyclin D1.

DTIC

Breast; Cancer; Cells (Biology); Mammary Glands; Regeneration (Physiology)

20070037498 Colorado Univ., Aurora, CO USA

Identifying ECM Mediators of Tumor Cell Dormancy

Schedin, Pepper; May 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0510

Report No.(s): AD-A471107; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471107>

Characterize the compositional and functional changes in mammary stroma that result from tamoxifen treatment. Approach: R75 mature female Sprague Dawley rats were randomized into three groups of 25 each; Gp1 nulliparous control, and Gp 2 tamoxifen treated (0.5 mg/tamoxifen body weight, s.c. injection for 30 days) and Gp 3 tamoxifen treated (1.0 mg tamoxifen dose). ECM was harvested from the mammary glands of Gps 1 biochemical and functional characterizations. The ECM preparations have been subjected to LCMS and MALDI-TOF mass spec. Due to technical difficulties also developed two in vitro models to investigate the effects of tamoxifen on mammary stroma. ECM deposited by primary mammary fibroblasts isolated from tamoxifen treated rats, or primary control fibroblasts treated with tamoxifen in culture has been utilized for ECM proteomics method development. Conditions demonstrate fibronectin (FN) is downregulated by tamoxifen, in vitro and in vivo; observations consistent with data demonstrating that FN is up during MEC proliferation and down regulated at times of MEC loss; suggesting that loss of FN may be integral to a tumor suppressive microenvironment investigate functional changes in ECM, MDA-MB-231 cells were pre-mixed with control matrix or matrix isolated from tamoxifen treated rats and orthotically injected into nude mice. Tumor growth was reduced in mice injected with ECM isolated from tamoxifen treated rats, demonstrating that tamoxifen altered EC manner consistent with tumor cell dormancy. Finally, this work identifies ECM mediators of tumor cell dormancy and progression that can be targeted for drug development.

DTIC

Cancer; Cells (Biology); Hibernation; Identifying; Mammary Glands; Tumors

20070037519 Texas Univ., Houston, TX USA

The BESCT Lung Cancer Program (Biology, Education, Screening, Chemoprevention, and Treatment)

Hong, Waun K; Khuri, Fadio R; Apr 2007; 177 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0689

Report No.(s): AD-A471138; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471138>

BESCT program aims to define molecular abnormalities contributing to lung cancer initiation and progression and to develop innovative therapeutic approaches for this cancer. Our specific aims are 1) to understand molecular alterations in lung cancer, 2) to develop chemoprevention strategies for lung cancer, and 3) to implement experimental molecular therapeutic approaches for lung cancer treatment.

DTIC

Cancer; Education; Lungs

20070037526 Emory Univ., Atlanta, GA USA

The Emory University Prostate Cancer Center Initiation Award

Petros, John A; Apr 2004; 11 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0080

Report No.(s): AD-A471154; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471154>

This award has funded the development of a multidisciplinary prostate cancer research consortium at Emory University. During the funding period a consortium has been developed and matured. The specific research projects funded have all been successful with resultant publications and NIH grants as tangible evidence of progress and success. In addition, the dynamic prostate cancer research supported by this award has aided in the recruitment of one of the largest and most well recognized prostate cancer research groups to Emory (Dr. Leland Chung and his associates). In part because of the research environment created by this award, another key recruit has just been completed in the Department of Pathology (Dr. Milton Datta) further enhancing our capabilities in translational prostate cancer research.

DTIC

Cancer; Medical Science; Prostate Gland

20070037529 Pittsburgh Univ., Pittsburgh, PA USA

The Impact of the 6:3 Polyunsaturated Fatty Acid Ratio on Intermediate Markers of Breast Cancer

Hudson, Alana; May 1, 2007; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0532

Report No.(s): AD-A471158; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471158>

Extensive experimental evidence has shown the intake of omega-6 polyunsaturated fatty acids (PUFAs) promotes breast cancer (1), while consumption of omega-3 PUFAs inhibits this disease. (2) Furthermore, it appears that the cancer promoting activity of the omega-6 fatty acids is abrogated by the competitive inhibition of omega-3 fatty acids (3,4). Although the mechanism by which the 6:3 PUFA ratio may promote breast cancer is unknown, it is suggested that a high 6:3 PUFA ratio may influence breast cancer risk by increasing prostaglandin E2 (PGE2) synthesis thereby inducing estrogen production, via upregulation of aromatase.

DTIC

Breast; Cancer; Fatty Acids; Mammary Glands; Markers

20070037533 Scripps Research Inst., La Jolla, CA USA

Legubicin, a Tumor-Activated Prodrug for Breast Cancer Therapy

Liu, Cheng; Apr 2007; 55 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0318

Report No.(s): AD-A471165; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471165>

Legumain is a recently discovered and only known asparaginyl endopeptidase that is well conserved throughout the biologic kingdoms. We have demonstrated that legumain is highly and inappropriately expressed in 100% human breast cancer specimens as well as murine breast cancer models. We demonstrated that an inactive prototype doxorubicin derived prodrug incorporating a succinyl blocked substrate peptide removable by legumain was effectively activated and tumoricidal in human breast cancer models. We designated this prodrug legubicin. Legubicin is not cytotoxic until activated by legumain due to reduced ability to enter cells and blocked binding to DNA. These properties led to increased tumor exposure and much reduced drug accumulation in normal tissues when administered in vivo. It has markedly reduced cardiac and myelosuppressive toxicities compare to doxorubicin. In this grant application we propose to further develop this prodrug strategy as a potential treatment for breast cancer.

DTIC

Breast; Cancer; Drugs; Mammary Glands; Therapy; Toxicity; Tumors

20070037534 Texas Univ., Houston, TX USA

Cell Cycle Regulatory Roles of ER-Alpha in Breast Cancer

Kamrani, Sonia; Mar 2007; 11 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0339

Report No.(s): AD-A471166; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471166>

The roles of estrogen and estrogen receptor (ER) in normal mammary gland development and in transformation to a tumor phenotype have been extensively studied. However, although the cumulative data suggests an important role for ER in breast cancer, the function of ER in regulating cell proliferation in normal and tumor tissue remains unclear. This study investigates the role of ER-alpha on the progression of the cells through different phases of the cell cycle in the presence and absence of its ligand, estradiol. The cellular localization of ER-alpha is also examined during cell cycle transition in MCF-7 cells. Experimental Design: The ER negative MDA-MB 231 and ER positive MCF-7 cell lines were used for study. Cells were synchronized in G1 phase of the cell cycle with lovastatin for 36 hours in estrogen free media and subsequently released from arrest with mevalonate. Transient transfection of MDA MB 231 cells with ER-alpha as well as addition of 17- estradiol to the cells were performed at the time of release from cell cycle arrest. Cells were harvested at different time intervals (0-68 hrs) after the release and subjected to western blot and flow cytometry analysis. For immunofluorescent detection of ER-alpha MCF-7 cells cultured on coverslips, synchronized with lovastatin and stained with anti-ER alpha antibody. Cells stained to look at ER-alpha in the cell. Results: Synchronization of MCF-7 cells revealed that the endogenous ER is subject to cell cycle regulation with its levels peaking at the S/G2 phase of the cell cycle. Similarly, MDA-MB231 cells transiently transfected with ER-alpha demonstrate tight cell cycle periodicity similar to that seen with cyclin B. Specifically, ER-alpha is up-regulated during late S phase and early G2 phase, and is down regulated during late G2 and M phases. In contrast, in non-synchronized MDA-MB 231 cells, exogenously transfected,

DTIC

Breast; Cancer; Estrogens; Mammary Glands

20070037541 Burnham Inst., La Jolla, CA USA

Study of Mechanisms of an Anti-Apoptotic Proteins, BI-1 in Prostate Cancer

Chen, Lili; Dec 2006; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0166

Report No.(s): AD-A471181; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471181>

Dysregulation of apoptosis is an important mechanism underlying the resistance to radio- or chemotherapy of androgen-insensitive prostate cancer. BI-1 and BAR were identified as inhibitors of a pro-apoptotic Bcl-2 family member, Bax, identified by a functional yeast screen. Both BI-1 and BAR are membrane proteins located at endoplasmic reticulum (ER). The importance of BI-1 in prostate cancer is underscored by its specific up-regulation in malignant cells. Furthermore, reduction of BI-1 expression by small interference RNA (siRNA) causes significant increase of spontaneous cell death in prostate carcinoma cells. This research project is about a regulatory protein network involving BI-1, BAR, Bap31, and Bcl-2. Using a coimmunoprecipitation assays, we demonstrated that BAR is bound to BI-1, Bap31, and Bcl-2, forming a multi-protein complex at endoplasmic reticulum. BAR is a multifunctional protein with a coiled-coiled domain, a SAM domain, and a predicted E3 ubiquitin ligase RING domain. The RING domain is proved to be essential for the E3 ubiquitin ligase activity of BAR. Acting as an E3 ubiquitin ligase, BAR specifically reduces the protein level of BI-1, but not Bap31 or Bcl-2. On the other hand, Bap31 was found to specifically increase the stability of BAR by decreasing proteasome-dependent degradation of BAR. A regulatory hierarchy seems to exist that Bap31 regulates the protein stability of BAR, an E3 ubiquitin ligase, which in turn modulates the stability of BI-1 in the protein complex.

DTIC

Apoptosis; Cancer; Prostate Gland; Proteins

20070037555 Georgetown Univ., Washington, DC USA

Interaction of AIB1 and BRCA1 in Breast Cancer

Lahusen, John T; Mar 2007; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0250

Report No.(s): AD-A471237; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471237>

AIB1 (SRC3) belongs to the p160 family of steroid receptor coactivators including SRC-1 and SRC-2. AIB1 interacts

with several nuclear receptors including estrogen and progesterone receptors in a ligand-dependent manner and enhances their transcriptional activity. AIB1 is amplified and/or overexpressed in approximately 30% of breast cancers and can increase the sensitivity of breast cancer cells to estrogen and to growth factor signaling. BRCA1 regulates cell cycle progression apoptosis induction transcription and DNA repair. From 5-10% of total breast cancers are due to germ-line BRCA1 mutations that lead to a deficiency in the BRCA1 protein. We have observed that AIB1 can partially reverse BRCA1 mediated repression of ER-dependent transcriptional activity in breast cancer. This research will identify if there is a functional consequence of an interaction between AIB1 and BRCA1 in breast cancer.

DTIC

Apoptosis; Breast; Cancer; Estrogens; Females; Genes; Hormones; Mammary Glands; Steroids

20070037556 Library of Congress, Washington, DC USA

Does Price Transparency Improve Market Efficiency? Implications of Empirical Evidence in Other Markets for the Health Sector

Austin, Andrew; Gravelle, Jane G; Jul 24, 2007; 52 pp.; In English

Report No.(s): AD-A471238; CRS-RL34101; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471238>

Consumer advocates, proponents of wider use of market incentives in the health care sector, and some policy makers have called for greater price transparency. Price transparency implies that consumers can obtain price information easily, so they can usefully compare costs of different choices. Price transparency may also mean consumers understand how prices are set and are aware of price discrimination. In health care markets consumers often have difficulty finding useful price data. In particular, few consumers have a clear idea of what hospital stays or hospital-based procedures will cost, or understand how hospital charges are determined. The dispersion of prices for similar health care procedures is high, which suggests that these markets are not working well with respect to price outcomes, as would be expected in ordinary competitive markets. In addition, prices paid by different types of payers vary dramatically. On average, patients without insurance or who pay their own bills pay much more relative to what private insurers, Medicare, and Medicaid pay. Better price information might allow patients, either directly or through their physicians, to obtain better value for health care services. Several states and health insurers now provide online data on hospital costs. These price transparency initiatives, at least so far, have had little visible effect on pricing. Public pressure, which in some cases has caused hospitals to curtail aggressive bill collection tactics, might change hospitals and health care providers pricing behavior. This report will be updated as events warrant.

DTIC

Cost Reduction; Health; Market Research; Medical Services

20070037558 Oregon Research Inst., Eugene, OR USA

Population Health Trial for Smokeless Tobacco Cessation with Military Personnel

Severson, Herbert; Gordon, Judith; Andrews, Judy; Peterson, Alan; Cigrang, Jeff; May 2007; 39 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-2-0017

Report No.(s): AD-A471246; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471246>

While smoking cessation has received considerable attention within the military the use of smokeless tobacco (chewing tobacco and snuff) has not been a focus of medical services or research. Epidemiological data suggest that while smoking has continued to decline both in the general population and within the military the use of smokeless tobacco products has increased. The primary objective of this research was to develop and evaluate an intervention for smokeless tobacco cessation in active-duty military personnel comprised of proactive recruitment targeted written and video materials mailed to the participant and phone call support. The study has now been completed. A total of 785 participants enrolled in the study. Mailed follow-up assessments at three and six months post enrollment were completed with 587 three-month surveys and 571 six-month surveys collected. We have reported on the significant outcomes of the study which showed that the brief phone call intervention supplemented with mailed print and video materials significantly increased tobacco cessation among active duty military personnel. The quit rates for participants receiving the active intervention were two to three times greater than for participants who received usual care and this increase in cessation was significant at each follow up point.

DTIC

Health; Medical Science; Military Personnel; Populations; Public Health; Smoke; Tobacco

20070037559 California Univ., Los Angeles, CA USA

Reg IV: A Candidate Marker of Metastatic Hormone Refractory Prostate Cancer

Reiter, Robert E; Jan 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0130

Report No.(s): AD-A471247; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471247>

In our previous in situ hybridization studies of prostate tissue arrays RegIV was shown to be strongly expressed by a majority of metastatic hormone refractory tumors (HRPC) and weaker RegIV expression was found in a subset of primary tumors but not expressed by normal tissue. Our goal is to better understand the role of RegIV in prostate cancer progression and to determine its possible use as a diagnostic marker for early and metastatic prostate cancers. We have developed and affinity purified a polyclonal anti-RegIV that has successfully been tested by immunohistochemistry on positive and negative controls. In vitro studies show cells overexpressing RegIV have a growth advantage and we have successfully made two si-RegIV constructs to knock down RegIV RNA and protein expression and in vivo studies are currently in progress.

DTIC

Antibodies; Cancer; Hormones; Markers; Metastasis; Prostate Gland; Proteins; Refractories; Tumors

20070037565 California Univ., San Diego, La Jolla, CA USA

Parallel Transport of Biological Cells using Individually Addressable VCSEL Arrays as Optical Tweezers

Flynn, Richard A; Birkbeck, Aaron L; Gross, Matthias; Ozhan, Mihrimah; Shao, Bing; Wang, Mark M; Esener, Sadik C; Jun 1, 2005; 6 pp.; In English

Report No.(s): AD-A471259; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471259>

We have demonstrated the use of vertical cavity surface emitting lasers (VCSELs) for optical trapping and active manipulation of live biological cells and microspheres. We have experimentally verified that the Laguerre Gaussian laser mode output from the VCSEL functions just as well as the traditional Gaussian fundamental laser mode for optically trapping biological cells and may be preferable since the highest intensity of the Laguerre Gaussian mode is located at the outer ring of the optical aperture, which allows for stronger optical confinement to be obtained for a lower total power. Another advantage that VCSELs have over conventional gas and diode lasers is their ability to be manufactured in an array form. Using a 2 x 2 array of VCSELs, the simultaneous and independent transport of four human red blood cells is demonstrated indicating that much larger two-dimensional VCSEL arrays can be used as individually addressable optical tweezers in biological chips and systems. This parallel transport capability will have a significant impact in currently developing biochip array and assay technologies through the facilitation of the selection, relocation, and precision placement of cells.

DTIC

Cells (Biology); Laser Cavities; Optical Equipment; Surface Emitting Lasers

20070037727 Temple Univ., Philadelphia, PA USA

Role of CDK4 in Breast Development and Cancer

Reddy, Haritha; Apr 1, 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0262

Report No.(s): AD-A471245; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cdk4 is an important regulator of G1/S cell cycle progression in mammalian cells. Loss of cdk4 in the mammary glands of mice results in abnormal development as evidenced by small fat pads and poor ductal branching. Dereglulation of Ras signaling is seen in many cancers. The aim of this study is to determine the role of Cdk4 in Ras-induced breast tumorigenesis. Results presented in this study indicate that approximately 90% of cdk4 $-/-$: MMTV-v-Ha-ras mice remain resistant to v-Ha-ras-induced breast tumorigenesis while only 40% of their wildtype counterparts were found to be tumor-free. These studies also indicate that both cdk4 $+/+$: MMTV-v-Ha-ras mice and cdk4 (R24C/R24C): MMTV-v-Ha-ras mice induce Ras-driven breast tumors with the same frequency. Many of these tumors showed elevated levels of cell cycle proteins as well as increased levels and activity of Ras, Raf, MEK and ERK proteins. These results indicate that Cdk4 is important for v-Ha-ras-induced mammary tumorigenesis and that activating mutations in Cdk4 do not accelerate this process.

DTIC

Abnormalities; Breast; Cancer; Cells (Biology); Mammals; Mammary Glands; Tumors

20070037747 Texas Univ., Houston, TX USA

A High Resolution Clinical PET with Breast and Whole Body Transfigurations

Wong, Wai-Hoi; Aug 2006; 161 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0461

Report No.(s): AD-A471319; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Despite advances in the last decade, the radiographic diagnosis of breast cancer remains uncertain. Of the annual 600,000 cases referred for biopsy by mammograms each year, 400,000 are unnecessary, costing \$2 billion annually. The diagnosis of breast cancer in young women and women with silicone implants continues to be difficult. Accurate detection of small breast tumors (2-3 mm) is still to be achieved. Positron emission tomography (PET) has the potential to reduce this high healthcare cost, unnecessary painful anxiety, and to improve diagnosis and survivability for women of all ages. We have developed the detector and electronic technology for building an ultrahigh resolution PET camera. We propose to use such technology to construct an ultrahigh resolution PET that has a dedicated breast-diagnosis mode that has 13-26 times higher detection sensitivity than regular PET and an ultrahigh image resolution of 3mm compared to the 4.5-6 mm in today's PET cameras. We have already developed a scaled-down engineering prototype PET to confirm the feasibility that 3 mm tumor can be detected accurately. We propose to construct a scaled-up clinical version of the design so that it can be used for clinical human trials to confirm the clinical utility.

DTIC

Breast; Cancer; High Resolution; Mammary Glands; Positrons; Tomography

20070037768 Texas Univ., Houston, TX USA

TARGET (Translational Approaches for the Reversal, Genetic Evaluation and Treatment) of Lung Cancer

Hong, Waun K; Khuri, Fadio R; Sep 2006; 347 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0706

Report No.(s): AD-A471363; No Copyright; Avail.: Defense Technical Information Center (DTIC)

TARGET is focused on a series of projects designed to obtain data in the preclinical and clinical settings to help us further the epidemiology of lung cancer, the molecular biology, genetics and epigenetics of lung cancer in the context of tobacco-damaged aerodigestive tract tissue, and the anticancer activity of several promising new agents, and various treatment and drug delivery approaches in models of lung cancer and other aerodigestive tract tumors.

DTIC

Cancer; Genetics; Lungs; Targets

20070037769 Cleveland Clinic Foundation, Cleveland, OH USA

Rapid Detection of Cellular Response to Biological Agents

Williams, Bryan R; Feb 2005; 135 pp.; In English

Contract(s)/Grant(s): DAMD17-01-C-0065

Report No.(s): AD-A471370; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our program objective is to develop simple and rapid methods for detecting at a cellular level, individual responses to environmental stresses elaborated by exposure to infectious agents such as bacteria and viruses. Our methods are based on transcript profiling and post-translational modification of proteins involved in signal transduction. Our hypothesis is that human cells respond to infectious insults to a genetically predetermined extent by stimulating the expression of sets of genes and activating signaling pathways that provide a specific signature for a given agent. We propose that this response will determine the outcome of the infection. We will test this hypothesis by developing custom cDNA and protein arrays designed to detect cellular responses to infectious agents. These will be tested using RNA and protein isolated from tissues sources most likely to be exposed. Our long term goal is to develop rapid quantitative detection devices to measure exposure and response to biological warfare, bioterrorism or emerging agents enabling appropriate triaging and medical intervention to save lives and to avoid unnecessary treatments. We have made significant progress towards this goal during the funded period of 1 Oct 2001 - 28 Feb 2005. We have used our custom cDNA microarrays to characterize the responses of mouse and human cells, in vitro and in vivo, to a variety of pathogens and shown that transcriptional profiles can indeed serve to differentiate between types of infections. We have made progress in the development of single chain antibodies for use in protein arrays to detect activation of signaling pathways impacted by biological agents. Moreover, the course of these studies, we have made a number of discoveries regarding the involvement of specific pathogen and host factors in the mechanisms and regulation of these signaling pathways.

DTIC

Bacteria; Detection; Genetics; Transferring; Viruses

20070037776 California Univ., Irvine, CA USA

Comparison of the Specificity of MREIT and Dynamic Contrast-Enhanced MRI in Breast Cancer

Birgul, Ozlem; May 2007; 81 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0446

Report No.(s): AD-A471382; No Copyright; Avail.: Defense Technical Information Center (DTIC)

It is possible to detect locations of lesions accurately in breast cancer using techniques such as x-ray mammogram accurately; however, the specificity of current techniques is low. Since the conductivity values of malignant, benign, and normal tissues are significantly different, this information can be used in classification. Current conductivity imaging techniques can only provide low-resolution images and fail in extreme cases. Magnetic resonance-electrical impedance tomography (MREIT) is a new modality that can reconstruct high-resolution conductivity images. In this study, we propose the use of MREIT for improving accuracy of breast cancer classification. In this project, MREIT system for 3D data acquisition was implemented. Mesh generation and image reconstruction algorithms in 3D were developed. 3D phantom studies were carried out successfully. Preliminary animal experiments that demonstrate conductivity contrast for R3230 tumor models were carried out. Data acquisition system was generalized for imaging at different field strengths. Preliminary images were acquired using fast imaging sequences that is crucial in in vivo imaging. During this period, PI acquired training in tumor biology and different imaging modalities in tumor imaging.

DTIC

Breast; Cancer; Electrical Impedance; Field Strength; Imaging Techniques; In Vivo Methods and Tests; Magnetic Resonance; Mammary Glands; X Rays

20070037777 Johns Hopkins Univ., Baltimore, MD USA

CDK5 as a Therapeutic Target in Prostate Cancer Metastasis

Nelkin, Barry; Jan 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0139

Report No.(s): AD-A471383; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have recently found that CDK5 is active in prostate cancer cell lines and in almost all human metastatic prostate cancers, and inhibition of CDK5 activity resulted in reduction of spontaneous metastases by 79%. In this project, we intend to develop CDK5 as a novel therapeutic target. Therefore, we proposed to characterize a series of small molecule CDK5 inhibitors for specificity in cell culture, and for their effect on xenograft models of prostate cancer. We also proposed to examine the role of CDK5 activity in growth of prostate cancer metastatic to bone, using PC3 based bioluminescent cell clones, and to explore the potential for CDK5 inhibition to sensitize prostate cancer cells to chemotherapy. In the current reporting period, we have found that a small molecule derivative of hymenialdisine is a selective inhibitor CDK5, blocking cell motility without an effect on cell growth. This compound may be useful in limiting metastases in prostate cancer. We have also developed the bioluminescent clones of PC3 cells necessary for our proposed examination of the effect of CDK5 inhibition on prostate cancer cell growth in the bone microenvironment.

DTIC

Bioluminescence; Cancer; Chemotherapy; Metastasis; Prostate Gland; Targets; Therapy

20070037779 Mount Sinai School of Medicine, New York, NY USA

Influence of Bone Remodeling Inhibition on the Development of Experimental Stress Fractures

Schaffler, Mitchell B; Nov 2005; 84 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8515

Report No.(s): AD-A471385; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Stress fractures result from repetitive loading and have been regarded as a mechanical fatigue-driven process. However, a number of studies indicate implicate increased bone remodeling in the pathogenesis of stress fractures. Our experiments tested the hypothesis that pharmacological inhibition of bone remodeling will slow the accumulation of microdamage and diminish the severity of the stress fracture. Using a bisphosphonate (BIS) to suppress remodeling in the rabbit tibial stress fracture model, we found that antiresorptive therapy reduced the intensity of the stress fracture response in this model. (99mTechnetium uptake reduced by approximately 50 percent, size of the resulting fracture callus reduced by about 30-50% in BIS-treated animals) and a trend toward reduced bone microdamage accumulation. These data are consistent with the hypothesis that bone remodeling contributes to the pathogenesis of stress fracture. However, variability in this model was

greater than expected, limiting our ability to move forward with this animal model. We also report on the results of novel model for stress fracture healing, using adult rats, developed under the aegis of this program.

DTIC

Bones; Fractures (Materials); Pathogenesis

20070037784 SRI International Corp., Menlo Park, CA USA

A Problem-Solving Environment for Biological Network Informatics: Bio-Spice

Lincoln, Patrick; Pedersen, Charles J; Jun 2007; 142 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-01-C-0153; DARPA ORDER-M293; Proj-BIOC

Report No.(s): AD-A471395; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The integration of multiple bioinformatics tools into an integrated suite poses many software engineering, social, and research challenges. We present our work on Bio-SPICE, an integrated open-source framework of tools for modern biology. SRI led the integration tasks, bringing together a community of researchers and practitioners to agree on a set of standards and practices that enabled multiple tools from multiple institutions to be brought to bear on problems of interest to biologists working on DoD-relevant problems. Working through communication and cultural barriers, the Bio-SPICE community developed good working relationships and built a series of impressive use cases, highlighting the effectiveness of combinations of computational tools from multiple sources working together on a common problem. This report documents the efforts at SRI International in leading the integration and combining research efforts across the Bio-SPICE program, including the development of the Bio-SPICE user interface, standards, and community working groups.

DTIC

Computer Programming; Problem Solving; Software Engineering

20070037791 Illinois Univ., Urbana, IL USA

Acetylcholinesterase-Based Electrochemical Multiphase Microreactor for Detection of Organophosphorous Compounds (Preprint)

Monty, Chelsea N; Oh, Ilwhan; Masel, Richard I; Apr 2007; 29 pp.; In English

Contract(s)/Grant(s): FA8650-04-1-7121; Proj-4H20

Report No.(s): AD-A471414; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A dual microchannel device with a gas-liquid interface was developed for use as an amperometric biosensor for the detection of organophosphorus compounds based on acetylcholinesterase inhibition. Electric eel acetylcholinesterase was immobilized on the liquid microchannel by creating a cross-linked gel with glutaraldehyde. The system was tested with malathion, an organophosphorus pesticide. The detection limit of the sensor in the parts-per-trillion range and the detection is rapid, sensitive, and selective to only phosphonates. Incorporation of existing acetylcholinesterase biochemistry into a micro-scale sensor also allows the device to be easily portable.

DTIC

Acetyl Compounds; Cholinesterase; Detection; Gas Detectors; Organic Phosphorus Compounds

20070037793 Illinois Univ., Chicago, IL USA

Tc-99m Labeled and VIP-Receptor Targeted Liposomes for Effective Imaging of Breast Cancer

Onyuksel, Hayat; Sep 1, 2006; 88 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0415

Report No.(s): AD-A471416; No Copyright; Avail.: Defense Technical Information Center (DTIC)

However, current methods of breast cancer detection cannot provide accurate results. This study was conceived to begin to address this issue by developing and testing a novel method of active targeting of radionuclide (Tc-99m) encapsulating sterically stabilized liposomes (SSL) for gamma scintigraphic imaging of breast cancer. This non-invasive imaging modality utilizes both overexpression of vasoactive intestinal peptide (VIP) receptors in breast tumor and distinct biology of the tumors (leaky vasculature) to target specifically to breast cancer. The liposomal imaging agent developed in this study encapsulates multiple molecules of Tc99m for high sensitivity. In addition, its specificity for breast cancer is achieved with a peptide (VIP) the receptors of which are over expressed in breast cancer. Targeting of this novel liposomal imaging agent to breast tumors was tested both in vitro using rat and human breast cancer tissues and in vivo using a carcinogen induced rat breast cancer model. The results showed that significantly more VIP-SSL were bound to carcinogen-induced rat breast cancer tissue sections than SSL without VIP or with non-covalently associated VIP. The imaging results demonstrated that Tc-99m encapsulating VIP-SSL showed a higher tumor-to-background ratio than Tc-99m encapsulating SSL. In addition, the accumulation of

Tc-99m encapsulating VIP-SSL was significantly higher than Tc-99m encapsulating SSL in rat breast tumor, suggesting that the presence of VIP did serve the purpose of active targeting of liposomes, confirming the results obtained by imaging studies. In conclusion, the novel breast tumor targeted liposomes developed in this study can provide accurate detection of breast cancer in the clinics. In addition, the same targeted carrier system can be used in the future for the targeted delivery of anticancer agents to breast tumors for safe and effective chemotherapy of breast cancer.

DTIC

Breast; Cancer; Imaging Techniques; Lipids; Mammary Glands; Peptides

20070037794 Isis Pharmaceuticals, Inc., Carlsbad, CA USA

Optimization of Broad-Spectrum Antimicrobial Activity for Novel Compound Classes

Griffey, Richard H; Apr 2005; 110 pp.; In English

Contract(s)/Grant(s): DAMD17-02-2-0023

Report No.(s): AD-A471417; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This final report summarized the results obtained from the preparation, evaluation, and extensive SAR analysis of hundreds of compounds with an emphasis on improving the antimicrobial activity of three compound classes outlined in our original proposal. The first class includes the substituted pyranosyl cytosines, the second class of compounds are the heterobiaryl guanidines, and the third are bis-heteroarylamidrazones

DTIC

Antibiotics; Antiinfectives and Antibacterials; Bacteria; Microorganisms; Molecules; Range (Extremes); Ribonucleic Acids; Spectra

20070037799 California Univ., San Diego, La Jolla, CA USA

Combinatorial Strategies and High Throughput Screening in Drug Discovery Targeted to the Channel of Botulinum Neurotoxin

Montal, Mauricio; Sep 1, 2006; 16 pp.; In English

Contract(s)/Grant(s): DAMD17-02-C-0106

Report No.(s): AD-A471426; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ultimate goal of this program is to discover selective and potent drugs targeted to prevent or relieve the neurotoxic actions of botulinum neurotoxin (BoNT) A. A major goal of this program is the identification of open channel blockers as a single class of drugs that would be effective against all BoNT isoforms. We consider the BoNT channel as a validated target for intervention aimed to inhibit the translocation of the light chain into the cytosol and therefore to attenuate the BoNT neurotoxicity. The major focus thus far has been the implementation of a reliable and robust high-throughput screen for blockers specific for BoNT using Neuro 2A cells in which BoNTA forms channels with similar properties to those previously characterized in lipid bilayers. The immediate task during the present reporting period involved the detailed characterization of the channel and chaperone activity of BoNTA on Neuro2A cells.

DTIC

Clostridium Botulinum; Combinatorial Analysis; Drugs

20070037803 Burnham Inst., La Jolla, CA USA

Nanocrystal Targeting In Vivo

Akerman, Maria E; Chan, Warren C; Laakkonen, Pirjo; Bhatia, Sangeeta N; Ruoslahti, Erkki; Aug 1, 2002; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0315

Report No.(s): AD-A471431; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Inorganic nanostructures that interface with biological systems have recently attracted widespread interest in biology and medicine. Nanoparticles are thought to have potential as novel intravascular probes for both diagnostic (e.g., imaging) and therapeutic purposes (e.g., drug delivery). Critical issues for successful nanoparticle delivery include the ability to target specific tissues and cell types and escape from the biological particulate filter known as the reticuloendothelial system. We set out to explore the feasibility of in vivo targeting by using semiconductor quantum dots (qdots). Qdots are small (<10 nm) inorganic nanocrystals that possess unique luminescent properties; their fluorescence emission is stable and tuned by varying the particle size or composition. We show that ZnS-capped CdSe qdots coated with a lung-targeting peptide accumulate in the lungs of mice after i.v. injection, whereas two other peptides specifically direct qdots to blood vessels or lymphatic vessels in tumors. We also show that adding polyethylene glycol to the qdot coating prevents nonselective accumulation of qdots in

reticuloendothelial tissues. These results encourage the construction of more complex nanostructures with capabilities such as disease sensing and drug delivery.

DTIC

Crystals; In Vivo Methods and Tests; Nanocrystals; Nanostructures (Devices)

20070037810 Albuquerque Univ., Albuquerque, NM USA

The Role of Telomeric Repeat Binding Factor 1 (TRF1) in Telomere Maintenance and as a Potential Prognostic Indicator in Human Breast Cancer

Bulter, Kimberly S; Griffith, Jeffrey K; Apr 2007; 19 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0370

Report No.(s): AD-A471441; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The aims of this study are to (i) determine the relationships between the telomere binding protein Telomere Repeat Binding Factor I (TRFI) and other telomere binding proteins (ii) establish the potential of TRFI as a surrogate marker for telomere content (TC) and as a potential clinical marker and (iii) characterize the relationship between the telomere binding protein TRFI and TC. Through examining the role of TRFI in telomere length control and in breast cancer progression this project also fosters the education of the candidate through the interaction with several experts in breast cancer pathology, biostatistics and clinical and basic research. The experiments involved require the interaction with professionals from several different fields of the biomedical sciences and the mastery of several challenging laboratory techniques. To date all specific aims; as outlined in the Statement of Work are expected to be completed on schedule. The research is in progress.

DTIC

Breast; Cancer; Maintenance; Mammary Glands; Telomeres

20070037812 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Detainee Medical Operations during Operation Iraqi Freedom: Determination of a Transition Plan

Sheaffer, Matthew A; Jun 15, 2007; 76 pp.; In English

Report No.(s): AD-A471445; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA Armed Forces in Iraq currently provides health care for thousands of detainees in U.S. custody. Required health care, in accordance with Department of Defense Directive and U.S. Army regulation, for detainees surpasses current deployable U.S. Army medical capabilities. Planning for the Iraqi government to take over essential services must include the provision for detainee health care. Nearly eight years prior to the initiation of Operation Iraqi Freedom, a decay of the Iraqi health care system began. Toward the end of the Saddam Hussein regime, money was shifted away from the health care system to bolster the military capability. Currently, a lack of security has effected reconstruction projects and resulted in hundreds of doctors and nurses to flee the country for personal safety as they are routinely kidnapped and killed by insurgent forces. This study answers the question: In light of international guidelines, Iraqi capabilities and U.S. obligations, can a transition plan be developed to allow the Iraqi government to assume the medical operations for detention operations? The study leads to the conclusion that U.S. Army regulations and doctrine does not fully support the Department of Defense Detainee Operations Policy. Additionally, new classifications of detained persons by U.S. Government have added confusion as to the treatment required and placed restraints for disposition of detainees on U.S. Army units conducting detention operations. Finally, the lack of security has dramatically slowed reconstruction projects, including hospitals and clinics; along with the inability of the Iraqi Government to maintain proper checks and balances among ministries, has permitted a continual decline of the medical capabilities throughout the country. Removal of discrepancies throughout DoD's detainee operations policy, acceptance of the Iraqi standard of detention health care are elements to facilitate a detainee medical operation transition plan.

DTIC

Medical Services; Warfare

20070037821 Boston Univ., Boston, MA USA

Assessment of the Genetic Variation in Bone Fracture Healing

Gerstenfeld, Louis C; Jan 2006; 84 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0576

Report No.(s): AD-A471462; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The hypothesis of these studies is that genetic processes that lead to the variations in both structural and material properties of bone development will be recapitulated in the developmental mechanism(s) that controls the bone quality during fracture healing. Two goals were set out in this proposal to test this hypothesis. The first was to determine how variations in

basic bone quality in the three in bred strains of mice were expressed during fracture healing. MicroCT and mechanical testing of day 21 and 35 fracture calluses demonstrated that each strain recapitulated their variations in geometric and material (BMD/BMC) properties during fracture healing. Furthermore, variations in bone quality differentially effected the rates of healing (i.e. there are genetic variations slow versus fast bone healing). The second goal was directed at identifying the underlying biological processes that lead to genetic variation, which effect both bone quality and rates of healing. Our data demonstrate that there is genetic variations in rates endochondral bone formation during fracture healing which recapitulate differences seen in original bone growth(i.e. genetic strains that show slow or fast epiphyseal growth show slow or fast fracture healing. Large scale transcriptional profiling initiated during the tenure of this grant is ongoing to further define genetic variability in fracture healing.

DTIC

Bone Mineral Content; Bones; Dwell; Fractures (Materials); Genetics; Healing

20070037836 Stanford Univ., Stanford, CA USA

A Novel Yeast Genomics Method for Identifying New Breast Cancer Susceptibility Genes

Brown, J M; Brown, James A; May 2007; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0451

Report No.(s): AD-A471490; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We are attempting to identify novel genes in the yeast *S. cerevisiae* that confer gross chromosomal instability (GCI) a hallmark of most breast cancers when deleted. Using a collection of yeast strains carrying the deletion of a unique open reading frame, we have transfected a yeast artificial chromosome (YAC) as a reporter for GCI frequency to determine the quantitative impact of the loss of each gene function. We have constructed the redesigned reporter with all of the components for selection and maintenance. The URA3 gene results in sensitivity to 5-FOA and the methionine regulated BAX gene induces apoptosis in yeast in individual and pooled deletion strains, and the NatMX (nourseothricin resistance) marker for YAC retention... We have introduced the YAC by mating into the entire collection of deletion strains and are currently running the pooled growth assay to identify genes affecting GCI. The mammalian orthologs of the resulting candidate genes methods. There is a crucial need to find new candidate genes for breast cancer susceptibility in women and identifying these human genes can further improve monitoring and treatment guidelines for women with these mutations.

DTIC

Breast; Cancer; Genes; Identifying; Mammary Glands; Oncogenes; Yeast

20070037837 California Univ., Los Angeles, CA USA

A Genetic Approach to Define the Importance of Rheb in Tuberous Sclerosis

Tamanoi, Fuyuhiko; Jan 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0164

Report No.(s): AD-A471491; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have made progress in characterizing Rheb2, examining effects of the TSC/Rheb/mTOR signaling on cell cycle progression, investigating mechanism of activation of mTOR and examining consequences of the activation of the TSC/Rheb/mTOR signaling pathway. We have shown that the TSC/Rheb/mTOR signaling pathway affects nuclear translocation of a Cdk2 inhibitor, p27. Novel activating mutations of mTOR were identified. Consequences of the activation of the TSC/Rheb/mTOR signaling pathway on cell physiology are being investigated. Our study makes significant contribution to understand how the TSC/Rheb/mTOR signaling pathway is regulated. Our investigation into cellular consequences of the activation of this pathway is important in understanding tuberous sclerosis.

DTIC

Arteriosclerosis; Genetics

20070037838 Brigham and Women's Hospital, Boston, MA USA

Reproductive and Hormonal Risk Factors for Breast Cancer in Blind Women

Lockley, Steven W; Jun 2007; 13 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0553

Report No.(s): AD-A471492; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Epidemiological observations indicate that breast cancer risk is lower in visually impaired women compared to sighted women and that risk is inversely correlated with degree of visual impairment. A hypothesis to explain these findings is that blind people are less susceptible to suppression of melatonin by light exposure at night and therefore have higher levels of

melatonin. Melatonin has oncogenic properties in vitro. In a survey of blind women, we will test the hypothesis that 1) the distribution of known reproductive risk factors for breast cancer among blind women will be consistent with lower risk when compared to the general population. In a subset of 240 women, we will test the hypotheses that 2) urinary melatonin levels are lower and estrogen levels are higher among blind women with light perception compared to women without light perception; 3) melatonin levels will be higher and estrogen levels lower among totally blind women who have non-24-hour melatonin rhythms and therefore a confirmed absence of light-induced suppression of melatonin, compared to totally blind women who have 24-hour melatonin rhythms and may be affected by light.

DTIC

Blindness; Breast; Cancer; Circadian Rhythms; Defects; Epidemiology; Estrogens; Females; Hormones; Mammary Glands; Risk; Vision

20070037839 Vanderbilt Univ., Nashville, TN USA

Manipulation of NF-KappaBeta Activity in the Macrophage Lineage as a Novel Therapeutic Approach

Yull, Fiona E; May 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0456

Report No.(s): AD-A471493; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Morphogenesis of the mammary gland is a highly complex process which when misregulated can result in tumorigenesis. It involves the interactions of multiple cell types in a highly regulated manner with complex signal transduction pathways coordinating the physiological processes. Interactions between epithelial and mesenchymal cells are known to be important. Recent studies highlight the importance of cell types, such as macrophages. The nuclear factor-kappa B (NF-kB) family of transcription factors appears to be critical in regulating the dynamic changes during normal and neoplastic development. This proposal seeks to investigate the contribution of NF-kB signaling within macrophages in normal and neoplastic mammary development. Our data will provide insights into the importance of NF-kB signaling in macrophages for tumor development and progression and have the potential for identification of novel therapeutic strategies. During this period we continued to characterize macrophages with constitutive NF-kappaB activity and identified differences in proliferation rates, expression of downstream gene expression and effects mediated by altered macrophages on associated epithelial cells. In addition, we have obtained the 3rd novel transgenic necessary for an inducible system to make feasible manipulation of NF-kappaB activity in macrophages in vivo. We have generated the double transgenics necessary to test our new models and have preliminary data to suggest that altered NF-kappaB activity within macrophages has significant effects on mammary ductal development.

DTIC

Macrophages; Mammary Glands; Therapy

20070037840 Salk Inst., La Jolla, CA USA

The Antemortem Detection and Conformational Switches of Prion Proteins

Schubert, David; Jul 2006; 40 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0285

Report No.(s): AD-A471494; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Blood from animals with prion disease contain low levels of prion infectivity, which primarily resides in the white blood cells (WBCs). We have developed a method that combines isolation of WBCs and cell blotting of PrPsc to detect individual cells that contain PrPsc. Sensitivity studies suggest that it can detect as low as 10 prion-infected cells in 5 x 10⁵ WBCs. The assay is able to detect the prion-infected cells in the blood of some, but not all, prion-infected animals at the clinical stage. We believe that the combination of this method with a recently published successful cyclic amplification of protein misfolding (PMCA) procedure may give the required sensitivity for antemortem detection of prion in blood. In addition, a structure-activity relationship study of the fungal HET-s prion shows that a unique amyloid fibrillar structure is the infectious entity of the HET-s prion, and glycoform stoichiometry of host protein was found to regulate prion strain specificity.

DTIC

Blood Cells; Clinical Medicine; Leukocytes; Proteins; Stoichiometry; Switches

20070037841 Northern California Inst. for Research and Education, San Francisco, CA USA

Mitochondrial Structure and Reactive Oxygen Species in Mammary Oncogenesis

Lau, Yun-Fai C; Apr 2007; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0247

Report No.(s): AD-A471495; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Oxidative stress may play a role in human oncogenesis, including breast cancer. The mitochondria are most common

sources of reactive oxygen species (ROS) responsible for most oxidative stress. This project evaluates the role of mitochondrial abnormalities in oxidative stress in breast cancer development. Complex II mutant subunits, affecting the quinone-binding site or the heme b ligand binding site, were generated and analyzed in both cell culture and transgenic mouse systems in terms of mitochondrial functions, ROS production and oncogenesis. Results from this study demonstrate that short-term expression of these mutants induces apoptosis in the cells; and transgenic mice harboring these mutant complex II subunits develop tissue vascularization and tumors at advanced ages. These findings suggest a role of oxidative stress in breast cancer development and progression, and provide clues on whether antioxidants are beneficial in prevention and treatment of such important cancer in women.

DTIC

Breast; Cancer; Mammary Glands; Mitochondria; Oxygen; Reactivity; Tumors

20070037842 Harvard Medical School, Boston, MA USA

Role of the p53 Tumor Suppressor Homolog, p63, in Breast Cancer

Yang, Annie; May 2007; 41 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0386

Report No.(s): AD-A471497; No Copyright; Avail.: Defense Technical Information Center (DTIC)

p63 is a member of the p53 gene family, and shows structural and functional similarities to the p53 tumor suppressor. While p53's role in breast carcinogenesis is well established, p63's involvement in this disease remains unclear. It has been shown that p63 is expressed in the myoepithelial cells of the breast, and that p63 is essential for mammary development. The main goal of this project is to investigate the potential role of p63 in breast cancer. Despite the homology to p53, p63's functions and mechanisms cannot necessarily be extrapolated from p53 paradigms. To understand the mechanisms of transcriptional regulation by p63, we analyzed p63 DNA-binding sites in vivo across the entire human genome. We provide evidence for the biological relevance of the binding sites identified, including motif discovery and evolutionary conservation. We also used RNAi strategies to analyze the consequences of p63 deficiency. By combining data from expression profiling of p63-depleted cells with the in vivo binding data, we identify a subset of genes that are directly regulated by p63. These include genes in cell proliferation, apoptosis, and various signaling pathways. A similar analysis of p73 DNA binding sites showed a striking overlap with p63 and evidence of co-occupancy by these two factors. These findings have implications for how these highly homologous transcription factors are recruited to DNA, and how they impact each other's respective biological functions.

DTIC

Breast; Cancer; Chromatin; Genes; Mammary Glands; Proteins; Suppressors; Tumors

20070037843 New South Wales Univ., Australia

Treatment of Prostate Cancer by Targeting Vascular Endothelial Growth Factor Receptors (VEGFRs) and Micrometastases With Bismuth-213 Labeled Vectors

Abbas Rizvi, Syed M; Nov 2006; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0621

Report No.(s): AD-A471499; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main purpose of the proposed study was to evaluate the toxicity and efficacy of multiple targeting vectors for the treatment of prostate cancer in mouse models. It included Avastin, an anti-vascular endothelial growth factor (VEGF) antibody and PAI2, a protein that targets uroplasinogen activation (uPA) receptors in the PA system; both to be used in combination therapy together with labeling with alpha-emitting radionuclide, Bismuth-213. New methods for the labeling of Avastin were developed with labeling efficiency in excess of 90%. The resulting conjugate was tested for in vitro stability and was found to be stable with less than 20% leaching over a period of 5 half-lives of the isotope. Enhancement of plasminogen activation expression was achieved with VEGF with PC3 cell line showing the maximum enhancement, DU145 showing some enhancement whereas LN3-LNCaP showing no change in its other negative uPA expression. VEGF secretion was estimated for the three cell lines and based on that PC3 was chosen for the tumour model development. Subcutaneous and orthotopic tumour models were successfully developed in mice and are subject of the ongoing in vivo studies. Successful labeling and stability testing of the Avastin conjugate is world first and remains the most significant finding of the study to-date.

DTIC

Bismuth Isotopes; Cancer; Cardiovascular System; Prostate Gland

20070037844 Texas Univ., Houston, TX USA

The Regulation of JAB1 and Its Role in Breast Cancer

Johnson, Terry J; Mar 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0330

Report No.(s): AD-A471501; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of the research done has been to determine the mechanism for overexpression of JAB1 through transcription factor analysis and FISH as well as the role of JAB1 in resistance. The major findings thus far are 1) The promoter region of JAB1 was analyzed and key transcription factors were identified that may drive JAB1 expression, CEBP alpha and GATA1 2) We have performed FISH on a number of breast cancer cell lines and patient fine Needle aspirations and have seen amplification of the JAB1 locus 3) JAB1 overexpression confers resistance to Herceptin in breast cancer cell lines SKBR3 and BT474, and inhibition of JAB1 increased the efficacy of Herceptin mediated G1 arrest and p27 accumulation. We completed the tasks listed for this time period and are on track as indicated in the SOW.

DTIC

Breast; Cancer; Mammary Glands

20070037845 Georgetown Univ. Hospital, Washington, DC USA

Transcription Factor Stat5 in Invasion and Metastasis of Human Breast Cancer

Wang, Youhong; May 2007; 19 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0408

Report No.(s): AD-A471502; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Class IA PI3Ks are regarded the most important in regulating cell proliferation and tumorigenesis. The p55 protein is a regulatory subunit of class IA PI3K. In vitro study has demonstrated that the NH2-terminal of p55 is sufficient to bind the cell cycle regulatory protein pRb. Association between calmodulin and p55 in 293T cells has been demonstrated by calmodulin sepharose beads pull-down assay in the previous report. We also demonstrated that p55 stabilized the interaction between calmodulin and Rb. We aim to uncover the cell cycle and growth regulation effect of p55 protein by overexpression and RNA interference analysis. Here we confirmed the co-immunoprecipitation of Rb with p55 protein. However, by overexpression of full-length p55 in MCF-7 cells or knocking down of p55 in AU565 cells, we could not demonstrate a significant effect on the cell cycle or cell growth. Using SK-Br-3 cells as a model for breast cancer cells, we found a shift in composition among the PI3K regulatory subunits once p55 was manipulated. Other PI3K regulatory subunits such as p85 and p50 increased when p55 was knocked down, and p85 decreased when p55 was overexpressed. This could account for the marginal effect we observed when we expressed or down-regulated p55 in breast cancer model systems.

DTIC

Breast; Calcium; Cancer; Mammary Glands

20070037846 Hamilton Regional Cancer Centre, Hamilton, Ontario Canada

The Role of Protein Elongation Factor eEF1A2 in Breast Cancer

Lee, Jonathan M; Sep 2006; 94 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0671

Report No.(s): AD-A471503; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall goal of the project is to explore the role of protein elongation factor eEF1A2 in breast tumor development and to determine whether eEF1A2 is a useful breast cancer prognostic factor. eEF1A2 is one of two members of the eEF1A family of proteins (eEF1A1 and eEF1A2) that bind amino-acylated tRNA and facilitate their recruitment to the ribosome during protein translation elongation. We have identified eEF1A2 as a novel breast cancer oncogene. Supporting this idea are our observations that: a) eEF1A2 expression is increased in approximately 50% of human breast tumors; b) eEF1A2 protein expression is a prognostic marker for breast cancer survival; c) eEF1A2 enhances the growth rate of malignant breast cells; d) eEF1A2 inhibits anoikis; e) eEF1A1 activates the Akt/PKB serine/threonine kinase; e) siRNA that inactivate eEF1A2 and inhibit the in vitro growth of breast cell lines; and f) eEF1A2 expression causes rearrangement of the actin cytoskeleton. Taken together, our observations indicate that eEF1A2 is likely to play a causal role in the development of breast cancer and that it is a likely target for breast cancer therapy.

DTIC

Breast; Cancer; Elongation; Mammary Glands; Proteins

20070037847 Wayne State Univ., Detroit, MI USA

Use of Mitochondria-Specific Dye MKT-077 as a Radiosensitizer to Preoperatively Treat Locally Advanced Breast Cancer

Braun, Rodney D; Apr 2007; 13 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0264

Report No.(s): AD-A471504; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The major goal of this project is to determine if the rhodacyanine analog dye, MKT-077, can be used to inhibit breast cancer cell oxygen metabolism and raise tumor oxygen levels, thereby radiosensitizing the tumor. In the second year, we had to switch breast cancer cell lines from the human MDA-MB 231 line to the rat R3230Ac mammary adenocarcinoma line, because we were unable to grow xenografts from the human cells. We have now used the R3230Ac cells in the in vitro experiments to determine drug uptake and subsequent MKT-077-induced metabolic inhibition, as outlined in Tasks 1 and 2. As noted in the Year 1 report, we are determining MKT-077 drug uptake and metabolic inhibition using cell suspensions. This approach has been successful, and we have been able to show that the cells rapidly take up the drug in a dose-dependent manner, whether the cells have been raised on air or under hypoxic conditions. We have also shown that MKT-077 can inhibit cellular oxygen metabolism by up to 70% at a dose of 6 g/ml in R3230Ac cells grown on 2.5% O₂. Our modeling has shown that the magnitude and time course of the inhibition are both concentration-dependent. In addition, we have begun the in vivo work in Fischer 344 rats. Infusion of 7.5 mg/kg MKT-077 resulted in a small rise in PO₂ of about 2 mm Hg 10 minutes after the end of the infusion. We are currently completing the in vitro experiments and plan to expand the in vivo work by determining the effects of other drug doses and measuring PO₂ histograms.

DTIC

Breast; Cancer; Dyes; Mammary Glands; Mitochondria

20070037849 Vanderbilt Univ., Nashville, TN USA

Radiation Sensitization in Breast Cancer via Targeting Survivin Expression

Lu, Bo; May 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0501

Report No.(s): AD-A471507; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We proposed to determine whether overexpression of survivin results in radioresistance and the possible mechanisms; whether regulators of survivin serve as targets for radiosensitization. We also found that deregulation of survivin in breast cancer is mediated by Stat3 (Signal transducer and activator of transcription). Co-inhibition of survivin and Stat3 results in significantly increased sensitization of breast cancer. In addition we found that inhibition of apoptosis induces autophagy in cell culture model of breast cancer. Z-VAD a pan-caspase inhibitor resulted in further tumor growth delay in a xenograft model of breast cancer.

DTIC

Breast; Cancer; Mammary Glands; Radiation Tolerance

20070037850 South Carolina Univ., Columbia, SC USA

Nutritional Status, DNA Damage, and Tumor Pathology

Berger, Sondra H; Adams, Swann; Hebert, James; Butler, William; Li, Mei; Aug 2006; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0755

Report No.(s): AD-A471508; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Genes involved in DNA damage surveillance and repair are implicated in breast cancer susceptibility and in breast tumor pathology. We are testing the hypothesis that the risk for more aggressive breast cancer is increased by nutritional deficiencies of folic acid and niacin. The study population consisted of 40 women (self-reported as African-American or European-American) previously diagnosed with breast cancer in South Carolina. The status of folic acid, measured as 5,10-methylenetetrahydrofolate (MTHF), and niacin, measured as nicotinamide adenine dinucleotide (NAD), was determined in circulating erythrocytes. Also analyzed were the genotypes of two genes encoding enzymes that partition MTHF into two pathways, which contribute to genomic integrity. A highly sensitive assay for detection of MTHF was developed; MTHF levels varied by 12-fold among the patients. An association was observed between genotype of methylenetetrahydrofolate reductase (MTHFR) and MTHF levels. This association was predicted by other investigations but not directly demonstrated. A novel association was observed between MTHFR genotype and ER status of the tumor. The data suggest that larger translational

studies are warranted to validate the associations observed in this pilot investigation.

DTIC

Breast; Cancer; Damage; Deoxyribonucleic Acid; Erythrocytes; Folic Acid; Maintenance; Mammary Glands; Nicotinic Acid; Nutrition; Pathology; Tumors

20070037851 California Univ., San Francisco, CA USA

Structural Characterization and Determinants of Specificity of Single-Chain Antibody Inhibitors of Membrane-Type Serine Protease 1

Farady, Christopher J; Mar 2007; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0300

Report No.(s): AD-A471511; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Membrane-type serine protease 1 (MT-SP1) is a cancer-associated serine protease implicated in the tumorigenesis and metastasis of breast cancer. Inhibition of MT-SP1 activity has been shown to decrease metastatic potential. We have developed a number of potent and specific single-chain (scFv) antibody inhibitors to MT-SP1, and have begun to characterize their mechanism of inhibition. Through kinetic characterization and site-directed mutagenesis experiments, it has been determined that three potent inhibitors have separate and novel mechanisms of inhibition which do not mimic either biologically or pharmaceutically relevant protease inhibitors. These novel modes of binding and inhibition are the basis for their specificity, and suggest these inhibitors will have less cross-reactivity and toxicity problems when used in vivo to further dissect the role of MT-SP1 in breast cancer.

DTIC

Antibodies; Breast; Cancer; Enzymes; Inhibitors; Mammary Glands; Membranes; Peptides; Protease

20070037853 Maryland Univ., Baltimore, MD USA

A Multidisciplinary Evaluation of Traumatic Brain Injury: Early Predictors of Outcome

Dischinger, Patricia C; Apr 2007; 147 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0204

Report No.(s): AD-A471519; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is the final report of a follow-up study of 180 subjects with Mild TBI who were treated at a Level I Trauma Center. The goal of the study was: 1) to describe the natural history of Mild TBI and 2) to identify factors that best predict long term sequelae. Most symptoms increased within 3-10 day post-injury decreased again by 3 months. Although physical symptoms had the highest prevalence, most returned to pre-injury levels by 3 months. Emotional and cognitive symptoms, however, remained elevated. Overall, approximately 36% of patients still reported four or more symptoms (defined as post-concussive syndrome, PCS), even one year after their injury. Post-injury emotional symptoms were the strongest predictors of PCS. Also, women and older patients were at higher risk of PCS. Balance problems, as assessed by balance testing, were associated with noise sensitivity, perhaps indicative of vestibular problems. In addition, while not all patients had balance testing, due to the presence of other injuries, noise sensitivity was significantly associated with subjects inability to return to work or school at one year post-injury. The simple reaction time measure from ANAM did not predict PCS. There was no association between post-injury S100 levels and long term sequelae.

DTIC

Brain; Injuries; Predictions

20070037854 Beth Israel Deaconess Medical Center, Boston, MA USA

Functional Erythropoietin Receptors Expressed by Human Prostate Cancer Cells

Sytkowski, Arthur J; Oct 2006; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0233

Report No.(s): AD-A471524; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Erythropoietin is effective in correcting the anemia associated with cancer and chemotherapy. However, Epo receptors (EpoR) have been found on tumor cells and Epo may stimulate these cells. We discovered that prostate cancer cell lines and primary prostate tumors express EpoR. In this study, we propose to gain insight into a pattern of EpoR expression in primary human prostate tumors and adjacent normal tissue and to study the role of the EpoR and the effect of Epo administration on growth of prostate cancer cells transplanted into SCID mice. We have prepared prostate cancer cell lines containing antisense EpoR constructs to be used in loss-of-function studies in vivo. Because we had found that the tetracycline inducible vector system was very 'leaky', we transfected LNCaP and PC-3 cells with stable antisense constructs. We found that the single

stranded cDNA probe was not sensitive enough and, therefore, tested an S1 nuclease protection technique. We completed our immunohistochemistry pilot study showing EpoR in primary human prostate tumors. We also determined of baseline growth kinetics for prostate cancer cells transplanted into SCID mice.

DTIC

Cancer; Erythrocytes; Hematopoiesis; Hormones; Prostate Gland

20070037856 Duke Univ., Durham, NC USA

Optical Spectroscopy and Multiphoton Imaging for the Diagnosis and Characterization of Hyperplasias in the Mouse Mammary Gland

Skala, Melissa C; Sep 2007; 16 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0330

Report No.(s): AD-A471526; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In these studies, the potential of optical techniques for early breast cancer detection were tested in animal models and cell culture. Optical spectroscopy, in vivo and in vitro microscopy studies indicate that optical methods show great promise for the early diagnosis of cancer, and may potentially provide biologically relevant information that could aid in treatment decisions. The features extracted from diffuse reflectance spectra measured in vivo from the hamster cheek pouch model of epithelial carcinogenesis, including the hemoglobin saturation, absorption and reduced scattering coefficient, were significantly lower in neoplastic tissues compared to normal tissues ($p < 0.05$). Multiphoton lifetime microscopy experiments of the same animal model revealed that the lifetime of protein-bound NADH decreased with low grade and high grade precancers (consistent with the 2006 progress report) and the lifetime of protein-bound FAD increased with high grade precancer only ($p < 0.05$) in vivo. No significant changes in the mean cellular redox ratio were found with precancer development ($p > 0.05$) in vivo. However, there was an increase in the intracellular variability of the redox ratio with both high and low grade pre-cancers ($p < 0.05$) in vivo. Genetic perturbations that depleted breast cancer cells (MCF7) of lactate dehydrogenase had no effect on the optical redox ratio, which was measured using confocal microscopy ($p > 0.05$).

DTIC

Algorithms; Breast; Cancer; Diagnosis; Enzymes; Imaging Techniques; Mammary Glands; Mice; Microscopy; Spectroscopy

20070037859 Washington Univ., Seattle, WA USA

Identification of Tumor Rejection Antigens for Breast Cancer Using a Mouse Tumor Rejection Model

Disis, Mary L; May 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0537

Report No.(s): AD-A471530; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the proposed study, we aim to identify tumor rejection antigens using mouse tumor rejection models. The study has three specific aims: (1) to determine the antigen repertoire induced by tumor rejection in FVB/N mice; (2) to identify the human homologues of the candidate rejection antigens and determine their immunogenicity; and, (3) to examine the in vivo tumor protection effect of vaccination with plasmids encoding tumor rejection antigens in neu-tg FVB/N mice. In the past year, we have successfully identified the antigen repertoire induced by tumor rejection in FVB/N mice. The human homologues of the candidate rejection antigens have been determined by database mining. We also started in vivo vaccination experiment to examine the tumor protection effect of the candidate antigens. We have made important findings toward each specific aim during last year, and based on our results, we plan to expand our discovery technique to a different tumor model, examine the immunogenicity of the human homologues of the mouse tumor rejection antigens we have identified, and test the in vivo protection effect of plasmid DNA vaccine targeting a combination of antigens.

DTIC

Antigens; Breast; Cancer; Mammary Glands; Mice; Tumors

20070037860 Wayne State Univ., Detroit, MI USA

Characterization of Novel Genes Within 8P11-12 Amplicon in Breast Cancer

Yang, Zeng-Quan; Jun 2007; 36 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0459

Report No.(s): AD-A471532; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The development of breast cancer is associated with gene amplification and overexpression that are %believe to have a causative role in oncogenesis. An important challenge in breast cancer research is to identify and characterize these genetic changes. Focal amplifications involving chromosome 8p11-p12 occur in approximately 15% of primary uncultured

human breast cancers. Recently we have undertaken a detailed genomic and expression analysis of the 8p11-p12 amplicon in breast cancer cell lines and identified several novel candidate genes including TC-1 and FLJ14299. We observed that TC-1 is located at the common core-amplified domain of the 8p11-12 region and overexpressed in the subset of breast cancer cells. Furthermore we have found that TC-1 has properties of an oncogene: TC-1 expression in normal mammary epithelial cell line MCF10A increases growth rate and allows growth in soft agar. Notably suppression of TC-1 expression by siRNA inhibited cell proliferation in TC-1 over expressing breast cancer cell lines. Our recent data also suggested that TC-1 over-expression is associated with the enhanced expression of a subset of beta-catenin target genes in breast cancer.

DTIC

Breast; Cancer; Genes; Mammary Glands

20070037867 Washington Univ., Seattle, WA USA

Phase II Study of HER-2/neu Intracellular Domain Peptide-Based Vaccine Administered to Stage IV HER2 Positive Breast Cancer Patients Receiving Trastuzumab

Disis, Mary L; May 2007; 11 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0561

Report No.(s): AD-A471552; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary purpose of this grant is to determine the overall survival benefit in Stage IV HER2 positive breast cancer patients vaccinated with a HER2 ICD peptide-based vaccine while receiving maintenance trastuzumab. The scope of the work includes a Phase II single arm study of a HER2 ICD peptide based vaccine given concurrently with trastuzumab. Six patients have been enrolled during the last reporting period. All adverse events reported for these six subjects are of low grade. Patients enrolled will be HER2 overexpressing stage IV breast cancer patients who have been treated to a clinical complete remission or have stable bone only disease and are within 6 months of starting maintenance trastuzumab. There have been no major findings to date.

DTIC

Breast; Cancer; Mammary Glands; Patients; Peptides; Vaccines

20070037868 Geneva Foundation, Tacoma, WA USA

Call-Center Based Disease Management of Pediatric Asthmatics

Quinn, James M; Apr 2006; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0182

Report No.(s): AD-A471554; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There are no population based prospective randomized controlled trials comparing exclusive telephonic disease management in pediatric asthma. Determine the effectiveness of exclusively telephonic disease management on a population of pediatric military family members. Primary endpoints were patient and care giver quality of life (QOL), inhaled short acting beta agonist use, pulmonary function (FEV1), and health care utilization and costs. Patients were enrolled at three DoD military treatment facilities in a similar geographic region. There control group received usual care compared with an intervention group that received a remote call-based asthma disease management program utilizing proactive education and monitoring in a series of predetermined calls in conjunction with a 24/7 help/advice line. Comparisons were made for time 0, 6, and 12 months for QOL and FEV1 while medication use, health care utilization and costs were compared for the 12 month period pre-enrollment vs the 12 month of the study period. Data was analyzed as intention to treat via a three-factor ANOVA (treatment, entry severity, time). Results: A total of 452 patients were enrolled, 222 control and 230 intervention. While there were significant differences among the variables with regard to severity and over time, there were no significant effects between the intervention and control groups. Conclusions: There is no evidence that exclusively telephonic disease management improved outcomes in pediatric military family members over usual care.

DTIC

Asthma; Diseases; Management Systems; Medical Services

20070037869 Texas Univ., Dallas, TX USA

Breast Cancer Gene Therapy: Development of Novel Non-Invasive Magnetic Resonance Assay to Optimize Efficacy

Mason, Ralph P; May 2007; 270 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0343

Report No.(s): AD-A471555; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Gene therapy holds great promise for treatment of breast cancer. In particular clinical trials are underway to apply

therapeutic genes related to pro-drug activation or to modulate the activity of oncogenes by blocking promoter sites. However, there are major problems in terms of assessing the delivery to target tissue, assessing the uniformity (versus heterogeneity) of biodistribution, and determining whether the genes are expressed. We designed, evaluated and tested a novel approach to gene activity detection- specifically, using fluorinated substrates of beta-galactosidase to reveal gene activity. Our prototype molecule PFONPG (p-fluoro-o-nitro-phenyl beta-D-galactopyranoside) is a direct analog of the traditional yellow biochemical indicator ONPG (o- nitro-phenyl beta-D-galactopyranoside). Analogs of this prototype were developed to optimize MR and biological characteristics and explore the feasibility of tailoring the reporter to specific applications, e.g., exploiting -gal activity to deliver specific physiological reporter molecules such as pH and potentially specific cytotoxic agents. The agents have been tested in solution, applied to cultured breast cancer cells, and used to examine beta-gal activity in vivo in transfected breast tumors.

DTIC

Assaying; Breast; Cancer; Carcinogens; Gene Therapy; Magnetic Resonance; Mammary Glands; Neoplasms; Tumors; Viruses

20070037871 City of Hope Medical Center, Duarte, CA USA

Phenotype and Function of Bone Marrow Infiltrating Lymphocytes in Chronic Myelogenous Leukemia

Pullarkat, Vinod; Apr 2007; 8 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0277

Report No.(s): AD-A471557; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The aims of this project are to determine the phenotype and antileukemic activity of activated bone marrow infiltrating leukemia (MIL) and compare them to activated peripheral blood lymphocytes from patients with chronic myelogenous leukemia (CML) on imatinib or other tyrosine kinase inhibitor therapy. Bone marrow and peripheral blood specimens were obtained from CML patients who had at least a minor cytogenetic response. The phenotype of MILs and peripheral blood lymphocytes (PBL) was analyzed by flow cytometry. MILs and PBLs were expanded and activated with anti CD3/CD28 magnetic beads in culture for 10 days. Activated MILs and PBLs were characterized by flow cytometry and tested for antileukemic activity in a colony suppression assay by coculture with CD34+ bone marrow progenitors at varying CD3:CD34 ratios in methycullulose medium. Analysis of the phenotype of MILs from four patients showed that MILs are predominantly comprised of effector memory T cells. These MILs could be expanded effectively without change in phenotype. MILs as well as activated PBLs showed ability to suppress CML progenitor growth in vitro.

DTIC

Bone Marrow; Leukemias; Lymphocytes; Phenotype

20070037872 Texas Univ., Houston, TX USA

Functional Proteomic Analysis of Signaling Networks and Response to Targeted Therapy

Ram, Prahlad T; Mar 2007; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0267

Report No.(s): AD-A471558; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of the research done has been to determine the regulation of the EGFR network and identify how manipulations of the network alter signal flow to bypass targeted inhibitions. The scope of the project is to understand the network and determine which molecules have to be targeted to inhibit tumor cell proliferation. The major finding thus far are 1) We have performed the proteomic analysis of the signaling network in a panel of 4 breast cancer cell lines and determined the network response to EGF and targeted inhibitors. 2) We have determined how information flows within the network and feedback regulation. 3) Using these biological data we have developed a computational model and have made predictions to identify combinations of targets. We have completed the tasks listed for this time period and are on track as indicated in the original grant.

DTIC

Functional Analysis; Networks; Proteome; Therapy

20070037873 Rochester Univ., NY USA

Properties of Leukemia Stem Cells in a Novel Model of CML Progression to Lymphoid Blast Crisis

Jordan, Craig T; Oct 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0608

Report No.(s): AD-A471560; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Progression of CML from chronic phase to lymphoid blast crisis is a poorly characterized event. However, at least some

of the molecular events that accompany evolution of the disease have been described. One such event, mutation of the p16Ink4a/p19Arf locus, is known to occur in approximately 50% of patients developing acute lymphoid disease. Based on this observation, we generated a novel mouse model in which combination of the well-known BCR/ABL translocation with loss of function mutation at the p16Ink4a/p19Arf locus induces a very robust and authentic lymphoid blast crisis. In order to understand the earliest origins of disease pathogenesis, we have used the model to characterize leukemia stem cells (LSC) as they progress from chronic phase disease to blast crisis. Intriguingly, in the chronic phase, LSC can be derived only by introduction of BCR/ABL into normal hematopoietic stem cells (HSC). Expression of BCR/ABL at later stages of hematopoietic differentiation does not support development of disease. In contrast, upon loss of p16Ink4a/p19Arf activity, expression of BCR/ABL is sufficient to induce disease at multiple stages of hematopoietic differentiation (HSC, CLP, Pro-B, etc). These findings indicate evolution of LSC during progression to lymphoid blast crisis can occur via mutations in several different types of stem and progenitor cells, an observation that has important ramifications for the clinical management of patients with lymphoid, as compared to myeloid blast crisis. Objective/Hypothesis: We hypothesize that mutations occurring during various stages of hematopoietic development will generate a heterogeneous population of LSC in lymphoid blast crisis, and that the various classes of LSC will differ with regard to their drug sensitivity. The objective of the proposal is to characterize discrete LSC types and define methods for their eradication.

DTIC

Leukemias; Stem Cells

20070037874 Dartmouth Medical School, Hanover, NH USA

Identification of Pro-Differentiation p53 Target Genes and Evaluation of Expression in Normal and Malignant Mammary Gland

Li, Hua; Apr 2007; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0350

Report No.(s): AD-A471561; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ectopic delta-N-p63 could block retinoic acid induced differentiation in embryonic carcinoma cells NT2/D1, and preserve transcript level of nestin post RA treatment. Similarly, RA treatment could inhibit the proliferation of breast cancer cell lines, and down-regulate the mRNA level of some self-renew relative genes including oct3/4, nanog and dab2 in these cells. Immunocytofluorescence staining detected existence of delta-N-p63 in both estrogen receptor negative cells such as SUM102, SUM149 and MDA-MB-231 cells, but also MCF-7 cells with luminal epithelial phenotype. And delta-N-p63 positive cells are not well-differentiated and lost expression of cell cycle marker ki-67, cyclin D1. Infection of breast cancer cells with delta-N-p63 adeovirus could decrease cell growth rate, cause G1/G0 cell phase arrest. In MCF-7 cell, ectopic delta-N-p63 could induce cells to lost expression of ki-67 and cyclin D1. Semi-quantitative PCR assay showed that over expression of delta-N-p63 had diverse effect on transcript level of some self-renew correlating gene events such as TA-P63, oct3/4, nanog, sonic hedgehog, hTERT, ect.

DTIC

Breast; Cancer; Estrogens; Genes; Mammary Glands; Targets

20070037876 California Univ., Berkeley, CA USA

The Role of Src in Mammary Epithelial Tumorigenesis

Kusdra, Leonard; May 2007; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0371

Report No.(s): AD-A471564; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The levels and activity of Src non-receptor tyrosine kinases are frequently found to be aberrantly elevated in mammary carcinoma cells compared to non-tumorigenic mammary epithelial cells. However, the role that Src family kinases play in tumor progression remains unclear. The overall objective of this study is to better elucidate the role that endogenous c-Src plays in mammary epithelial tumorigenesis. Our lab has found that genetic and pharmacological inhibition of Src in tumor cells that mimic the early stages of tumorigenesis (T4-2 cells), when cultured in a protein rich extracellular matrix (3D-rBM; Matrigel(TradeMark)), formed organized, polar, multicellular spheroid structures (termed 'acini') similar to the physiological lobular-aveoli structures found in the mammary tissue. Additionally, more invasive carcinoma cells (MDA-MB-231 cells) whereby Src signaling was pharmacologically or genetically inhibited were unable to form actin-rich invasive structures in 3D-rBM culture.

DTIC

Breast; Cancer; Epithelium; Mammary Glands

20070037895 MicroEnergy Technologies, Inc., Vancouver, WA USA

Sterilization of Medical Instruments

Birmingham, Joseph; Moore, Mary; Moore, Robert; May 6, 2007; 24 pp.; In English

Contract(s)/Grant(s): FA9550-06-C-0054

Report No.(s): AD-A471591; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A need exists for a portable sterilization system that can quickly sterilize skin for possible use with medical instruments and skin catheters. To address this challenge, MicroStructure Technologies (MicroST) is developing an atmospheric pressure nonthermal plasmas for rapid deactivation of cells and bacterial spores on surfaces. For example, the lethal Ames strain of *Bacillus anthracis* has been deactivated after a minute of ionized gas exposure. The objective of this DARPA seedling project is to demonstrate the sterilization efficiency of novel plasma blanket designs on: * Inoculant bacteria such as *Staphylococcus* and possibly *Leishmaniasis*. * Bacterial spores require longer exposures to ionized gases to effect sterilization * The inoculant shall be placed on the top and/or bottom of artificial skin to reveal surface and subcutaneous sterilization capability of the ionized gas treatment. The plasma blanket succeeded in demonstrating close to a log 3 reduction in bacterial cells on skin samples.

DTIC

Bioinstrumentation; Medical Equipment; Sterilization

20070038115 Defence Research and Development Suffield, Suffield, Alberta Canada

Rational Design of Therapeutic and Diagnostic Against Botulinum Neurotoxin

Chan, N W; Wang, Y; Tenn, C C; Weiss, Ten; Hancock, J R; Chenler, C L; Lee, W E; Dickinson-Laing, T; Yin, J; Gebremedhin, M G; Mah, D C; Dec 2006; 52 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471413; DRDC-S-TM2006-233; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In September 2006, several cases of botulinum poisoning were reported in USA and Canada due to consumption of commercial organic carrot juice. This incident led to the hospitalization of several individuals who received intensive ventilator support. In spite of botulinum neurotoxin being the most poisonous material, little is known about its mechanism of binding, effective drugs are lacking, and correct diagnosis of botulinum poisoning is slow. Fast and accurate diagnosis of botulinum poisoning (through protein fingerprinting), and new rational drug designs are needed to supplement the current protocol for treatment of botulinum poisoning: administration of antitoxin, adequate mechanical ventilation, and meticulous and intensive care. This technical memorandum reviews past and present research & development efforts on botulinum neurotoxins and future pre-clinical drug discovery directions at DRDC Suffield. A comprehensive drug discovery process is described, including high throughput screening FRET assay, rapid and efficient CE-LIF enzymatic assay, equilibrium binding-affinity MS assay, cell-based assay, and in vivo mouse bioassay. Mechanistically-novel additions to current therapeutics could be in the form of a combination of antitoxin and drugs against cell binding and/or the proteolytic activity of botulinum

DTIC

Bacteria; Clostridium Botulinum; Therapy; Toxins and Antitoxins

20070038119 Air Force Inst. for Environment, Safety and Occupational Health Risk Analysis, Brooks AFB, TX USA

Anthrax

Gutke, Gregory D; Thomas, Richard J; Jul 2007; 4 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471329; IOH-RS-BR-BC-2007-0001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Overview article on Anthrax to include prevention, epidemiology, pathophysiology, diagnosis, and treatment for medical providers for the upcoming textbook 'The 5-Minute Clinical Consult 2009.' Anthrax is a highly infectious disease of animals especially ruminants (hooved animals such as cows goats sheep etc.) that is caused by the bacteria *Bacillus anthracis*. Cutaneous (95% of US cases) inhalational and gastrointestinal forms can be transmitted to man by contact with the animals or their products (typically hair or hides) *Synonym(s) for cutaneous anthrax: Charbon; Malignant pustule; Siberian ulcer; Malignant edema; Splenic fever; Milzbrand. *Synonym(s) for inhalational anthrax: Raggpicker's disease; Woolsorter's disease

DTIC

Bacillus; Infectious Diseases; Vaccines

20070038384 California Univ., San Diego, La Jolla, CA USA

Electro-Optical Platform for the Manipulation of Live Cells

Ozkan, M; Pisanic, T; Scheel, J; Barlow, C; Esener, S; Bhatia, S N; Oct 2, 2002; 8 pp.; In English

Report No.(s): AD-A471614; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471614>

The advent of the genome facilitated by the advances in micro- and nanotechnology has revolutionized our understanding of living systems. DNA microarrays, catalytic RNA arrays, and protein arrays are all a consequence of innovations in engineering at the micro- and nanoscales. Here, we extend this paradigm to the fabrication of live mammalian cell arrays that can be used to investigate the state of the cell at the level of an integrated system. Specifically, we describe an electro-optical system that utilizes physical properties of mammalian cells (charge, dielectric permittivity) rather than receptor-mediated adhesion to rapidly pattern and manipulate cells in a microarray format. The platform we describe is an electro-optical method that employs two complementary methods of cell manipulation: (1) electrophoretic arraying of cells in a dc field due to their intrinsic negative surface charge and (2) remote optical manipulation of individual cells by vertical-cavity surface emitting laser driven infrared optical tweezers. The platform is optically transparent and thus enables monitoring of fluorescent reporters of cellular events (e.g., expression of green fluorescent protein) and allows remote optical manipulation of arrayed cells without risk of breaching the aseptic environment. In addition to the experimental manipulation of mammalian cells, we also present a theoretical framework to establish the limitations of the platform we describe. The ability to probe dynamic cellular events in parallel may offer insights into unforeseen biological mechanisms of cellular function and find applications in drug discovery, functional genomics, and tissue engineering.

DTIC

Antenna Arrays; Deoxyribonucleic Acid; Electro-Optics; Mammals; Microelectromechanical Systems; Ribonucleic Acids

20070038400 Defence Science and Technology Organisation, Edgecliff, Australia

Maximum Utility for Limited Vaccine Stocks - A Case Study using Agent-based Modelling

Forsyth, Adam; Fry, Ash; Oct 1, 2003; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471654; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471654>

Briefing on using agent-based modelling to determine the maximum utility for vaccine stocks.

DTIC

Computerized Simulation; Inoculation; Optimization; Vaccines

20070038416 State Dept., Washington, DC USA

North American Plan for Avian and Pandemic Influenza

Aug 2007; 54 pp.; In English

Report No.(s): AD-A471695; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471695>

Canada, Mexico and the USA face a growing threat posed by the spread of avian influenza and the potential emergence of a human influenza pandemic. The highly pathogenic (HPAI) H5N1 avian influenza virus, which re-emerged in Asia in late 2003, has already spread to Europe, the Middle East, and Africa. Although the virus has not yet reached North America, Canada, Mexico, and the USA must be prepared for the day when it or some other highly contagious virus does. At the March 2006 Security and Prosperity Partnership of North America (SPP) summit in Cancun, the leaders of Canada, Mexico, and the USA committed to developing a comprehensive, coordinated and science-based North American approach to prepare for and manage avian and pandemic influenza. The North American Plan for Avian and Pandemic influenza outlines how Canada, Mexico, and the USA intend to work together to combat an outbreak of avian influenza or an influenza pandemic in North America. The Plan complements national emergency management plans and builds upon the core principles of the International Partnership on Avian and Pandemic Influenza, the standards and guidelines of the World Organization for Animal Health (OIE), the World Health Organization (WHO) -- including the revised International Health Regulations, as well as the rules and provisions of the World Trade Organization (WTO) and the North American Free Trade Agreement. This Plan outlines a collaborative North American approach that recognizes controlling the spread of avian influenza or a novel strain of human influenza, with minimal economic disruption, is in the best interest of all three countries. Coordination among Canada, Mexico, and the USA will be critical in the event of an avian influenza outbreak or pandemic. The Plan, therefore, describes the organizational emergency management frameworks in each of the three countries and how they intend to coordinate their activities.

DTIC

Birds; Canada; Emergencies; Influenza; Management Methods; Management Planning; United States

20070038427 Columbia Univ., New York, NY USA
CHEK2*1100DEL Variant and Breast Cancer Risk

Ahsan, Habibul; Oct 2006; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0774

Report No.(s): AD-A471716; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471716>

We propose to examine the association between the CHEK2*1 100delC gene variant and breast cancer among BRCA1/2-negative families. Vital to DNA replication and normal growth of breast cells (like all other cells in the body) is their ability to detect aberrations/damage in the DNA and subsequently to halt the replication process correct errors if possible and either resume normal cell replication or initiate cell death. The CHEK2 gene the human ortholog of yeast Cds1 and Rad53 encodes a cell-cycle checkpoint kinase that plays a role in DNA repair processes involving BRCA1 and p53 and is thus a candidate gene for familial breast cancer and Li-Fraumeni Syndromes (LFS). The proposed study by examining CHEK2 in familial breast cancer will provide additional knowledge to enhance our understanding of the role of CHEK2 gene in breast cancer. By estimating the absolute and relative risk of breast cancer in relation to the CHEK2*1 100delC variant the proposed study will offer direct evidence on assessing genetic risk of familial breast cancer.

DTIC

Breast; Cancer; Epidemiology; Genetics; Mammary Glands; Risk

20070038428 Dana Farber Cancer Inst., Boston, MA USA

A Randomized Study of the Effects of Tibolone on Bone Density, Menopausal Symptoms, and Breast Density in High-Risk Women After Prophylactic Oophorectomy

Garber, Judy; LeBoff, Meryl; Joffe, Hadine; Lin, Nancy; Ryan, Paula; Sep 2006; 5 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0708

Report No.(s): AD-A471717; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471717>

The synthetic steroid tibolone has been shown to improve bone mass mitigate menopausal symptoms and reduce breast density in women with natural menopause. It has not been evaluated in an abrupt menopause model as occurs in women at high risk of breast cancer because of inherited risk who undergo prophylactic oophorectomy to reduce breast cancer risk. We had planned to conduct a double-blind randomized placebo-control trial to test the hypotheses that Tibolone would accomplish these goals in high-risk premenopausal women undergoing prophylactic oophorectomy and provide an alternative for them to manage menopause symptoms without increasing breast cancer risk. Unfortunately despite several modifications to the protocol a series of outside events ultimately made it impossible for the project to be completed. Many of the modifications required by the DOD required extensive revisions all of which were in progress until ultimately the final blow: the US FDA determined that the New Drug Application (NDA) submitted for tibolone by Akzo Nobel's human healthcare business Organon is 'not approvable'. This response follows an amendment to the NDA which Organon filed with the FDA in December 2005. This finally makes it unreasonable to attempt to conduct the trial with an agent that has no future in the U.S. Therefore the project will be withdrawn and unspent funds returned to the Department of Defense.

DTIC

Bone Mineral Content; Breast; Cancer; Females; Mammary Glands; Signs and Symptoms

20070038432 Georgetown Univ., Washington, DC USA

Mutagen Sensitivity, Apoptosis, and Polymorphism in DNA Repair as Measures of Prostate Cancer Risk

Goldman, Radoslav; Feb 2006; 150 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0057

Report No.(s): AD-A471725; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471725>

Prostate cancer is the most common lethal tumor among US males but etiology of the disease remains unknown. We hypothesize that low DNA repair contributes to increased risk of having prostate cancer. To evaluate the hypothesis, we conducted a case-control study of prostate cancer evaluating association of mutagen sensitivity phenotype with cancer risk. We established a repository of fully annotated specimen of 63 prostate cancer cases and 109 controls frequency matched on age and race. We created a sample repository consisting of serum, plasma, buffy coat, urine, toenail clipping and saliva. We also created a computerized database of the samples in Microsoft Access. We developed assays for mutagen sensitivity, comet assay, and apoptosis in white blood cells exposed to bleomycin and ionizing radiation to evaluate DNA repair capacity. We evaluated mutagen sensitivity in 95 subjects and determined that mean breaks in lymphocytes exposed to bleomycin are

significantly higher ($p < 0.001$) in prostate cancer cases (mean=1.1; SD=0.3) than controls (mean=0.7; SD=0.3). This pilot study fills important gaps in our understanding of prostate cancer etiology and produces new hypotheses which can be tested in an expanded prostate cancer study.

DTIC

Apoptosis; Cancer; Deoxyribonucleic Acid; Mutagens; Polymorphism; Prostate Gland; Risk; Sensitivity

20070038434 Arkansas Univ. for Medical Sciences, Little Rock, AR USA

Vaccination of High-Risk Breast Cancer Patients with Carbohydrate Mimicking Peptides

Kieber-Emmons, Thomas; May 2007; 85 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0542

Report No.(s): AD-A471727; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471727>

The expression of the Tumor Associated Carbohydrate Antigens such as the neolactoseries antigen Lewis Y (LeY) and gangliosides such as GM2 and GD2IGD3 are amplified on breast cancer cells and is linked to poor prognosis and high risk of disease relapse. Immunotherapy to direct responses to TACA is therefore perceived to be of clinical benefit. To overcome this deficiency we developed mimotopes of TACA to induce more robust cross-reactive and tumor-specific responses. In preclinical studies immunization with these mimotopes reduce tumor burden and inhibited metastatic outgrowth of murine tumor cells expressing TACA structural homologues. Thus peptide mimotopes of TACA represent a new and very promising tool to induce a strong immune response to TACA expressed on Breast Cancer cells. Based on encouraging preclinical results our objectives for the current funding period (years 1 and 2) are to develop the necessary preclinical data required by the Food and Drug Administration (FDA) for filing an Investigational New Drug (IND). In this context we: 1.) Developed the necessary procedures for the required Good Laboratory Practice (GLP) studies; 2.) Defined problems in scale up of the manufactured mimotope vaccines; 3.) Identified alternative mimotopes of TACA that circumvent the scale up problems.

DTIC

Breast; Cancer; Carbohydrates; Mammary Glands; Patients; Peptides

20070038435 Indiana Univ., Indianapolis, IN USA

PSES-a Novel Prostate Specific Chimeric Enhancer for Prostate Cancer Gene Therapy

Kao, Chinghai; Feb 2007; 51 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0168

Report No.(s): AD-A471728; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471728>

Recently we generated a chemic prostate specific promoter, called PSES, by combining the enhancer elements from the PSA and PSMA genes. Based on PSES, we developed a prostate-restricted replicative adenovirus (PRRA), called AdE4PSESE1a. AdE4PSESE1a only replicated in PSA/PSMA positive prostate cancer cells or cells expressing adenoviral E1 and E4 proteins. AdE4PSESE1a only partially inhibited tumor growth when tested in animals. Then we armed AdE4PSESE1a with TRAIL to make AD-IU-2. Ad-IU-2 retains the prostate specificity of AdE4PSESE1a and expresses TRAIL only in PSA/PSMA positive cells. Ad-IU-2 demonstrated better in vitro cell killing activity and tumor killing activity in vivo than AdE4PSESE1a against PSA/PSMA positive prostate cancers. We also tested whether antiangiogenic factor EndoAngio (an endostatin-angiostatin fusion protein) can slow down tumor growth to give AdE4PSESE1a enough time to eradicate a tumor. We found that coinjection of an EndoAngioexpressing replication defective adenovirus, AdEndoAngio, with AdE4PSESE1a would be able to eliminate 7 of 8 treated tumors. We incorporated EndoAngio expression cassette into AdE4PSESE1a to make an antiangiogenic PRRA.

DTIC

Adenoviruses; Cancer; Gene Therapy; Prostate Gland

20070038436 Burnham Inst., La Jolla, CA USA

A New Transgenic Approach to Target Tumor Vasculature

Pasquale, Elena B; Jun 2006; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0314

Report No.(s): AD-A471729; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471729>

Breast cancer growth relies on a blood supply. Therefore, anticancer therapies that disrupt tumor angiogenesis to starve

tumor cells can be very effective. To examine the importance of candidate proteins in adult angiogenesis, we generated a transgenic mouse model expressing the receptor for an avian retrovirus only in new blood vessels. The avian retrovirus was en-gineered to express ephrin-B2 (a protein whose importance in blood vessel growth we wanted to examine) fused to green fluorescent protein (EGFP) and, as controls, EGFP alone and an onco-gene known to promote endothelial cell proliferation also fused to EGFP. In vivo angiogenesis assays and tumor analysis demonstrated expression of the retroviral receptor in new blood vessels and susceptibility to infection by the retrovirus causing expression of the EGFP-tagged proteins. However, optimization of virus delivery to obtain higher and more consistent levels of infection will be needed to establish if a protein has proangiogenic activity.

DTIC

Angiogenesis; Breast; Cancer; Mammary Glands; Targets; Tumors

20070038437 New Mexico Univ., Albuquerque, NM USA

Evaluation of Genomic Instability as an Early Event in the Progression of Breast Cancer

Heaphy, Christopher M; Griffith, Jeffrey K; Apr 2007; 111 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0273

Report No.(s): AD-A471730; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471730>

We have shown in two independent retrospective studies that loss of telomere content (Tc) has potential value in predicting clinical outcome in breast cancer. However, an alternative marker for TC, which could be assessed in samples with small numbers of cells, such as fine needle aspirates, with commonly used methods is desirable. The aim of this study is to demonstrate that measurement of allelic imbalance (AI), which could be easily adapted to the clinical laboratory setting, can serve as a surrogate for TC, discriminating between women in need of more aggressive treatment and those for whom aggressive protocols are unnecessary. The candidate has developed a robust assay to determine the extent of AI that discriminates between normal and tumor specimens with 67% sensitivity and 99% specificity. Currently, the candidate is assessing the potential prognostic capabilities of the assay in node negative breast tumors. Additionally, the candidate has shown that increased AI and altered TC are present in both tumors and surrounding histologically normal breast tissues at distances at least one 1 cm from the visible tumor margins and decrease as a function of distance. In addition to evaluating a potential biomarker of breast cancer progression, the proposed investigation has provided the candidate opportunities to interact with pathologists and oncologists to learn normal and abnormal breast morphology, the strengths and limitations of currently used breast cancer biomarkers and the scientific rationale for ongoing clinical trials. To date, all tasks, as outlined in the Statement of Work, are on schedule.

DTIC

Breast; Cancer; Genome; Mammary Glands; Stability

20070038440 Texas Univ., Dallas, TX USA

Investigation of Metastatic Breast Tumor Heterogeneity and Progression Using Dual Optical/SPECT Imaging

Antich, Peter P; Constantinescu, Anca; Lewis, Matthew; Mason, Ralph; Richer, Edmond; May 2007; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0551

Report No.(s): AD-A471735; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471735>

The goal of our project is to image the processes that occur during tumor growth and metastatic spread or regression including the fate of minimal residual disease. To do so it is necessary to test the limits of sensitivity of newly developed techniques: our technical goal is to develop integrated light emission and single photon emission tomography. We have made substantial progress in our techniques for the detection of metastases. We have demonstrated our capability to detect millimeter or sub-millimeter metastases in mice by light emission. To this end we have used Light Emission Tomography (LET), a technique based on bioluminescence of cancer cells infected with luciferase, to detect metastases in the lung and head. We have begun assessment of perfusion using fluorescence imaging. In addition, our technological focus is on the simultaneous use of Single-photon Emission Computed Tomography (SPECT), and to this end we have developed a new form of micro-SPECT based on cooled, electron-multiplied Charge-Coupled Devices (EMCCDs) with which we are performing ongoing imaging experiments. We have also collaborated on the assessment of a new, promising SPECT imaging agent, clioquinol or Iodinated hydroxyquinoline. We will use bioluminescence imaging to test if clioquinol imaging detects areas

where tumor cells proliferate and establish metastases and to identify the relative times at which the images first appear.
DTIC

Breast; Cancer; Heterogeneity; Image Processing; Imaging Techniques; Mammary Glands; Metastasis; Neoplasms; Tumors

20070038449 Rutgers - The State Univ., New Brunswick, NJ USA

EPR Assembly of Microgel for FRET Imaging of Breast Cancer

Stein, Stanley; Apr 2007; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0342

Report No.(s): AD-A471769; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471769>

The purpose of this project is to develop a new process for identifying breast cancer. This process should be at least as convenient as mammography for the patient more sensitive for detection of the smallest and earliest tumors, and more accurate in distinguishing tumors from normal tissues. First the tumor site is marked by entrapment of a polymer-PNA conjugate due to EPR effect. Based on the longer retention of the polymer conjugate in tumors versus normal tissue, a second polymer-PNA conjugate containing the complementary PNA sequence is administered. This second conjugate will interact with first conjugate due to complementary base pairing to form insoluble and intermolecular polymer networks (microgel). These microgels can then be used as targets to deliver another reagents for imaging. In first tow years of grants, wer have completed the synthesis of copolymer, polymer conjugates labeled with hilyte fluorescein dyes and polymer-PNA conjugates. We have also developed a non-invasive method of investigating EPR by skinscan. We have initiated studies with polymer-PNA conjugates.

DTIC

Breast; Cancer; Imaging Techniques; Mammary Glands

20070038451 Michigan Univ., Ann Arbor, MI USA

Ultrasonically-Induced Vaporization of Perfluorocarbon Droplets for Occlusion Therapy of Breast Cancer

Fowlkes, Jeffrey B; Jun 2004; 89 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0344

Report No.(s): AD-A471775; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471775>

A technique termed Acoustic Droplet Vaporization (ADV) has been developed in which ultrasound triggers small liquid droplets to form gas bubbles in arterial blood. The droplets are injected intravenously thus eliminating catheterization. Droplets vaporize into bubbles at the desired location in the body by applying ultrasound through the skin. Using renal occlusion as a model blood flow following ADV in the renal artery was reduced by greater than 90% in the renal cortex and more than 60% in the medullary tissues. An average organ perfusion reduction of >70% was achieved using ADV. The studies performed represented the most extensive investigation of flow occlusion by ADV to date. The control kidney on the contralateral side showed a maximum decrease in regional blood flow of 18% relative to the pre- ADV baseline. Image-based hyper-echogenicity from ADV of IA injections was monitored for approximately 90 minutes and cortex perfusion was reduced by >60% of its original value for more than 1 hour. This could be enough time for the onset of cell death and possible tumor treatment via ischemic necrosis. Moreover currently used radiofrequency tissue ablation-based tumor treatment could benefit from ADV due to the decreased heat loss via vascular cooling.

DTIC

Breast; Cancer; Drops (Liquids); Mammary Glands; Occlusion; Therapy; Ultrasonics; Vaporizing

20070038452 Cambridge Univ., Cambridge, UK

Biosilica-Immobilized Enzymes for Biocatalysis (Preprint)

Betancor, Lorena; Luckarift, Heather R; Aug 2007; 19 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A471777; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471777>

Bacterial enzymes are remarkable biocatalysts and catalyze a wide variety of processes that can be utilized for the production of novel compounds or pharmaceutical intermediates. Enzymes also possess a wide range of pharmacological activities and are often investigated for therapeutic effects. A stable immobilized-enzyme preparation is essential to facilitate the use of enzymes in potential applications. Biomineralization reactions have been demonstrated as an effective mechanism

to generate silica nanoparticles which are suitable for enzyme immobilization. Biological templates are used to catalyze the precipitation of silica to form a network of fused silica nanospheres. Additional enzyme added during the reaction becomes rapidly entrapped inside the silica spheres as they form. The silica forms at ambient environmental conditions, providing a biocompatible environment for enzyme immobilization. The silica-enzyme immobilization technique provides significant stabilization to a wide range of enzymes. The applicability of silica-encapsulated enzymes is presented for a range of model systems to provide insight into the versatility of the method for biocatalysis.

DTIC

Bacteria; Biotechnology; Enzymes; Nanoparticles; Proteins; Silicates

20070038464 Dana Farber Cancer Inst., Boston, MA USA

The Role of BRCA1/BARD1 Heterodimers in the Mitosis-Interphase Transition

Joukov, Vladimir; May 2007; 63 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0524

Report No.(s): AD-A471801; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471801>

The study was aimed at exploiting the advantages of the *Xenopus* egg extract as a biochemically tractable in vitro cell cycle model system in order to elucidate the molecular function of the breast and ovarian tumor suppressor BRCA1 and its heterodimerizing partner, BARD1. Experiments using both egg extracts and cultured mammalian cells revealed a previously unknown role of BRCA1/BARD1 in the mitotic spindle assembly. This BRCA1/BARD1 function is centrosome-independent, operates downstream of Ran GTPase, and depends upon the E3 ubiquitin ligase activity of the heterodimer. BRCA1/BARD1 ensures proper spindle pole formation by down-modulating the function of a recently discovered TPX2 partner, XRHAMM, thereby facilitating the accumulation of TPX2, the major spindle assembly factor and Ran target, on spindle poles. Our study implicated BRCA1/BARD1 in the regulation of three SAFs (RHAMM, TPX2, and Aurora A), which are overexpressed or amplified in certain cancers, thus pointing to the existence of a tumor suppressor oncoprotein network that controls mitotic spindle assembly.

DTIC

Breast; Cancer; Genes; Mammary Glands; Mitosis; Spindles

20070038465 Chicago Univ., Chicago, IL USA

Extranuclear Signaling Effects Mediated by the Estrogen Receptor

O'Neill, Erin; Mar 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0241

Report No.(s): AD-A471802; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471802>

Recent evidence has made it clear that ER-mediated extranuclear signaling is involved in the growth and survival of ER-expressing cells and tissues, including both reproductive and nonreproductive. Specifically, we are interested in examining the ability of ER action to rapidly modulate various signaling cascades, and our main goals with this research are to: 1) define the mechanism responsible for the rapid ER signaling, 2) investigate the observed signaling in an animal model, 3) determine and compare the target genes that are regulated by ER rapid signaling versus classical ER transactivation, and 4) examine the subsequent cellular and biological responses to rapid 17 β -estradiol (E2) action. Previously, we confirmed that E2 and other ER-specific ligands can rapidly phosphorylate and activate Erk1/2 in the breast cancer cell line, MCF-7, an effect that is blocked by the potent ER antagonist, ICI 162,770. We have also provided evidence that E2 administration to ovariectomized immature rats can induce Erk1/2 phosphorylation in the uterine horn and brain and that E2 can also induce α CaMKII autophosphorylation in the brain in vivo. α CaMKII was also identified as an upstream regulator of E2-induced ERK1/2 phosphorylation. We show here that E2 can rapidly and significantly induce α CaMKII autophosphorylation, which subsequently mediates ERK1/2 phosphorylation in immortalized GnRH neurons and primary hippocampal cells. This signaling results in p90RSK and CREB phosphorylation that appears to require Ca²⁺ influx through the L-type Ca²⁺ channels. Interestingly, the administration of either E2 or PPT, the ER α -selective agonist, but not vehicle, to female ovariectomized rats results in a clear enhancement of α CaMKII autophosphorylation in the hippocampus. Our findings suggest a novel model for the activation of ERK1/2 by ER α via α CaMKII signaling, which increases our understanding of E2 action in the central nervous system.

DTIC

Breast; Cancer; Estrogens; Mammary Glands; Phosphorylation

20070038472 Mount Sinai School of Medicine, New York, NY USA

One-Carbon Metabolism and Breast Cancer Survival in a Population-Based Study

Chen, Jia; Jun 2007; 8 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0514

Report No.(s): AD-A471823; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471823>

The 5-year survival rate for BC among US women has increased from 75% during 1974-76 to 85% during 1989-95. Despite such marked improvement, BC is still the leading cause of cancer mortality among women 20-59 years of age and the second leading cause of cancer mortality among all women. Disease-free survival after BC treatment is likely predicted by both tumor characteristics and host factors. The clinical and pathologic parameters that have been shown to influence disease prognosis include tumor size, nodal involvement, tumor state, grade, hormone receptor status, mitotic index, expression of multi-drug resistance proteins, p53 status, and HER-2/neu status. Meanwhile, only a few host factors have been identified that impact disease free or overall survival, particularly those that a patient may engage in to modify or help clinicians to tailor effective and efficient treatment strategy. This proposed study focuses on one-carbon metabolism, a key process for DNA methylation and DNA synthesis. One-carbon metabolism is crucial of BC prognosis because it not only provides methyl group for regulating expression of genes that have prognostic values (e.g. ER, PR, BRCA1, etc.) but also is a primary target for treatment of the disease (e.g. 5-FU, methotrexate, etc.). We propose to utilize the resources of the Long Island Breast Cancer Study Project, a large population-based study consisting of ~1500 BC cases and ~1500 controls. We will examine the dietary intake of one-carbon-related micronutrients/compounds (e.g. folate, methionine, choline, B vitamins, alcohol, etc) in relation to disease-free and overall survival of BC via the mechanism of promoter hypermethylation (presumably silencing) of the ER, PR, and BRCA1 genes. We will also examine whether functional polymorphisms in one carbon metabolism may influence survival of BC, either through modifying the efficacy of chemotherapeutic drugs or influencing methylation of prognosis related genes.

DTIC

Breast; Cancer; Carbon; Deoxyribonucleic Acid; Mammary Glands; Metabolism; Populations; Proteins; Survival

20070038474 Pennsylvania Univ., Philadelphia, PA USA

Structure-Based Design of Molecules to Reactivate Tumor-Derived p53 Mutations

Marmorstein, Ronen; Jun 2007; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0564

Report No.(s): AD-A471826; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471826>

Of the genetic alterations associated with breast cancer, changes in p53 are the most frequently identified and a subset of these changes destabilize the p53 core domain structure. The overall goal of our studies is to identify small molecule compounds that bind and stabilize this subset of tumor-derived p53 mutants. We anticipate that the identification of such compounds will serve as a scaffold for the preparation of small molecule drugs for the treatment of p53-mediated breast cancer. Towards this goal, we have published studies where we have employed a Multiple Solvent Crystal Structures (MSCS) technique to identify a p53 binding sites for the small molecule compound tris(hydroxymethyl)aminomethane (Tris) and have used both solution studies and molecular dynamics simulations to show that Tris binding increases the stability of the p53 core domain. We have more recently carried out virtual screening (in silico) to identify Tris analogues that are predicted to have improved p53 core domain binding and stability properties. In the future, we will continue the virtual screening studies and test our virtual screening 'hits' in solution for improved p53 core domain binding and stability. We will also cocrytallize the p53 core domain with the Tris analogues that show the most favorable properties for second generation structure-based optimization of these compounds.

DTIC

Apoptosis; Breast; Cancer; Deoxyribonucleic Acid; Drugs; Mammary Glands; Molecules; Mutations; Tumors

20070038475 Sloan-Kettering Inst. for Cancer Research, New York, NY USA

Modifiers of the Efficacy of Risk-Reducing Salpingo-Oophorectomy for the Prevention of Breast and Ovarian Cancer in Carriers of BRCA1 and BRCA2

Kauff, Noah D; May 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0375

Report No.(s): AD-A471828; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471828>

The principle investigator was funded via a Physician-Scientist Training Award to participate in a comprehensive training

plan to foster the transition to independent clinical breast cancer researcher. This plan included: 1) conduct of a prospective study examining modifiers of the efficacy of risk-reducing salpingo-oophorectomy for the prevention of breast and ovarian cancer in carriers of BRCA mutations; and 2) participation in a structured training program in research methodology biostatistics molecular biology and ethics. Progress from 5/1/2006 - 4/30/2007 includes: 1) Submission for publication the first prospective data examining the efficacy of risk-reducing salpingo-oophorectomy for the prevention of BRCA-associated breast and gynecologic cancer when BRCA2 mutation carriers are examined separately from BRCA1 mutation carriers.; 2) Continuation of training in genetic epidemiology laboratory methods outcomes analysis and conduct of clinical research through participation in the weekly laboratory meetings of Kenneth Offit MD MPH in addition to formal mentoring; and 3) Continued progress on a genetic epidemiologic computational and structural analysis of BRCA2 variants of uncertain significance funded by a peer-reviewed NIH award (1 R03 CA119265-01 to N.D.K.) to the principal investigator of this PTSA.

DTIC

Breast; Cancer; Genes; Mammary Glands; Mutations; Ovaries; Prevention; Risk

20070038476 Manitoba Univ., Winnipeg, Manitoba Canada

Characterization of Steroid Receptor RNA Activator Protein Function in Modulating the Estrogen Signaling Pathway

Yan, Yi; May 2007; 122 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0245

Report No.(s): AD-A471830; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471830>

Steroid receptor RNA activator (SRA) was shown to differ from all previously characterized co-activators as it was demonstrated to function as a RNA rather than a protein molecule. We have however demonstrated that this once thought non-coding RNA encodes a well conserved protein (SRAP). The aims of this year are mainly on identification of SRAP-interacting Proteins and how SRAP interacts with transcriptional regulators to modulates of transcription as well as the respective impacts of SRA RNA and SRA protein on the ER signaling pathway. We have determined through protein arrays that SRAP is indeed able to directly interact with various transcription factors. Furthermore we have established that SRAP is associated to chromatin in MCF-7 cells. We also examined the possible effect of SRAP recruitment on transcription using the potent GAL4-VPI6 hybrid transcription activation system. We observed that SRA possesses a transcriptional repressive activity capable of inhibiting the GAL4-VP16 transcription activity. This SRAP transcriptional repressive potential is sensitive to trichostatin A (a HDAC inhibitor) treatment. And SRAP is able to co-immunoprecipitate HDAC activity. Meanwhile we have also investigated the possible mechanism of intron-1 retention as a participating to the generation of coding and non coding SRA RNAs.

DTIC

Activation; Breast; Cancer; Estrogens; Mammary Glands; Modulation; Proteins; Ribonucleic Acids; Steroids

20070038477 South Carolina Univ., Columbia, SC USA

Dietary Seaweed and Early Breast Cancer: A Randomized Trial

Teas, Jane; May 2007; 85 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-98-1-8207

Report No.(s): AD-A471833; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471833>

The purpose of this research is to investigate whether eating brown seaweed (*Undaria pinnatifida*) can influence breast cancer risk. Brown seaweeds are popular in Japan, where the incidence of breast cancer is about 1/6 the rate of that reported for American women. In several animal studies of diet and cancer, adding seaweed to the normal diet resulted in longer healthy lives. In particular, we will examine cell surface binding characteristics and protein expression associated with the consumption of dietary seaweeds by women without breast cancer, women with estrogen receptor negative breast cancer, and women with estrogen receptor positive breast cancer. All subjects have completed the study, and all samples have been analyzed for the endpoints defined in the study. Additionally, samples have been analyzed for urokinase and urine as been included in the proteomic study. Papers on iodine content in commercially available seaweeds has been published, as has a review of the health effects of seaweeds and a paper describing the bioavailability of seaweed iodine in brown seaweeds. The analyses of the proteomics data and the flow cytometry data were completed in April and May, and preparation of manuscripts is in process.

DTIC

Algae; Breast; Cancer; Diets; Mammary Glands; Seaweeds

20070038582 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Pathology of Inhalational Anthrax Infection in the African Green Monkey

Twenhafel, N A; Leffel, E; Pitt, M L; Jan 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471841; RPP-06-042; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There is a critical need for an alternative nonhuman primate model for inhalational anthrax infection because of the increasingly limited supply and cost of the current model. This report describes the pathology in 12 African green monkeys (AGMs) that succumbed to inhalational anthrax after exposure to a low dose (presented dose $200-2 \times 10(4)$ colony-forming units [cfu]) or a high dose (presented dose $2 \times 10(4)-1 \times 10(7)$ cfu) of *Bacillus anthracis* (Ames strain) spores. Frequent gross lesions noted in the AGM were hemorrhage and edema in the lung, mediastinum, and mediastinal lymph nodes; pleural and pericardial effusions; meningitis; and gastrointestinal congestion and hemorrhage. Histopathologic findings included necrohemorrhagic lymphadenitis of mediastinal, axillary, inguinal, and mesenteric lymph nodes; mediastinal edema; necrotizing splenitis; meningitis; and congestion, hemorrhage, and edema of the lung, mesentery, mesenteric lymph nodes, gastrointestinal tract, and gonads. Pathologic changes in AGMs were remarkably similar to what has been reported in rhesus macaques and humans that succumbed to inhalational anthrax; thus, AGMs could serve as useful models for inhalation anthrax studies.

DTIC

Africa; Infectious Diseases; Monkeys; Pathology; Respiration

20070038583 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Development of a TaqMan(R)-Minor Groove Binding Protein Assay for the Detection and Quantification of Crimean-Congo Hemorrhagic Fever Virus

Garrison, A R; Alakbarova, S; Kulesh, D A; Shezmukhamedova, D; Khodjaev, S; Endy, T P; Paragas, J; Jan 2007; 8 pp.; In English

Report No.(s): AD-A471842; TR-06-133; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Crimean-Congo hemorrhagic fever virus (CCHFV) is a tick-borne virus of the genus *Nairovirus* and the family *Bunyaviridae*. It is a negative-strand RNA virus comprised of small (S), medium (M), and large (L) genome segments. The S segment encodes for nucleocapsid protein, the M segment codes for envelope glycoproteins (Gn and Gc), and the L segment codes for the RNA-dependent RNA polymerase. Currently, there are a limited number of methods for rapidly diagnosing CCHFV infections. We developed a real-time, reverse transcription-polymerase chain reaction assay for the rapid detection of CCHFV by using the TaqMan(R)-minor groove binding protein probe technology. The primers and probes were designed to amplify and detect a region in the S segment of CCHFV that is conserved across multiple strains. The limit of detection of the assay was 10 genome copies of RNA. This primer and probe set was specific to 18 strains of CCHFV tested and did not cross-react with either a DNA panel of 78 organisms or a panel of 28 diverse RNA viruses. This will rapidly and specifically detect CCHFV, and it has been used to detect CCHFV infection in samples from humans, animals, and ticks.

DTIC

Africa; Assaying; Detection; Diseases; Fever; Grooves; Hemorrhages; Infectious Diseases; Proteins; Viruses

20070038590 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

How Ebola and Marburg Viruses Battle the Immune System

Mohamadzadeh, Mansour; Chen, Lieping; Schmaljohn, Alan L; Jul 2007; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471860; TR-06-116; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The filoviruses Ebola and Marburg have emerged in the past decade from relative obscurity to serve now as archetypes for some of the more intriguing and daunting challenges posed by such agents. Public imagination is captured by deadly outbreaks of these viruses and reinforced by the specter of bioterrorism. As research on these agents has accelerated, it has been found increasingly that filoviruses use a combination of familiar and apparently new ways to baffle and battle the immune system. Filoviruses have provided thereby a new lens through which to examine the immune system itself.

DTIC

Antigens; Immunology; Tropism; Viruses

20070038596 Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD USA
Bacillus Anthracis Spores of the bclA Mutant Exhibit Increased Adherence to Epithelial Cells, Fibroblasts, and Endothelial Cells but not to Macrophages

Bozue, Jorl; Moody, Krishna L; Cote, Christopher K; Stiles, Bradley G; Friedlander, Arthur M; Welkos, Susan L; Hale, Martha L; Sep 2007; 9 pp.; In English

Report No.(s): AD-A471872; TR-07-029; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Bacillus anthracis is the causative agent of anthrax, and the spore form of the bacterium represents the infectious particle introduced into a host. The spore is surrounded by an exosporium, a loose-fitting membrane composed of proteins and carbohydrates from which hair-like projections extend. These projections are composed mainly of BclA (Bacillus-collagen-like protein of B. anthracis). To date, exact roles of the exosporium structure and BclA protein remain undetermined. We examined differences in spore binding of wild-type Ames and a bclA mutant of B. anthracis to bronchial epithelial cells as well as to the following other epithelial cells: A549, CHO, and Caco-2 cells; the IMR-90 fibroblast line; and human umbilical vein vascular endothelium cells. The binding of wild-type Ames spores to bronchial epithelial cells appeared to be a dose-dependent, receptor-ligand-mediated event. There were similar findings for the bclA mutant, with an additional nonspecific binding component likely leading to significantly more adherence to all nonprofessional phagocytic cell types. In contrast, we detected no difference in adherence and uptake of spores by macrophages for either the wild-type Ames or the bclA mutant strain. These results suggest that one potential role of the BclA fibers may be to inhibit nonspecific interactions between B. anthracis spores with nonprofessional phagocytic cells and thus direct the spores towards uptake by macrophages during initiation of infection in mammals.

DTIC

Bacillus; Endothelium; Fibroblasts; Macrophages; Spores

20070038597 Georgia Univ., Athens, GA USA

Type VI Secretion is a Major Virulence Determinant in Burkholderia Mallei

Schell, Mark A; Ulrich, Ricky L; Ribot, Wilson J; Brueggemann, Ernst E; Hines, Harry B; Chen, Dan; Lipscomb, Lyla; Kim, H S; Mrazek, Jan; Nierman, William C; DeShazer, David; Jun 1, 2007; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471873; TR-06-138; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Burkholderia mallei is a host-adapted pathogen and a category B biothreat agent. Although the B. mallei VirAG two-component regulatory system is required for virulence in hamsters, the virulence genes it regulates are unknown. Here we show with expression profiling that overexpression of virAG resulted in transcriptional activation of approximately 60 genes, including some involved in capsule production, actin-based intracellular motility, and type VI secretion (T6S). The 15 genes encoding the major sugar component of the homopolymeric capsule were up-expressed > 2.5-fold, but capsule was still produced in the absence of virAG. Actin tail formation required virAG as well as bimB, bimC and bimE, three previously uncharacterized genes that were activated four- to 15-fold when VirAG was overproduced. Surprisingly, actin polymerization was found to be dispensable for virulence in hamsters. In contrast, genes encoding a T6S system were up-expressed as much as 30-fold and mutations in this T6S gene cluster resulted in strains that were avirulent in hamsters. SDS-PAGE and mass spectrometry demonstrated that BMAA0742 was secreted by the T6S system when virAG was overexpressed. Purified His-tagged BMAA0742 was recognized by glanders antiserum from a horse, a human and mice, indicating that this Hcp-family protein is produced in vivo during infection.

DTIC

Bacteria; Determinants; Infectious Diseases; Secretions; Virulence

20070038602 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Development of Treatment Strategies to Combat Ebola and Marburg Viruses

Paragas, Jason; Geisbert, Thomas W; Feb 2, 2006; 11 pp.; In English

Contract(s)/Grant(s): Proj-02-4-4J-081; Proj-3-4-7-J-020

Report No.(s): AD-A471881; RPP-05-412; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ebola and Marburg viruses are emerging/re-emerging pathogens that pose a significant threat to human health. These naturally occurring viral infections frequently cause a lethal hemorrhagic fever in humans and nonhuman primates. The disastrous consequences of infection with these viruses have been pursued as potential biological weapons. To date, there are no therapeutic options available for the prophylaxis or treatment of infected individuals. The recognition that Ebola and Marburg viruses may be exploited as biological weapons has resulted in major efforts to develop modalities to counter infection. In this review, select technologies and approaches will be highlighted as part of the critical path for the development

of therapeutics to ameliorate the invariably devastating outcomes of human filoviral infections.

DTIC

Combat; Fever; Health; Hemorrhages; Viral Diseases; Viruses

20070038609 Cold Spring Harbor Lab., New York, NY USA

NF-1 Dependent Gene Regulation in *Drosophila Melanogaster*

Zhong, Yi; Apr 2004; 33 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0643

Report No.(s): AD-A471891; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Neurofibromatosis type 1 (NF1) is characterized by benign but disfiguring skin tumors, pigmentation defects and learning disabilities, as well as increased risk of brain tumors. The NF1 tumor suppressor protein (neurofibromin) inhibits Ras, a protein that is overactive in a wide variety of human cancers. NF1 also controls levels of cyclic AMP, an important intracellular messenger involved in cell growth and learning. We have used an Affymetrix whole genome chip, containing all 13,500 genes of the fruit fly *Drosophila*, to identify 93 genes with altered expression patterns in flies that have no NF1 protein compared to normal wild type flies. Importantly, expression of half these genes is restored to normal levels when human NF1 is expressed in flies with no NF1. At least a quarter of these genes are involved in nervous system function or development.

DTIC

Drosophila; Gene Expression; Genes; Proteins

20070038610 Arizona Univ., Tucson, AZ USA

Dynamic Tissue Culture System from Prostate Biopsy Specimens as a Model for Predicting Tumor Radio-Sensitivity to Ionizing Radiation Treatment

Walker, Jonathan; Apr 2005; 5 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0223

Report No.(s): AD-A471892; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The underlying hypothesis driving this project is the notion that all prostate carcinomas are not the same (even if they have the same clinical stage, Gleason score, and pretreatment PSA). By studying individual tumor specimens from patient's prostate carcinomas prior to treatment, it will be possible to obtain information that will make it possible to understand the pathologic factors and molecular regulators that are involved in determining radiation induced apoptosis and intrinsic radio-sensitivity. Our long term goal, for which this proposal will be the first step, is to develop a system to better individualize each patient's treatment based on various clinical, pathological and molecular biological parameters, thereby maximizing the treatment potential benefit to the patient, while also minimizing the potential treatment toxicity to the patient.

DTIC

Cancer; Culture Techniques; Ionizing Radiation; Mathematical Models; Prostate Gland; Sensitivity; Tissue Culturing; Tissues (Biology); Toxicity; Tumors

20070038611 Boston Univ., Boston, MA USA

Assessment of the Genetic Variation in Bone Fracture Healing

Gerstenfeld, Louis C; Jan 2006; 84 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0576

Report No.(s): AD-A471893; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The hypothesis of these studies is that genetic processes that lead to the variations in both structural and material properties of bone development will be recapitulated in the developmental mechanisms that control the bone quality during fracture healing. Two goals were set out in this proposal to test this hypothesis. The first was to determine how variations in basic bone quality in the three inbred strains of mice were expressed during fracture healing. MicroCT and mechanical testing of day 21 and 35 fracture calluses demonstrated that each strain recapitulated their variations in geometric and material properties during fracture healing. Furthermore, variations in bone quality differentially effected the rates of healing (i.e. there are genetic variations slow versus fast bone healing). The second goal was directed at identifying the underlying biological processes that lead to genetic variation, which effect both bone quality and rates of fracture healing which recapitulate differences seen in original bone growth. Large scale transcriptional profiling initiated during the tenure of this grant is ongoing to further define genetic variability in fracture healing.

DTIC

Bones; Fractures (Materials); Genetics; Healing

20070038617 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Conversion of a Mouse Fab into a Whole Humanized IgG Antibody for Detecting Botulinum Toxin

Palys, Thomas J; Schmid, Kara E; Scherer, John M; Schoepp, Randal J; Apr 2006; 10 pp.; In English

Report No.(s): AD-A471902; USAMRIID-TR-06-081; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Antibodies serve as the gold standard in most immunodiagnostic assays. Recent advances in recombinant DNA technology have offered the production of antibody fragments or Fabs as promising alternatives. However, the lack of the Fc region of the antibody can be difficult in many standard diagnostic platforms. Therefore we sought to convert a murine Fab into a whole humanized IgG. The variable regions from an anti-botulinum Fab were cloned into human IgG heavy and light chain vectors and produced in myeloma cells. Purified humanized IgG demonstrated conversion to human IgG with no traces of mouse Fab as determined by Western blot analysis. In addition, the humanized IgG performed better as both a detection and capture reagent in an ELISA format and detected the botulinum toxoid at a lower concentration than the parental murine Fab. This technique offers the ability to convert various species of antibodies or antibody fragments into humanized antibodies with improved characteristics in immunodiagnostic assays, for use as human controls in serological assays, or for possible therapeutic benefit.

DTIC

Antibodies; Clostridium Botulinum; Detection; Mice; Toxins and Antitoxins

20070038621 New School of Architecture and Design, San Diego, CA USA

The Relationship and Understanding Between the Food we eat, Blood and Our Overall Health

Irwin, Jennifer M; Jan 2005; 250 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471912; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis examines how an integrative and preventative healing center is necessary for the wellness of our society and military personnel by understanding how food can react positively or negatively to someone's health depending on their blood type and the lifestyle they lead. The Health care profession predominantly focuses on curing disease while the preventative solutions are often overlooked and underestimated. Those who have 'food allergies' and what may seem to be a simple reoccurring sickness have very few places to go for guidance or real help since their problems are not considered a 'disease'. But the years of contamination could cause a complete immune system failure leading to cancer or some other life threatening disease. Our world once lived as one with nature relying on the earth's natural healing plants and foods. We were once fully dependent on it for healing but now we have isolated ourselves causing pain and confusion to not only our mind and body but to our earth and our environment. Misguided, lost and alone. This thesis responds to the problem of medical physicians overlooking or ignoring the natural healing aspects of plants and food and how our nation has become a 'fast food' processed nation that has caused an increase in health problems and blood disorders. A holistic healing arts center and resort. will combine the traditional medical practices with the alternative therapies to provide a treatment facility that is in search for the answers on an individual level. The patient or visitor will be the educated on their blood type and what types of food and fitness will be best to enhance their lives and create a daily balance for optimum wellness.

DTIC

Blood; Eating; Food; Health; Hematology; Medical Services

20070038625 Army Tank-Automotive Research and Development Command, Warren, MI USA

Can A Self-Diagnostic Digitally Controlled Pacemaker/Defibrillator Device be Used For Alerting Military Personnel When a Soldier Health Condition Becomes Compromised Out in the Field

Steven, Nedd; Sep 26, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471920; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Self-Diagnostic Digitally Controlled Pacemaker/Defibrillator Device (SDDCPDD) has several features that I think may be very useful to the Armed Services. Even though this device is designed as a pacemaker/defibrillator device; its applications can be used as a sensory data retrieval device for Soldiers that have been captured in the field or in combat missions. This research investigates the use of Unified Modeling Language (UML) Diagrams, Object-Oriented Analysis and Design, and Structured Query Language (SQL) to develop the high level architecture of a system to store and retrieve digital/wireless communication information from a pacemaker/defibrillator, or other device to determine the whereabouts, and alert military personnel of the status of the Soldier. It presents the requirements and architectural design of the Self-Diagnostics Digitally Controlled Pacemaker/Defibrillator Device.

DTIC

Architecture (Computers); Digital Systems; Fibrillation; Health; Military Personnel

20070038628 California Univ., San Diego, La Jolla, CA USA

Regulated Ubiquitinylation-Dependent Corepressor and Coactivator Complex Exchange as a Potential Target in Estrogen-Dependent Breast Cancer

Chang, Christine S; Sep 1, 2006; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0277

Report No.(s): AD-A471926; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The initial focus of my first year of training has been on getting training in basic molecular biology experimental techniques and bioinformatics analysis of microarray and genome-wide chromatin immunoprecipitation data. Successful initial research results have been accepted for publication. Mutant constructs that block specific phosphorylation sites in TBL1 and TBLR1 has been constructed for microinjection and transfection experiments to test functionality of each phosphorylation sites. Phosphopeptide specific antibodies for TBL1 and TBLR1 have been developed and initial characterization of the antibody has been performed. Performed data analysis of genome-wide chromatin immunoprecipitation experiments with ERalpha, RNA polymerase III and histone modification markers and correlate the binding data with expression profiles upon estrogen stimulation.

DTIC

Breast; Cancer; Estrogens; Mammary Glands; Targets

20070038631 Wisconsin Univ., Madison, WI USA

Regulated GDNF Delivery in Vivo Using Neural Stem Cells

Svendsen, Clive; Apr 1, 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0122

Report No.(s): AD-A471929; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This year we have confirmed that hNPC delivering GDNF can protect dopamine neurons in a rat model of Parkinson's disease and have now shown an improvement in behavioral asymmetry induced by the lesion. We have completed a large monkey study using GDNF-hNPC and are in the process of analyzing those data. We have published regulated vector data described last year and have two other papers under review for publication. We were awarded a one year no cost extension with (new aims and goals) to this grant which is currently underway.

DTIC

Diseases; In Vivo Methods and Tests; Models; Stem Cells

20070038634 Michigan Univ., Ann Arbor, MI USA

Influences of Nutrition and Physical Forces on Bone Structure/Function Properties

Goldstein, Steven A; McCreadie, Barbara; Morris, Michael; Oct 2005; 103 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0809

Report No.(s): AD-A471937; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The specific goals of this research program were to contribute to two major objectives in support of reducing the incidence of fracture: 1. The development and application of micro-imaging and testing techniques in animal models to study bone structure function properties. 2. Exploring the influence of calcium and vitamin D metabolism and physical forces on bone integrity. Using mouse models, this study demonstrated that the use of micro-imaging techniques (Micro CT, Raman Spectroscopy) and micro-mechanical testing methods (femora; 4 pt. bending , vertebral compression, tibial torsion) can effectively characterize the morphologic and mechanical properties of bone and how they may be altered by nutrition, exercise and gender. While the results illustrated little or no effect of exercise, the properties of the bone are significantly influenced by mouse strain, gender, and calcium intake.

DTIC

Bones; Fractures (Materials); Nutrition

20070038651 Library of Congress, Washington, DC USA

The Americans with Disabilities Act (ADA): Allocation of Scarce Medical Resources During a Pandemic

Jones, Nancy L; Sep 5, 2007; 20 pp.; In English

Report No.(s): AD-A471981; CRS-RL-33381; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The emergence and rapid spread of a new avian influenza virus (H5N1) and its potential for causing a human influenza pandemic have given rise to numerous issues. One of these is the general lack of surge capacity within the U.S. health-care

system. Essentially, this means that a severe influenza pandemic could lead to much greater demand for vaccines, antiviral medications, and other medical technology, such as ventilators, than there are supplies. This potential imbalance has led to recommendations for priorities for medical resources for certain categories of individuals, including recommendations in the U.S. Department of Health and Human Services (HHS) Pandemic Influenza Plan. This report examines selected proposed priorities in light of the nondiscrimination provisions of the Americans with Disabilities Act (ADA) and section 504 of the Rehabilitation Act of 1973. It will be updated as appropriate.

DTIC

Allocations; Disabilities; Influenza; Viruses

20070038663 Italian National Cancer Inst., Rome, Italy

Endogenous 6-Hydroxymelatonin Excretion and Subsequent Risk of Breast Cancer: A Prospective Study

Muti, Paola C; Mar 2007; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0195

Report No.(s): AD-A472009; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The prevalence of breast cancer is greatest in industrialized regions and exposure to light at night has been proposed as a potential risk factor. Modulation of melatonin secretion by light has been implicated in the causal pathway linking exposure to light and breast cancer risk. Recent evidence indicates that melatonin is a natural oncostatic agent capable of functioning through a variety of anti-proliferative, anti-oxidative, and immunostimulatory mechanisms. We conduct a study to investigate the association of prediagnostic melatonin production and subsequent breast cancer risk in a prospective cohort study, the Italian ORDET study. Thus, prediagnostic melatonin production will be measured as urine levels of the 6-hydroxymelatonin sulphate (6-OHMS), its primary enzymatic metabolite, in 12-hour urine (overnight) collection. The study will be conducted as a nested case-control study. We expect 533 breast cancer cases among cohort members during the 17 year-follow-up period. Four controls will be matched to each case on age, menopausal status, recruitment center and time of recruitment for a total number of 2,132 control subjects. This study would be the first one analyzing the potential effect of melatonin on breast cancer risk. It will provide important data on risk factors that are likely key to the development of this disease at great public health impact.

DTIC

Breast; Cancer; Epidemiology; Excretion; Hormones; Mammary Glands; Melatonin; Metabolites; Risk

20070038670 Fox Chase Cancer Center, Philadelphia, PA USA

The Nuclear Death Domain Protein p84N5; A Candidate Breast Cancer Susceptibility Gene

Godwin, Andrew; May 2007; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0312

Report No.(s): AD-A472021; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Efforts to identify genes that contribute to breast cancer lead to the discovery of the human TREX complex, a group of proteins that work together to accurately process and transport messenger RNAs from the nucleus to the cytoplasm in a cell. A member of this complex, referred to as p84N5 (more recently named hTREX84) was found to be a culprit of aggressive human breast cancers. hTREX84 is expressed at very low levels in normal breast epithelial cells, but is highly expressed in breast tumors. hTREX84 expression correlates with tumor size and the metastatic state of the tumor progression. Inhibition of hTREX84 levels via RNAi approaches blocks breast tumor cell growth and causes the cells to die. Thus, hTREX84 appears to be a prognostic marker for determining the aggressiveness of breast cancer and may also be an ideal target for therapeutic drugs against breast cancer.

DTIC

Breast; Cancer; Death; Dies; Drugs; Genes; Mammary Glands; Metastasis; Oncogenes; Proteins

20070038671 Pennsylvania Univ., Philadelphia, PA USA

Near-Infrared Fluorescence Imaging Guided Therapy: Molecular Beacon-Based Photosensitizers Triggered by Breast Cancer-Specific mRNA

Zheng, Gang; Chen, Juan; Stefflova, Klara; May 2007; 101 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0373

Report No.(s): AD-A472022; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have developed breast cancer-targeted photodynamic molecular beacons (PMB) using two different activation mechanisms: mRNA-triggered (openable) PMB and protease-triggered (cleavable) PMB. We have validated the core principle

of PMB concept: the ability of photosensitizer (PS) to produce singlet oxygen (1O_2) can be precisely controlled in response to specific breast cancer-associated biomarkers. For the first time, using mouse models and on separate cells, we have shown that it is possible to limit the collateral damage to surrounding normal cells using this approach, thus achieved the unprecedented tumor selectivity for breast cancer PDT. In addition, we also demonstrated the versatility of the PMB design by developing PDT beacons with tailored functions such as the PDT agents with a built-in apoptosis sensor for in situ and real time monitoring of the therapeutic outcome.

DTIC

Beacons; Breast; Cancer; Fluorescence; Imaging Techniques; Mammary Glands; Photosensitivity; Ribonucleic Acids

20070038672 Cedars-Sinai Medical Center, Los Angeles, CA USA

Targeting siRNA Missiles to HER2+ Breast Cancer

Medina-Kauwe, Lali K; Jun 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0549

Report No.(s): AD-A472023; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The most significant finding of the research period reported here is that delivery conjugates can be assembled that can direct siRNA molecules to target cells, including HER2+ human breast cancer cells, in culture in the presence of serum, while non-target cells are avoided. The successful siRNA delivery in serum resulted in substantial reduction of target gene expression in the specific cells being aimed at by these missile-like molecules. These findings suggest that the approach of using our lab's novel targeting and cell penetration proteins may be effective at targeting specific tumor cells in vivo, which will be tested in our upcoming funding periods.

DTIC

Adenoviruses; Breast; Cancer; Genes; In Vivo Methods and Tests; Mammary Glands; Missiles; Ribonucleic Acids

20070038674 Thomas Jefferson Univ., Philadelphia, PA USA

Artificial Pancreas for Control of BG and Insulin Levels in Hospitalized Patients with Diabetes and Stress Hyperglycemia

Joseph, Jeffrey I; Aug 1, 2007; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0004

Report No.(s): AD-A472026; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This addendum to the final report contains a summary of the data analyses for the research project entitled Artificial Pancreas for Control of BG and Insulin Levels in Hospitalized Patients with Diabetes and Stress Hyperglycemia, (Principal Investigator: Jeffrey Joseph, DO; Award Number: W81XWH-04-1-0004). The original tasks set forth in the statement of work for this research project are given in Table 1 (modifications to the statement of work appear in italics). The information herewith addresses tasks 3 and 4. Please refer to the original final report submitted February 2007 for information on all other tasks. The body of the report is separated into two sections. Section A will review the performance of the needle-type interstitial fluid glucose sensor, the Telemetered Glucose Monitoring System (TGMS). Six TGMS sensors were placed on each of the ten subjects studied for a total of 60 sensors. Section B will review the performance of the vascular blood glucose sensor, the Vascular Glucose Monitoring System (VGMS). A total of five sensors were studied with one sensor inserted into a central vein in the first five subjects.

DTIC

Blood; Cardiovascular System; Chemical Composition; Glucose; Hyperglycemia; Insulin; Metabolic Diseases; Pancreas; Patients

20070038675 Nebraska Univ., Omaha, NE USA

Estrogen-Induced Depurination of DNA: A Novel Target for Breast Cancer Prevention

Cavaliere, Ercole L; May 2007; 119 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0229

Report No.(s): AD-A472027; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The research conducted in this COE grant is based on the paradigm that estrogens can become endogenous carcinogens when their metabolism is unbalanced favoring formation of catechol estrogen quinones and their reaction with DNA. Compelling evidence obtained in the various specific aims of this COE will be decisive for determining the risk of breast cancer by using the depurinating estrogen-DNA adducts as biomarkers. These biomarkers will also be used for evaluating the ability of specific antioxidants to prevent breast cancer initiation. Much of the research accomplished by this COE was

published in a review article in BBA-Reviews in Cancer which was co-authored by all the participants of the COE.
DTIC

Antioxidants; Breast; Cancer; Carcinogens; Deoxyribonucleic Acid; Estrogens; Mammary Glands; Prevention; Quinones; Targets

20070038691 Tulane Univ., New Orleans, LA USA

Enhancing the Immune Response to Recombinant Plague Antigens

Clements, John D; May 2007; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-2-0058

Report No.(s): AD-A472048; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The etiologic agent of plague is the Gram negative bacterium *Yersinia pestis*. *Y. pestis* is a concern as one of the microorganisms with potential for use against civilian or military populations as a biological warfare/ biological terrorism agent. In that case, the pneumonic form of plague would be the most likely outcome. This form of plague is particularly devastating because of the rapidity of onset, the high mortality, and the rapid spread of the disease. Immunization against aerosolized plague presents a particular challenge for vaccine developers. The studies reported herein explore the ability of a novel adjuvant, designated LT(R192G), to promote the rapid development of long-lasting, high titer antibodies against a recombinant plague antigen (F1-V) and protection in a murine model. Subsequent studies will be performed in non-human primates. Different routes of administration are examined to test the hypothesis that heterologous boosting will be more effective than homologous boosting at increasing the magnitude and/or duration of the antibody response.

DTIC

Antibodies; Antigens; Immunity; Physiological Responses

20070038692 Temple Univ., Philadelphia, PA USA

ON012380: A Non-ATP Competitive Inhibitor of BCR-ABL for the Therapy of Imatinib-Resistant CMLs

Reddy, E P; May 2007; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0267

Report No.(s): AD-A472049; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Because it is now apparent that a significant proportion of patients chronically treated with imatinib develop resistance due to the acquisition of mutations in the kinase domain of BCR-ABL our aim was to generate a potent inhibitor of BCR-ABL by targeting regions outside the ATP binding site of this enzyme as these compounds offer the potential to be unaffected by mutations that make CML cells resistant to imatinib. Screening of a novel library of small molecule kinase inhibitors which are unrelated to ATP or other purine and pyrimidine nucleosides using the high through-put assay led to the identification of three six new compounds series. Of these three compounds were found to be most active against all of the imatinib-resistant forms of BCR-ABL including the T3151 mutation in vitro and in vivo assays. In addition these compounds were also found to inhibit the proliferation of and induce apoptosis of leukemic cell lines that express the V617F mutant form of JAK2 and establish their utility for the treatment of myeloproliferative disorders arising due to mutations in JAK2. We provide a detailed description of their biological activity and mechanism action of these compounds.

DTIC

Adenosine Triphosphate; Inhibitors; Mutations; Therapy

20070038693 California Univ., Los Angeles, CA USA

Effects of Hematopoietic Lineage and Precursor Age on CML Disease Progression

Dorshkind, Kenneth; Mar 2007; 41 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0795

Report No.(s): AD-A472050; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Declines in lymphopoiesis during aging diminish the immune response, but little consideration has been given to its effect on the development of hematological disease. This report demonstrates that age-related defects in lymphopoiesis contribute to the myeloid dominance of adult leukemia. Using a murine model of chronic myeloid leukemia (CML), an adult-onset malignancy arising from transformation of hematopoietic stem cells (HSC) by the BCR-ABLP210 oncogene, our studies have demonstrated that young bone marrow (BM) cells transformed with BCR-ABLP210 initiated both a myeloproliferative disorder (MPD) and B lymphoid leukemia while BCR-ABLP210 transformed old BM cells recapitulated the human disease

by inducing a MPD with rare lymphoid involvement. Further, the lesser severity of MPDs initiated from old BCR-ABLP210 transduced BM cells revealed unappreciated defects in aged

DTIC

Blood Cells; Diseases; Hematopoietic System

20070038694 Cold Spring Harbor Lab., New York, NY USA

Analysis of Learning Disabilities of Tuberous Sclerosis Complex in Drosophila

Zhong, Yi; Jan 2006; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0195

Report No.(s): AD-A472052; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Intellectual impairments/learning disabilities are among the most frequent clinical manifestations of tuberous sclerosis complex (TSC). In this proposal, we explored Drosophila models for TSC related learning defects. Both *tsc1* and *tsc2* genes are conserved in flies and mutants are available. Our preliminary data indicated that mutations in both genes were able to cause learning defects even in heterozygous mutants. We also showed that this gene could be critically involved in learning processes for over expression of both gene together led to an increase in memory retention. Although these studies were still very preliminary, it is encouraging that Drosophila may serve as models for gaining insights into molecular basis of the TSC disorder-related cognitive dysfunction.

DTIC

Disabilities; Drosophila; Learning; Mental Performance

20070038698 Thomas Jefferson Univ., Philadelphia, PA USA

EGFR-Dependent Regulation of Matrix-Independent Epithelial Cell Survival. Addendum

Rodeck, Ulrich; Apr 2007; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0216

Report No.(s): AD-A472057; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Signaling through the epidermal growth factor (EGFR) has been implicated in both effective wound healing and epithelial neoplasia. We have identified a novel function of the EGFR in support of epithelial cell survival, particularly in conditions of anchorage-independence. Objective/Hypothesis: Define molecular mechanisms and pathways by which EGFR activation supports epithelial cell survival. Two specific aims focus on (1) posttranslational modification of relevant Bcl-2 family members by EGFR activation through MAPK-dependent mechanisms and, (2) STAT3 activation by deregulated EGFR signaling as observed in epithelial cancer. Work related to Specific Aim 1 has been completed and published in three manuscripts during 2006. In addition, another manuscript has been accepted for publication in 2007. The final action item, i.e. assessment of JNK and p38 activation in the anchorage-independent state as they relate to NF-kappaB activity has been completed. In summary, we have completed the work proposed in both, Specific Aims 1 and 2 of the original proposal.

DTIC

Epithelium; Survival

20070038699 Meharry Medical Coll., Nashville, TN USA

Modulation of the Proliferation and Metastasis of Human Breast Tumor Cells by SLUG (IDEA)

Chaudhuri, Gautam; Apr 2007; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0466

Report No.(s): AD-A472059; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of the project for the reporting period was to identify high affinity SLUG-regulated gene promoters from human breast cells. We over expressed 3xFLAG-tagged (C-terminal) human SLUG in the SLUG-negative MDA-MB-468 and MCF-7 cells through a lentiviral construct. By chromatin immunoprecipitation assay and Q-PCR, we identified/reconfirmed a handful of the gene promoters that indeed bind in vivo with SLUG in the human breast cells tested. They include cytokeratins 8, 18, and 19, E-cadherin, occludin, Na/K ATPase, vitamin D receptor, integrin alpha 3, PUMA, BRCA2, claudins 5, 3, 7, 11, 1, 14, and 16, desmoglein 1, and 2, PCNA, PGDH and plakoglobin gene promoters. We are employing the chromatin immuno-precipitation-DNA selection and ligation (ChIP-DSL, formerly known as ChIP-GLAS, Aviva System Biology) technique for further analysis. We evaluated the mRNA levels of these potentially SLUG-regulated genes in invasive and non-invasive human breast tumor cells. We have designed DNA decoys against the DNA binding domain of SLUG from the claudin 7 gene promoter (highest affinity for SLUG among the promoters tested). We are currently testing whether these

decoys can block the binding of SLUG in vivo to its target promoters and stimulate the expressions of SLUG-regulated genes in human breast cells.

DTIC

Breast; Cancer; Cells (Biology); Mammary Glands; Metastasis; Modulation; Tumors

20070038702 Texas Univ., Houston, TX USA

Regulation of Calcium Fluxes and Apoptosis by BCL-2 Family Proteins in Prostate Cancer Cells

McConkey, David J; Feb 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0182

Report No.(s): AD-A472063; No Copyright; Avail.: Defense Technical Information Center (DTIC)

BCL-2 family proteins regulate apoptosis but their mechanisms of action remain unclear. We have demonstrated that Bax and Bak, two pro-apoptotic members of the family, are both capable of triggering release of Ca²⁺ from the endoplasmic reticulum and that this contributes to cell death in human prostate cancer cells. In work supported by this proposal we performed comprehensive analyses of the effects of siRNA-mediated knockdown of BH3- only members of the family, Bax, and Bak on apoptosis induced by diverse stimuli. The data demonstrate that Bax and Bak play non-overlapping roles in cell death; Bax appears to be linked more closely to cell death induced by stimuli that mobilize ER Ca²⁺, whereas Bak appears to play a more dominant role in ER stress. In ongoing studies we are assessing the effects of knockdown on ER Ca²⁺ fluxes and plan to finish the project within a year.

DTIC

Apoptosis; Calcium; Cancer; Prostate Gland; Proteins

20070038703 Stanford Univ., Stanford, CA USA

Genomic and Expression Profiling of Benign and Malignant Nerve Sheath Profiling of Benign and Malignant Nerve Sheath

van de Rijn, Matt; Nielsen, Torsten; Rubin, Brian; May 2007; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0297

Report No.(s): AD-A472065; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of the study is to identify genes that will serve as molecular markers for progression of neurofibroma to MPNST, and to identify potential therapeutic targets. miRNA expression profiling was performed on 6 cases of MPNSTs, and 7 cases of synovial sarcomas. By using unsupervised hierarchical clustering most tumors were grouped together according to tumor type. Subsequent analyses using Significance Analysis of Microarrays (SAM) identified miRNAs that differentiate between MPNSTs and synovial sarcoma (SS). To develop a cell line model for MPNSTs, global gene expression profiles for cell lines established from 3 primary MPNST and SS tumor tissues was carried out and their expression profiles were compared with other sarcomas. A large tissue microarray (TMA) containing about 200 nerve sheath tumors was used to test for EGFR expression by IHC. Neoplasms in which the majority of samples showed high expression by IHC included MPNST (83% of NF1- associated and 77% of sporadic), 73% of plexiform neurofibroma, 100% diffuse neurofibroma and 93% of SS.

DTIC

Cancer; Genes; Genome; Neoplasms; Nerves; Sheaths

20070038704 Wisconsin Univ., Madison, WI USA

Enhancing the Anti-tumor Activity of ErbB Blockers with Histone Deacetylase(HDAC)Inhibition in Prostate Cancer Cell Lines

Chinnaiyan, Prakash; Harari, Paul M; May 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0040

Report No.(s): AD-A472066; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Characterize the capacity of HDAC inhibitors to enhance the anti-tumor activity of anti-ErbB agents in prostate cancer cell lines. Interactions between these agents will be examined at both the cell signaling level, as well as through biologic end-points, including cellular proliferation, impact on cell cycle kinetics, invasion, and angiogenesis. HDAC inhibitors attenuate ErbB expression near complete abrogation of EGFR and AKT signaling in the prostate cancer cell lines. HDAC inhibitors enhanced antiproliferative effects and apoptosis induction of ErbB blockade in multiple cell lines. Preliminary gene expression profiles using cDNA arrays suggests multiple levels of potential synergy between ErbB and HDAC inhibitors.

Continuing work with additional prostate cancer cell lines and examining other biologic end-points, including cell cycle kinetics, angiogenesis, and invasion. Promising results will then be evaluated in vivo.

DTIC

Cancer; Inhibitors; Prostate Gland; Tumors

20070038705 Northeastern Univ., Boston, MA USA

Characterizing the Dynamic Response of the Estrogen Receptor to Agonists and Antagonists by Multi-frequency Electron Spin Resonance Spin-Labeling

Budil, David E; Hanson, Robert N; May 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0551

Report No.(s): AD-A472067; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall objective of this project is to characterize the detailed structural and dynamic response of the estrogen receptor ligand binding domain (ER-LBD) to a variety of ligands ranging from strong estrogens to strong antiestrogens using electron spin labeling. The technical aims for the initial period involved developing site-directed spin-labeled mutants of the ER-LBD and synthesizing new spin-labeled ligands for the proposed studies. We have optimized cell culture production of ER-LBD and expressed a number of single and doubly labeled mutants. In addition we have synthesized a new spin label for attachment to site-selected cysteine residues in this protein and made substantial progress towards the synthesis of spin-labeled ligands with a range of agonist/antagonist activities. Initial electron spin resonance studies have established that the selected label locations will be acceptably sensitive to the type of ligand present.

DTIC

Dynamic Response; Electron Paramagnetic Resonance; Estrogens

20070038706 Indiana Univ., Indianapolis, IN USA

Center of Excellence for Individualization of Therapy for Breast Cancer

Sledge, George W; Apr 2007; 40 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0468

Report No.(s): AD-A472068; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Optimal systemic treatment after breast cancer is the most crucial factor in reducing mortality in women with breast cancer. Adjuvant chemotherapy and hormonal treatment both reduce the risk of death in breast cancer patients. However, while estrogen receptors status predicts for response to hormone treatments, there are no clinically useful predictive markers for chemotherapy responses. All eligible women are therefore treated in the same manner. Even denoal drug resistance will result in treatment failures in many breast cancer patients. Currently, there are no methods available to distinguish those patients who are likely to respond to specific chemotherapies, and given the accepted practice of prescribing adjuvant treatment to most parties, even if the average expected benefit is slow, the selection of appropriate patients represents a major advance in the clinical management of breast cancer today.

DTIC

Breast; Cancer; Chemotherapy; Clinical Medicine; Drugs; Estrogens; Hormones; Mammary Glands; Therapy

20070038707 Connecticut Univ., Storrs, CT USA

Relationship of Neurocognitive Function to Breast Cancer Treatment and Induced Menopause

Kenefick, Amy L; May 1, 2007; 67 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0528

Report No.(s): AD-A472069; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The intent of this Clinical Research Nurse Award was to facilitate the preparation of the investigator for an active career in collaborative clinical breast cancer research. The training component of this award included formal and informal experiences related to breast cancer research/treatment and research methodology. A nine month longitudinal research study describing changes in neurocognitive function in women receiving chemotherapy for breast cancer and in a comparison group of women having had surgically induced menopause was designed and initiated but a sufficient sample has not yet accrued during the period of this grant.

DTIC

Breast; Cancer; Chemotherapy; Clinical Medicine; Cognition; Hormones; Mammary Glands; Neurology

20070038709 State Univ. of New York, Stony Brook, NY USA

Molecular Basis of Essential Thrombocytosis

Bahou, Wadie; Jun 1, 2007; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0349

Report No.(s): AD-A472071; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Human blood platelets play critical roles in normal hemostatic processes and pathologic conditions such as thrombosis (i.e. cardiovascular disease and stroke), vascular remodeling, inflammation, and wound repair. Despite the biological importance of platelets and their intact protein synthetic capabilities, remarkably little is known about platelet mRNAs. The pathogenesis of essential thrombocytosis (ET), a disease of platelet number and function, is poorly understood at the molecular level. The main goal of this project is to build on our preliminary data that suggests that patients with ET have distinct platelet transcript profiles that differ from those of normal platelets. The three main hypotheses to be tested are: (1) patients with ET have mRNA profiles that are distinct from those of normal controls; (2) these differences can be used to elucidate the molecular basis of ET; and (3) these differences can be used to differentiate ET from other causes of thrombocytosis (ET diagnostics). Completion of the specific aims as outlined below should (i) provide considerable insight into the molecular basis of ET, (ii) assist with molecular diagnostics, and (iii) help to devise rational approaches for pharmacological intervention.

DTIC

Cardiovascular System; Heart Diseases; Injuries; Platelets; Thrombosis

20070038710 Thomas Jefferson Univ., Philadelphia, PA USA

Role of Stat5a in Differentiation of Human Breast Cancer

Ryder, Amy; Jun 2007; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0554

Report No.(s): AD-A472072; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Stat5 is closely involved in mammary gland differentiation and lactation. We have previously shown that active Stat5 is lost during breast cancer progression and this loss is associated with a more aggressive disease status. In this study, we propose to investigate the ability of active Stat5 to induce differentiation as a means to suppress invasion and metastasis of breast cancer cell lines. Using a constitutively active Stat5a that is tyrosine phosphorylated and transcriptionally active in the absence of prolactin stimulation, we hypothesize that over expression of active Stat5 will correlate with increased expression of differentiation markers and reduced invasion in vitro and in vivo. We have generated two constitutively active Stat5a constructs, Stat5a-S710F and Stat5a-3ser, and have determined that Stat5a-3ser has a greater potential to be active in the absence of prolactin stimulation. We have generated lentiviral, adenoviral, and MDA-MB-231 stable cell lines expressing these constructs and are in the process of initiating both in vitro and in vivo differentiation and invasion studies outlined in the original proposal.

DTIC

Breast; Cancer; Mammary Glands; Pituitary Hormones; Proteins

20070038711 Retina Foundation, Boston, MA USA

Molecular Solutions to Low Injuries Resulting from Battlefield Injuries

Dartt, Darlene A; May 1, 2007; 17 pp.; In English

Contract(s)/Grant(s): W81XWH-04-2-0008

Report No.(s): AD-A472073; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We hypothesize that targeted molecular intervention can preserve vision threatened by battlefield trauma-induced corneal and retinal inflammation, corneal and retina/optic nerve apoptosis, ocular surface dry eye after refractive surgery, and retinal degeneration. We are studying the consequences of trauma-induced (1) corneal inflammation using a gene therapy approach of providing soluble Fas ligand to the cornea to determine if this ligand can suppress corneal inflammation in mice; (2) retinal inflammation by examining if transforming growth factor-beta, thrombospondin, and somatostatin, in sub retinal space, can suppress inflammation within retina secondary to autoimmune uveoretinitis and light-induced damage in mice; (3) corneal cell death by apoptosis and promote regeneration by identifying the anti-apoptotic gene with the greatest capacity to suppress corneal cell apoptosis using mice; (4) retinal cell death and regeneration by using mice to determine if systemic treatment with lithium chloride can prevent collateral damage to retinal neurons and promote optic nerve regeneration; (5) dry eye by determining how to minimize dry eye after LASIK refractive surgery by developing new tests to predict pre-disposition to refractive surgery induced dry eye; and (6) retinal injury by generating stem cell polymer composites.

DTIC

Eye (Anatomy); Injuries

20070038712 Winston-Salem State Univ., Winston-Salem, NC USA

Quality of Life and Functional Status across the Life Course

Naughton, Michelle J; May 1, 2007; 32 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0447

Report No.(s): AD-A472074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Behavioral Center of Excellence in Breast Cancer contains three separate, but related research projects focused on breast cancer patients quality of life and functional status. There is also a Biostatistics's Core Facility supporting all three studies. The three projects are: Project 1) Menstrual Cycle Maintenance and Quality of Life Following Treatment for Breast Cancer: A Prospective Study. This is a study of women aged 45 years and younger diagnosed with a first breast cancer. Project 2) Investigating Mechanisms to Explain Age Associated Differences in Quality of Life Among Breast Cancer Patients. This study examines psychosocial and clinical factors associated with patient's (aged 18-80+ years) coping and quality of life during the first 18 months post-diagnosis. Project 3) Research on Optimal Recovery Practices in Breast Cancer (RESTORE). This is a randomized exercise intervention trial with a lymphedema prevention program. Project 1 is a continuation of a study that was initiated in January of 1998. Projects 2 and 3 are new protocols, which will begin patient recruitment in the fall of 2002. All three studies have the potential to greatly improve the functional status and life quality of breast cancer patients during treatment and beyond.

DTIC

Breast; Cancer; Mammary Glands; Patients

20070038713 Creighton Univ., Omaha, NE USA

Effect of Reminder Telephone Calls on Mammography Compliance in High Risk Women

Synder, Carrie L; Jun 1, 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0465

Report No.(s): AD-A472075; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Even though mammography has been proven to be effective in reducing breast cancer mortality this simple screening measure is underutilized by women who are at an inordinately high risk for developing breast cancer. The effect of a reminder telephone call intervention has not been studied in this high-risk population where the need for compliance is crucial. The hypothesis for this study is that a simple reminder telephone call will significantly increase mammography frequency in high-risk women compared to a control group. Four-hundred and forty-seven women consented to participate in the study. Interestingly 346 (77%) reported obtaining annual mammography for at least the past two years. Subjects who were non-compliant by self-report (n=32) were randomized to the intervention or control group. Reminder and follow-up telephone calls were completed on 31 women randomized to the study. A statistical difference (p=0.0017) was observed between the two groups. These findings support the hypothesis that mammography compliance in high risk women can be increased if an intervention such as a simple reminder call is implemented thereby leading to an early diagnosis and potential cure. Future studies should aim to increase the number of subjects and determine barriers in obtaining mammograms in these high risk individuals.

DTIC

Breast; Cancer; Females; Mammary Glands; Risk; Telephones

20070038716 Fox Chase Cancer Center, Philadelphia, PA USA

BRCC36, a Novel Subunit of a BRCA1 E3 Ubiquitin Ligase Complex: Candidates for BRCA3

Chen, Xiaowei; Jun 2007; 41 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0573

Report No.(s): AD-A472078; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Breast cancer is a genetically heterogeneous disease, and multiple genes remain to be identified among BRCA1 and BRCA2 mutation-negative breast cancer-prone families. We believe that a valid approach to identify genetic factors that contribute to breast cancer risk is to evaluate genes coding for proteins that interact with BRCA1 in a multiple protein complex. We have recently found one such candidate, referred to as BRCC36. We have reported a profound increase in BRCC36 expression in breast tumors. Furthermore, our studies have defined BRCC36 as a direct regulator of BRCA1 activation and nuclear foci formation in response to IR in a number of breast cancer cell lines. Our results have found that down-regulation of BRCC36 expression impairs homologous recombination repair (HRR). Therefore, our data suggest that DNA repair pathway activated in response to IR and appears to sensitize breast cancer cells to IR-induced apoptosis. Importantly, we found that BRCC36 mutated in the germline of a cancer-prone family and may increase the risk of developing breast cancer. Overall,

aberrant expression or mutation of BRCC36 genes in breast tumors may lead to disruption of the normal function of BRCA1 and contribute to the development of breast cancer.

DTIC

Breast; Cancer; Genes; Ionizing Radiation; Mammary Glands

20070038717 Arizona Univ., Tucson, AZ USA

Acute Lung Injury Following Smoke Inhalation: Predictive Value of Sputum Biomarkers and Time Course of Lung Inflammation

Burgess, Jefferey L; May 1, 2007; 48 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0673

Report No.(s): AD-A472079; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The role of lung inflammatory mediators in the development of lung injury following smoke inhalation is unknown. Our objectives are to determine whether initial markers of inflammation or longitudinal changes in inflammatory markers are associated with ARDS or hypoxemia. Study design: Bronchial secretions from 200-250 intubated patients with smoke inhalation injury will be evaluated for initial and longitudinal changes concentrations of substance P, TNF- α , IL-1, IL-8, and IL-10, as well as cell count and differential every two hours to a maximum of 72 hours. Initial lung inflammation and changes in inflammatory markers will be compared in patients with and without subsequent significant lung injury. We have enrolled 123 subjects. To date, we have completed sample assays and data analysis on a subset of 21 subjects with early samples. We have assessed longitudinal changes in TNF- α , IL-1, IL-8, IL-10, sFAS1, substance P, IL-1RA, 2M, MMP-9, and TIMP-1 concentrations over the first 36 hours post-exposure, and looked at the relation between these biomarkers and hypoxemia and ARDS. We have defined temporal changes in IL-8, IL-1, IL-1RA/IL-1, and TNF- α /TNF-R2 post-exposure, and have found that initial concentrations of IL-8 and the ratio of 2-M to IL-8 are significant predictors of subsequent hypoxemia. Further analysis of additional markers, including neutrophils, proteases, and protease-inhibitors, have been started.

DTIC

Biomarkers; Bronchi; Injuries; Lungs; Predictions; Serums; Smoke

20070038719 California Univ., San Francisco, CA USA

Exploring Women's Perceptions of Their Risk of Developing Breast Cancer

Katapodi, Maria C; Jun 2007; 118 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0356

Report No.(s): AD-A472081; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The study aimed to describe perceived breast cancer risk, compare subjective and objective risk estimates, and examine the influence of heuristic reasoning in women's narratives. The survey used three probability scales (Verbal, Comparative, Numerical) and the Gail model to measure perceived and objective risk. Aim 3 is addressed with Argument and Heuristic reasoning analysis. We recruited a multicultural, educated sample of 184 English-speaking women from community settings. Fifty four provided an in-depth interview. Participants held an optimistic bias regarding their breast cancer risk (comparative optimism and better-than-average), and underestimated their objective risk calculated with the Gail model. Older women and those with one affected first-degree relative did not perceive higher risk, which implies that women's knowledge of breast cancer risk factors was incomplete, despite their high educational level. Age and family history are independent predictors of sporadic and hereditary/familial breast cancer risk; yet, women could not distinguish between the two forms of the disease. Moreover, higher risk women were not more likely to receive more frequent screening.

DTIC

Breast; Cancer; Females; Mammary Glands; Perception; Risk

20070038720 Chicago Univ., Chicago, IL USA

Investigation of Three-Group Classifiers to Fully Automate Detection and Classification of Breast Lesions in an Intelligent CAD Mammography Workstation

Edwards, Darrin C; Metz, Charles E; Giger, Maryellen L; May 1, 2007; 97 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0495

Report No.(s): AD-A472082; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our goal is to develop a fully automated classification scheme for computer-aided diagnosis in mammography. Our proposed scheme would classify computer detections into three groups: malignant lesions, benign lesions, and false-positive computer detections. We proved that the area under the ROC curve (AUC) is not useful in classification tasks with three or

more groups, and showed that the three decision boundary lines used by the three-group ideal observer are intricately related to one another. We analyzed several recently proposed three-group classification methods in terms of the ideal observer. We collected a database of 270 mammographic images with clustered microcalcification lesions. We have developed a novel performance metric that may generalize better than AUC to tasks with more than two groups. A three-group classifier could potentially allow radiologists to detect more malignant breast lesions without increasing their false-positive biopsy rates.

DTIC

Breast; Classifications; Classifiers; Computer Aided Design; Computer Techniques; Detection; Diagnosis; Lesions; Workstations

20070038722 University Health Network, Toronto, Ontario Canada

Detecting and Targeting Oncogenic Myc in Breast Cancer

Penn, Linda Z; Jun 2007; 148 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0571

Report No.(s): AD-A472084; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Deregulation of the cellular myc proto-oncogene is one of the strongest activators of tumorigenesis and understanding the target genes regulated by this transcription factor in cancer etiology will clearly mark a key advance. Here we identify the non-coding RNA H19 as a Myc-induced gene that plays a functional role in breast cancer development. We have also developed antibody reagents to TRRAP, a cofactor that collaborates with Myc to drive tumorigenesis. To determine which target genes are co-regulated by Myc and TRRAP in breast cancer, we have optimized a ChIP-on-chip protocol (Chromatin immunoprecipitation coupled with microarray technology) that can be used with breast cancer cells and primary specimens to achieve both sensitive and specific results. We have also mapped two regions of TRRAP that interact with Myc as shown by co-immunoprecipitation. Our work will impact breast cancer research in several ways. The refined ChIP-on-chip protocol will be used by ourselves and others to conduct breast cancer research focused on specific transcription factors, such as Myc, as well as other regulatory mechanisms at the level of chromatin (e.g. replication, DNA repair). In addition to several valuable antibody reagents, we have identified a novel Myc binding domain of TRRAP and we have identified H19 as a molecular target for the development of novel anti-cancer therapeutics.

DTIC

Breast; Cancer; Carcinogens; Detection; Genes; Mammary Glands; Oncogenes; Tumors

20070038724 New York Univ., New York, NY USA

Regulation of MDM2 Activity by Nucleolin

Borowiec, James A; Jun 2007; 66 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0299

Report No.(s): AD-A472086; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The major accomplishment of our studies is the finding that nucleolin stabilizes p53 by inhibiting the p53-antagonist Hdm2. The increase in p53 protein by nucleolin leads to higher expression of p21cip1/waf1 a reduced rate of cellular proliferation and an increase in apoptosis. Nucleolin also facilitated p53 activation in response to low levels of genotoxic stress. The properties of nucleolin are strikingly similar in many respects to the tumor suppressor ARF including: 1) up-regulation in response to proliferative signals 2) stabilization of p53 by associating with Mdm2 3) inhibition of the E3 ubiquitin ligase activity of Mdm2 and 4) reduction in Hdm2 protein levels. Importantly while ARF and nucleolin can associate our observed effects of nucleolin on Hdm2 activity and p53 protein levels are not dependent upon ARF because they can occur in cells that lack detectable p14ARF mRNA and protein expression. We hypothesize that nucleolin functions in such an ARF-independent pathway to regulate p53 and Hdm2 in response to hyper-proliferative signals. Our data suggest that nucleolin like ARF is an important tumor suppressor in humans. We hypothesize that features of the nucleolin structure can be used to design novel inhibitors of Hdm2 for use in the prevention and/or treatment of breast cancer.

DTIC

Breast; Cancer; Lesions; Mammary Glands; Proteins; Suppressors

20070038725 General Accounting Office, Washington, DC USA

DOD Civilian Personnel: Medical Policies for Deployed DOD Federal Civilians and Associated Compensation for Those Deployed

Farrell, Brenda S; Sep 18, 2007; 33 pp.; In English

Report No.(s): AD-A472087; GAO-07-1235T; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As the Department of Defense (DOD) has expanded its involvement in overseas military operations, it has grown

increasingly reliant on its federal civilian workforce to support contingency operations. GAO was asked to discuss DOD's (1) force health protection and surveillance policies, (2) medical treatment policies that cover federal civilians while they are deployed to support contingency operations in Afghanistan and Iraq, and (3) differences in special pays and benefits provided to DOD's deployed federal civilian and military personnel. For this statement, GAO primarily drew on its September 2006 report that addressed these objectives. For its report, GAO analyzed over 3,400 deployment-related records at eight component locations for deployed federal civilians and policies related to defense health care, reviewed claims filed under the Federal Employees' Compensation Act (FECA); and examined major provisions of special pays and disability and death benefits provided to DOD's deployed federal civilians and military personnel. GAO recommended that DOD establish an oversight and quality assurance mechanism to ensure that all components fully comply with its requirements. In 2007, DOD issued a new force health protection and surveillance policy that if effectively implemented will establish such a mechanism.

DTIC

Defense Program; Deployment; Medical Services; Personnel; Policies

20070038731 Library of Congress, Washington, DC USA

U.S. International HIV/AIDS, Tuberculosis, and Malaria Spending: FY2004-FY2008

Salaam-Blyther, Tiaji; Sep 11, 2007; 13 pp.; In English

Report No.(s): AD-A472108; CRS-RL33485; No Copyright; Avail.: Defense Technical Information Center (DTIC)

On January 28, 2003, during his State of the Union Address, President George Bush proposed that the USA spend \$15 billion over five years to combat HIV/AIDS, tuberculosis (TB), and malaria through the President's Emergency Plan for AIDS Relief (PEPFAR). The President proposed that most of the spending on PEPFAR programs be concentrated in 15 countries in Africa, Asia, Latin America, and the Caribbean. Of the \$15 billion, the Plan proposed spending \$9 billion on prevention, treatment, and care services in the 15 Focus Countries, where the Administration estimated 50% of all HIV-positive people lived. The President also proposed that \$5 billion of the funds be spent on existing bilateral HIV/AIDS, TB, and malaria programs and research, and \$1 billion of PEPFAR funds be reserved for U.S. contributions to the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund). Between FY2004 and FY2008, PEPFAR aims to have supported care for 10 million people affected by HIV/AIDS, including children orphaned by AIDS; prevented 7 million new HIV infections; and supported efforts to provide antiretroviral medication (ARV) to 2 million HIV-infected people.

DTIC

Federal Budgets; Parasitic Diseases; Signs and Symptoms; Tuberculosis; Viruses

20070038732 Michigan Univ., Ann Arbor, MI USA

Prostate Cancer Aggressiveness Gene in Hereditary Prostate Cancer

Cooney, Kathleen; Mar 2007; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0314

Report No.(s): AD-A472110; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is the final report of our CDMRP-funded research grant. Our study comprised of two research aims to examine the role of EZH2 and prostate cancer. In the first of these aims, we have explored and developed data indicating that a polymorphism in EZH2, Asp146His, may contribute to aggressive prostate cancer, and we are currently conducting validation studies to determine if our findings may be used to predict whether men with prostate cancer will have a more aggressive clinical course. This may lead to the recommendation of more aggressive therapies based on genotype. In the second aim, we demonstrated that for the first time that the chromatin-remodeling protein EZH2 interacts with the nuclear receptor REA. This observation begins to shed light on how EZH2 may function in hormonally-regulated tissues, and raises the intriguing possibility that targeted intervention of these factors involved in chromatin remodeling may represent a novel area for the future design of pharmacologic agents for the treatment of prostate cancer.

DTIC

Cancer; Genes; Human Behavior; Personality; Prostate Gland

20070038733 California Univ., Berkeley, CA USA

Signaling Crosstalk: A Live in Situ Analysis of the Temporal and Spatial Regulation of Key Pathways in Human Breast Cancer Progression

Boudreau, Aaron; May 2007; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0339

Report No.(s): AD-A472111; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Signal transduction networks such as the PI3K-AKT and EGFR pathways are important regulators of cell fate decisions,

including cell proliferation, differentiation, apoptosis, and homeostasis. Furthermore, these pathways integrate and influence one another when cells are within an appropriate microenvironment. Using a proteomic approach, we identify stratifin, a protein which regulates AKT and EGFR signaling as well as the cell cycle, to be upregulated in T4-2 cells cultured in 3D IrECM. Expression of stratifin decreases to S1 levels upon phenotypic reversion; these effects were not seen when cells were cultured in 2D, supporting a possible role of stratifin in crosstalk. In the mouse mammary gland, stratifin expression was restricted to myoepithelial cells, and was expressed predominantly during periods of branching morphogenesis and ductal infiltration. Taken together, these data suggest a novel role of stratifin in epithelial cell proliferation and migration. The signaling networks regulated by stratifin will be assessed by shRNA knockdown in T4-2 cells.

DTIC

Breast; Cancer; Mammary Glands

20070038734 Texas Univ., Houston, TX USA

Specific, Reversible Cytostatic Protection of Normal Cells Against Chemotherapeutic in Breast Cancer Therapy

Mull, Benjamin B; Mar 1, 2007; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0255

Report No.(s): AD-A472112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The adverse effects of cancer chemotherapy are widely recognized. Hair loss, gastrointestinal discomfort, lethargy and anorexia are quite common. The cause for these events is the nonspecific nature of current cancer treatment agents. Cytotoxic drugs, while effective at killing proliferating tumor cells, also target normal dividing cells. It is the purpose of this study to develop a proven in vitro strategy to protect normal dividing tissues using a cytostatic agent, UCN-01. There reversible arrest of normally dividing tissues in mice will be examined for improved tolerance of chemotherapeutics. This protective effect will also be evaluated in mice bearing orthotopically implanted breast tumors.

DTIC

Breast; Cancer; Mammary Glands; Protection; Therapy

20070038736 Texas Univ., Dallas, TX USA

Broad Spectrum Chemotherapy: A Novel Approach Using Beta-Galactosidase Activated Pro-Drugs

Liu, Li; Mar 2007; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0331

Report No.(s): AD-A472114; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Gene therapy shows promise for treating prostate cancer and is being exploited in several clinical trials. A major hurdle is establishing a method of verifying transgene activity in situ. Beta-galactosidase (beta-gal) was historically the most popular reporter gene for molecular biology. I have introduced a novel concept for further exploration of gene therapy using beta-galactosidase to activate a broad-spectrum chemotherapeutic to assess the efficacy of the pro-drugs in vitro and explore growth delay in animal models. I also have developed a new beta-galactosidase molecular reporter for MRI spectra, which can be used to detection of lacZ gene expression in vivo.

DTIC

Cancer; Chemotherapy; Drugs; Imaging Techniques; Magnetic Resonance; Prostate Gland; Range (Extremes); Spectra

20070038737 Baylor Coll. of Medicine, Houston, TX USA

INT6 May Influence Breast Cancer Formation by Regulating the 26S Proteasome

Sha, Zhe; Chang, Eric; Apr 1, 2007; 36 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0380

Report No.(s): AD-A472115; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Inactivation of int6 has been linked to breast cancer formation, but its molecular function and precise role in tumorigenesis are largely unknown. This project tests the hypothesis that into is a tumor suppressor gene, regulating the proteasome to mediate genetic stability and cell division. My data showed that Into formed a complex with the proteasome. If into expression is knocked down, proteasome becomes mis-assembled. These into- cells are hypersensitive to proteasome drug and show chromosome instability. To better understand the mechanism through which into regulates the proteasome, I have also completed a structure-function analysis to better understand the role of PCI domain in the Into protein and a manuscript describing this study has been submitted and under review. In addition to these progresses, I have just completed a photobleaching-based study analyzing proteasome mobility and movement in vivo, and how is this regulated by into. A manuscript describing this will be submitted in a month. In conclusion, this fellowship has allowed me to work very

productively to decipher the function of into as a potential breast tumor suppressor.

DTIC

Breast; Cancer; Cell Division; Chromosomes; Genetics; Mammary Glands; Tumor Suppressor Genes

20070038739 Boston Medical Center Corp., Boston, MA USA

The Role of DN-GSK3b in Mammary Tumorigenesis

Farago, Marganit D; Jul 2007; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0375

Report No.(s): AD-A472118; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent studies have implicated ectopic activation of the Wnt pathway in many human cancers, including breast cancer. beta-catenin is a critical co-activator in this signaling pathway, and is regulated in a complex fashion by phosphorylation, degradation, and nuclear translocation. Glycogen synthase kinase-3beta (GSK3beta) phosphorylation of the N-terminal domain of beta-catenin targets it for ubiquitination and proteosomal degradation. We hypothesized that expression of dominant negative (DN) GSK3beta in mammary glands would function in a dominant negative fashion by antagonizing the endogenous activity of GSK3beta and promoting breast cancer development. Consistent with this, we find that DN-GSK3beta stabilizes beta-catenin expression, catalyzes its localization to the nucleus, and upregulates the downstream target gene, cyclin D1, in vitro. In vivo, transgenic mice overexpressing the DN-GSK3beta under the control of the MMTV-LTR develop mammary tumors with overexpression of beta-catenin and cyclin D1. In addition, low dose of carcinogen treatment (DMBA) accelerates mammary tumor formation in DN-GSK3beta mice and exhibits a higher mortality rate than untreated transgenic mice. Thus, antagonism of GSK3beta activity is oncogenic in the mammary epithelium; mutation or pharmacologic downregulation of GSK3beta could promote mammary tumors. Moreover, carcinogen treatment accelerates tumorigenesis in mice that have a genetic predisposition to breast cancer.

DTIC

Breast; Cancer; Carcinogens; In Vitro Methods and Tests; In Vivo Methods and Tests; Mammary Glands

20070038882 Washington Univ., Seattle, WA USA

Octanoyl-Homoserine Lactone Is the Cognate Signal for Burkholderia mallei BmaR1-BmaI1 Quorum Sensing

Duerkop, Breck A; Ulrich, Ricky L; Greenberg, E P; Jul 2007; 8 pp.; In English

Contract(s)/Grant(s): NIAID-U54AI057141; NSRA-T32-GM07270

Report No.(s): AD-A471918; TR-07-041; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Acyl-homoserine lactones (HSLs) serve as quorum-sensing signals for many Proteobacteria. Members of the LuxI family of signal generators catalyze the production of acyl-HSLs, which bind to a cognate receptor in the LuxR family of transcription factors. The obligate animal pathogen Burkholderia mallei produces several acyl-HSLs, and the B. mallei genome has four luxR and two luxI homologs, each of which has been established as a virulence factor. To begin to delineate the relevant acyl-HSL signals for B. mallei LuxR homologs, we analyzed the BmaR1-BmaI1 system. A comparison of acyl-HSL profiles from B. mallei ATCC 23344 and a B. mallei bmaI1 mutant indicates that octanoyl-HSL synthesis is BmaI1 dependent. Furthermore, octanoyl-HSL is the predominant acyl-HSL produced by BmaI1 in recombinant Escherichia coli. The synthesis of soluble BmaR1 in recombinant E. coli requires octanoyl-HSL or decanoyl-HSL. Insoluble aggregates of BmaR1 are produced in the presence of other acyl-HSLs and in the absence of acyl-HSLs. The bmaI1 promoter is activated by BmaR1 and octanoyl-HSL, and a 20-bp inverted repeat in the bmaI1 promoter is required for bmaI1 activation. Purified BmaR1 binds to this promoter region. These findings implicate octanoyl-HSL as the signal for BmaR1-BmaI1 quorum sensing and show that octanoyl-HSL and BmaR1 activate bmaI1 transcription.

DTIC

Anhydrides; Bacteria; Detection

20070038883 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Severe Encephalitis in Cynomolgus Macaques Exposed to Aerosolized Eastern Equine Encephalitis Virus

Reed, Douglas S; Lackemeyer, Matthew G; Garza, Nicole L; Norris, Sarah; Gamble, Scott; Sullivan, Lawrence J; Lind, Cathleen M; Raymond, Jo L; Aug 1, 2007; 11 pp.; In English

Report No.(s): AD-A471845; TR-06-138; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cynomolgus macaques exposed to an aerosol containing a virulent strain of eastern equine encephalitis (EEE) virus developed neurological signs indicating encephalitis that corresponded with the onset of fever and an elevated heart rate. Viremia was either transient or undetectable even in animals that succumbed to the illness. The onset of illness was dose

dependent, but once a febrile response was observed, macaques were moribund within 36 h. Simultaneously, a prominent leukocytosis was seen; 1 day before being moribund, macaques had a white blood cell count >20,000 cells/ microL. The leukocytes were predominantly granulocytes. Increases in serum levels of blood urea nitrogen, sodium, and alkaline phosphatase were also seen. The rapid onset and severity of neurological signs mirror what has been reported for human cases of disease caused by EEE.

DTIC

Aerosols; Encephalitis; Viruses

20070038904 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Superantigen-Induced Cytokine Release from Whole-Blood Cell Culture as a Functional Measure of Drug Efficacy after Oral Dosing in Nonhuman Primates

Krakauer, Teresa; Stephens, Julie; Buckley, Marilyn; Tate, Mallory; Oct 1, 2007; 7 pp.; In English

Report No.(s): AD-A471839; TR-07-044; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Evaluation of drug efficacy for human diseases is routinely performed in animal models for efficiency and in accordance with FDA regulations. Rhesus macaques have been used as models for various lethal diseases and correlates of immunity, as nonhuman primates (NHP) closely resemble humans. We examined the ex vivo cytokine response of superantigen-stimulated whole-blood cells as a first step to therapeutic efficacy testing for bacterial superantigen-induced shock in NHP after oral dosing of pentoxifylline. Doses of 120mg/kg of pentoxifylline effectively attenuated staphylococcal enterotoxin B-induced tumor necrosis factor alpha (TNFalpha), gamma interferon (IFNgamma) and interleukin 2 (IL-2) in ex vivo culture of NHP whole-blood cells by 88%, 81%, and 76%, respectively, whereas lower doses of 48 or 72mg/kg had no inhibitory effect. Thus cytokine release of stimulated peripheral blood cells provides a convenient biological measurement of the anti-inflammatory potency of pentoxifylline and has the advantage of assessing functional responses to a specific biotoxin of interest.

DTIC

Cells (Biology); Culture Techniques; Drugs; Primates

20070038929 Washington Univ., Seattle, WA USA

Clinical and Molecular Consequences of NF1 Microdeletion

Stephens, Karen; May 2007; 43 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0203

Report No.(s): AD-A471858; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have developed rapid and sensitive assays for the detection and mapping of both the common 1.4 Mb NF1 microdeletion and novel microdeletions; our subjects carrying microdeletions have contributed to diverse collaborations including development of a mouse model of plexiform neurofibroma tumorigenesis and the conservation of recombination hotspots. Our hypothesis that genome instability occurs during NF1-tumorigenesis continues to be supported by our findings. First, somatic instability leading to uniparental isodisomy and homozygous NF1 inactivation in NF1-related leukemias, which add to our understanding of leukemogenesis and identifies chromosomal regions where somatic recombination may be favored. Second, we localized neurofibromin to the centrosome in normal and malignant epithelial cells. Third, our preliminary observations show that centrosomes appear abnormal in NF1-derived neurofibromas, suggesting a potential new function for neurofibromin in normal centrosome function and in maintaining genome stability.

DTIC

Fibrosis; Cells (Biology)

20070039073 NASA Marshall Space Flight Center, Huntsville, AL, USA

Testing Prospects for Reliable Diatom Nanotechnology in Microgravity

Gordon, Richard; Hoover, Richard B.; Tuszynski, Jack A.; deLuis, Javier; Camp, Philip J.; Tiffany, Mary Ann; Nagy, Stephen S.; Lerner, Beatriz E.; August 26, 2007; 14 pp.; In English; SPIE Optics and Photonics: Optical Engineering and Application, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The worldwide effort to grow nanotechnology, rather than use lithography, focuses on diatoms, single cell eukaryotic algae with ornate silica shells, which can be replaced by oxides and ceramics, or reduced to elemental silicon, to create complex nanostructures with compositions of industrial and electronics importance. Diatoms produce an enormous variety of structures, some of which are microtubule dependent and perhaps sensitive to microgravity. The NASA Single Loop for Cell Culture (SLCC) for culturing and observing microorganisms permits inexpensive, low labor in-space experiments. We propose

to send up to the International Space Station diatom cultures of the three diatom species whose genomes are being sequenced, plus the giant diatoms of Antarctica (up to 2 mm diameter for a single cell) and the unique colonial diatom, *Bacillaria paradoxa*. *Bacillaria* cells move against each other in partial synchrony, like a sliding deck of cards, by a microfluidics mechanism. Will normal diatoms have aberrant pattern and shape or motility compared to ground controls? The generation time is typically one day, so that many generations may be examined from one flight. Rapid, directed evolution may be possible running the SLCC as a compustat. The shell shapes and patterns are preserved in hard silica, so that the progress of normal and aberrant morphogenesis may be followed by drying samples on a moving filter paper 'diatom tape recorder'. With a biodiversity of 100,000 distinct species, diatom nanotechnology may offer a compact and portable nanotechnology toolkit for exploration anywhere.

Author

Nanotechnology; Algae; Cell Culturing; Weightlessness; Nanostructure Growth

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*.

20070037825 Civil Aeromedical Inst., Oklahoma City, OK USA

Flight Attendant Fatigue

Nesthus, Thomas E; Schroeder, David J; Connors, Mary M; Rentmeister-Bryant, Heike K; DeRoshia, Charles A; Jul 2007; 70 pp.; In English

Report No.(s): AD-A471470; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Departments of Transportation and Treasury and Independent Agencies Appropriations Bill (House Rpt. 108-671) included a directive to the Federal Aviation Administration to conduct a study of flight attendant fatigue. The NASA Ames Research Center Fatigue Countermeasures Group (FCG) was contracted by CAMI to conduct the study. To meet the goals of the study, this report contains a literature review on fatigue as potentially experienced by flight attendants, an evaluation of currently used (actual vs. scheduled) flight attendant duty schedules, and a comparison of these schedules to the current CFRs. The report additionally reviews fatigue-related incident/accident information from the Aviation Safety Reporting System (ASRS) and the NTSB database. One report section describes the application of three different performance and fatigue models to assess how flight attendant duty schedules contribute to increased levels of fatigue and predicted changes in performance. The report concludes with 6 recommendations concerning issues that require further evaluation, including: (1) Survey of Field Operations. To assess the frequency with which fatigue is experienced, the situations in which it appears, and the consequences that follow; (2) Focused Study of Incident Reports. To better understand details of the incidents; (3) Field Research on the Effects of Fatigue. To explore physiological and neuropsychological effects of fatigue, sleepiness, circadian factors, and rest schedules on flight attendants; (4) Validation of Models for Assessing FA Fatigue. An important step to understanding whether and how models could be used in conjunction with field operations; (5) International Carrier Policies and Practices Review. To learn how other countries address these issues and with what results; and (6) Training. FAs could benefit from information on fatigue.

DTIC

Flight Crews; Flight Fatigue; Workloads (Psychophysiology)

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

20070037450 NASA Marshall Space Flight Center, Huntsville, AL, USA

Fabrication Infrastructure to Enable Efficient Exploration and Utilization of Space

Howell, Joe T.; Fikes, John C.; McLemore, Carole A.; Manning, Curtis W.; Good, Jim; September 24, 2007; 20 pp.; In English; 58th International Astronautical Congress, 24-28 Sep. 2007, Jyderabad, India; Original contains black and white illustrations

Report No.(s): IAC-07-D3.3.02; Copyright; Avail.: CASI: [A03](#), Hardcopy

Unlike past one-at-a-time mission approaches, system-of-systems infrastructures will be needed to enable ambitious

scenarios for sustainable future space exploration and utilization. Fabrication infrastructure will be needed to support habitat structure development, tools and mechanical part fabrication, as well as repair and replacement of ground support and space mission hardware such as life support items, vehicle components and crew systems. The fabrication infrastructure will need the In Situ Fabrication and Repair (ISFR) element, which is working in conjunction with the In Situ Resources Utilization (ISRU) element, to live off the land. The ISFR Element supports the entire life cycle of Exploration by: reducing downtime due to failed components; decreasing risk to crew by recovering quickly from degraded operation of equipment; improving system functionality with advanced geometry capabilities; and enhancing mission safety by reducing assembly part counts of original designs where possible. This paper addresses the fabrication infrastructures that support efficient, affordable, reliable infrastructures for both space exploration systems and logistics; these infrastructures allow sustained, affordable and highly effective operations on the Moon, Mars and beyond.

Author

Life Support Systems; Space Exploration; Life (Durability); Habitats; Fabrication; Space Missions

20070037748 Massachusetts Inst. of Tech., Cambridge, MA USA

Collaborative Human-Computer Decision Making for Command and Control Resource Allocation

Cummings, Mary L; Aug 2007; 20 pp.; In English

Contract(s)/Grant(s): N00014-04-1-0543; BAA04-001

Report No.(s): AD-A471321; MIT-6896251; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The focus of this research program was the development of a collaborative human-computer decision-making model that demonstrates not only what decision making functions should always be assigned to humans or computers, but what functions can best be served in a mutually supportive human-computer decision making environment. It is possible that when the human and computer collaborate, they can discover solutions superior to the one either would have determined independently of the other. This research effort investigated the strengths and limitations of both humans and computers in command and control resource allocation problems, and examines how humans and computer can work together collaboratively to promote efficient, effective, and robust decision making.

DTIC

Command and Control; Decision Making; Human-Computer Interface; Resource Allocation

20070037775 Naval Postgraduate School, Monterey, CA USA

An Analysis of Manpower Requirements for the USA Marine Corps Tiers II and III Unmanned Aerial Systems Family of Systems Program

Nader, Cesar E; Jun 2007; 158 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471381; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research was conducted to examine the quantitative and qualitative component requirements for the Tier II and Tier III of the USA Marine Corps Unmanned Aerial Systems Program. The main objective of this research is to develop a proposed manpower structure for a composite squadron in order to improve current UAS capabilities while minimizing manpower requirements. This was accomplished by conducting an independent assessment of manpower requirements of the different strategies being considered under the Unmanned Aerial Systems Family of Systems (UAS FoS) for the Marine Corps for the Tier II and III. In the final analysis, the research recommends the consolidation of the Tiers II and III to form a composite UAV squadron, reduce the logistics footprint by relegating the support mission to the MWSS and the MALS, and combining operational and maintenance billets within the current VMU structure to consolidate

DTIC

Manpower; Remotely Piloted Vehicles; United States

20070037798 Army Research Lab., Aberdeen Proving Ground, MD USA

Non-Line-of-Sight Cannon (NLOS-C) System Crew Shock Loading, Evaluation of Potential Head and Neck Injury

LaFiandra, Michael E; Zywiol, Harry; Aug 2007; 74 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-62716AH70

Report No.(s): AD-A471425; ARL-TR-4228; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Future Combat Systems (FCS) non-line of sight cannon (NLOS-C) is an artillery weapon that will use a 155-mm cannon that will be capable of automatically firing and reloading ammunition, as many as six rounds per minute. The goal of this project was to quantify the effects of weapon fire recoil on a surrogate human occupant. In 2004, the Tank-Automotive Research, Development, and Engineering Center (TARDEC) ride motion simulator (RMS) was used to simulate the effects

of gun firing shock on a Hybrid III instrumented anthropometric test device (ATD) capable of measuring head acceleration, neck force and torque. The RMS simulated firing scenarios included two different harness types (3 point or 5 point) and two seat heights (normal and raised 3 inches). The data were sent to the U.S. Army Research Laboratory's (ARL) Human Research Engineering Directorate for analysis. Biomechanics researchers at ARL were tasked with relating the neck force and torque and head accelerations to established injury criteria for the neck and head. Data from the Hybrid III ATD were compared to the standards established by the National Highway Traffic Safety Administration (NHTSA). Based on the standards used by NHTSA, the acceleration of the head and the forces and torques experienced by the neck of the occupant of an NLOS-C during weapon firing are less than the injury criteria for the 50th percentile male. Resulting probability of injury rates were nearly zero for head injuries but were as high as about 0.147 (14.7%) for moderate neck injuries and as high as 0.029 (2.9%) for critical neck injuries. The established injury criteria do not account for possible cumulative effects of the repeated impulses of weapon firing (as many as six rounds per minute), so the actual probability for neck injury may be greater than reported here. At the time this report was written, a standard for multiple impulse events had not been established.

DTIC

Biodynamics; Guns (Ordnance); Injuries; Line of Sight; Systems Analysis

20070038274 NASA Johnson Space Center, Houston, TX, USA

Constellation Space Suit System Development Status

Ross, Amy; Aitchison, Lindsay; Daniel, Brian; [2007]; 7 pp.; In English; International Conference on Environmental systems, 9-13 Jul. 2007, Chicago, IL, USA

Report No.(s): Rept-07ICES-131; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The Constellation Program has initiated the first new flight suit development project since the Extravehicular Mobility Unit (EMU) was developed for the Space Shuttle Program in the 1970s. The Constellation suit system represents a significant challenge to designers in that the system is required to address all space suit functions needed through all missions and mission phases. This is in marked contrast to the EMU, which was designed specifically for micro-gravity space walks. The Constellation suit system must serve in all of the following scenarios: launch, entry and abort crew survival; micro-gravity extravehicular activity (EVA); and lunar (1/6th-gravity) surface EVA. This paper discusses technical efforts performed from May 2006 through February 2007 for the Constellation space suit system pressure garment.

Author

Constellation Program; Extravehicular Mobility Units

20070038277 NASA Johnson Space Center, Houston, TX, USA

Challenges to Cabin Humidity Removal Presented by Intermittent Condensing Conditions

vonJouanne, Roger G.; Williams, David E.; July 09, 2007; 11 pp.; In English; 37th International Conference on Environmental Systems, 9-12 Jul. 2007, Chicago, IL, USA; Original contains color illustrations

Contract(s)/Grant(s): 401769.06.01.01.01

Report No.(s): Paper No. 07ICES-199; Copyright; Avail.: CASI: [A03](#), Hardcopy

On-orbit temperature and humidity control (THC) is more easily accomplished when the THC hardware is either consistently dry (i.e., no humidity control is occurring), or consistently wet. The system is especially challenged when intermittent wet/dry conditions occur. The first six years of on-orbit ISS operations have revealed specific concerns within the THC system, specifically in the condensing heat exchanger and the downstream air/water separator. Failed or degraded hardware has been returned to ground and investigated. This paper presents the investigation findings, and the recommended hardware and procedural revisions to prevent and recover from the effects of intermittent condensing conditions.

Author

Humidity; Spacecraft Cabin Atmospheres; Spacecraft Environments; Ambient Temperature

55

EXO BIOLOGY

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

20070037445 International Society for Optical Engineering, USA

Microbial Extremophiles in Evolutionary Aspect

Pikuta, Elena V.; Hoover, Richard B.; August 26, 2007; 12 pp.; In English; SPIE Optics and Photonics: Optical Engineering

and Application, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20070037445>

The microflora of the cryosphere of planet Earth provides the best analogs for life forms that might be found in the permafrost or polar ice caps of Mars, near the surface of the cometary nuclei, or in the liquid water beneath the ice crusts of icy moons of Jupiter and Saturn. For astrobiology the focus on the study alkaliphilic microorganisms was enhanced by the findings of abundant carbonates and carbonate globules rimmed with possibly biogenic magnetites in association with the putative microfossils in the ALH84001 meteorite. Although the ALH84001 'nanofossils' were too small and simple to be unambiguously recognized as biogenic, they stimulated Astrobiology research and studies of microbial extremophiles and biomarkers in ancient rocks and meteorites. Recent studies of CI and CM carbonaceous meteorites have resulted in the detection of the well-preserved mineralized remains of coccoidal and filamentous microorganisms in cyanobacterial mats. Energy Dispersive X-ray Analysis has shown anomalous biogenic element ratios clearly indicating they are not recent biological contaminants. This paper reviews microbial extremophiles in context of their significance to Astrobiology and the evolution of life. Extremophilic microorganisms on Earth are models for life that might endure high radiation environments in the ice near the surface of comets or on the icy moons of Jupiter and Saturn and in the seafloor deep beneath the icy crusts of Europa and Enceladus.

Author

Microorganisms; Permafrost; Polar Caps; Ice Environments; Meteorites; Biological Effects; Biological Evolution; Fossils

20070037446 NASA Marshall Space Flight Center, Huntsville, AL, USA

Ratios of Biogenic Elements for Distinguishing Recent from Fossil Microorganisms

Hoover, Richard B.; August 26, 2007; 19 pp.; In English; SPIE Optics and Photonics: Optical Engineering and Application, 26-30 Aug. 2007, San Diego, CA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070037446>

The ability to distinguish possible microfossils from recent biological contaminants is of great importance to Astrobiology. In this paper we discuss the application of the ratios of life critical biogenic elements (C/O; C/N; and C/S) as determined by Energy Dispersive X-ray Spectroscopy (EDS) to this problem. Biogenic element ratios will be provided for a wide variety of living cyanobacteria and other microbial extremophiles, preserved herbarium materials, and ancient biota from the Antarctic Ice Cores and Siberian and Alaskan Permafrost for comparison with megafossils and microfossils in ancient terrestrial rocks and carbonaceous meteorites.

Author

Microorganisms; Carbonaceous Meteorites; Biological Effects; Contamination; Exobiology; Fossils; Permafrost; Bacteria

20070037447 NASA Marshall Space Flight Center, Huntsville, AL, USA

Early Proterozoic (2.04 GA) Phosphorites of Pechenga Greenstone Belt and Their Origin

Rozanov, Alexei Yu.; Astafieva, Marina M.; Hoover, Richard B.; August 26, 2007; 9 pp.; In English; SPIE Optics and Photonics: Optical Engineering and Application, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

No principal differences have been found between microfossils described from Cambrian and Phanerozoic and the 2000 Ma phosphorites. Numerous samples revealed diverse microbial microstructures interpreted as cyanobacterial mats consisting of filamentous (1-3 microns in diameter, 20 microns in length), coccoidal (0.8-1.0 microns) and ellipsoidal or rod-shaped microfossils (0.8 microns in diameter, around 2 microns in length) which morphologically resemble modern *Microcoleus* and *Siphonophycus*, *Thiocapsa*, and *Rhabdoderma*, respectively, reported from alkali or saline environment. The sequence of the early Palaeoproterozoic events which point to a significant oxidation of the hydrosphere, including the formation of phosphorites and changes in the phosphorous cycle, mimics the sequence which was repeated at the Neoproterozoic-Cambrian transition, implying that oxidation of the terrestrial atmosphere-hydrosphere system experienced an irregular cyclic development.

Author

Microorganisms; Fossils; Precambrian Period; Igneous Rocks; Ellipsoids; Microstructure

20070038267 NASA Marshall Space Flight Center, Huntsville, AL, USA

Astrobiological Significance of Microbial Extremophiles

Pikuta, Elena V.; Hoover, Richard B.; August 26, 2007; 1 pp.; In English; SPIE Optics and Photonics 2007, 26-30 Aug. 2007, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

ONLINE: <http://dx.doi.org/10.1117/12.742289>

The microflora of the cryosphere of planet Earth provides the best analogs for life forms that might be found in the permafrost or polar ice caps of Mars, near the surface of the cometary nuclei, or in the liquid water beneath and the ice crusts of icy moons of Jupiter and Saturn. The importance of study alkaliphilic microorganisms for astrobiology was enhanced by the findings of abundant carbonates and carbonate globules rimmed with possibly biogenic magnetites in association with the putative microfossils in the ALH84001 meteorite. Although the ALH84001 'nanofossils' were too small and simple to be unambiguously recognized as biogenic, they stimulated Astrobiology research and studies of microbial extremophiles and biomarkers in ancient rocks and meteorites. Recent studies of CI and CM carbonaceous meteorites have resulted in the detection of the well-preserved mineralized remains of coccoidal and filamentous microorganisms in cyanobacterial mats. Energy Dispersive X-ray Analysis has shown anomalous biogenic element ratios clearly indicating they are not recent biological contaminants. This paper reviews microbial extremophiles in context of their significance to Astrobiology. The study of halophilic microorganisms was started from work with saline soils and lakes, and one of the record of good growth for *Haloferax mediterranei* was shown at 30 percent NaCl. Although alkali-tolerant nitrifying bacteria had previously been reported, the first described alkaliphilic microorganism was the bacterium *Streptococcus faecalis*. Halophilic and alkaliphilic forms are relevant to conditions that might be found in closed impact basins and craters on Mars filled with evaporite deposits. The first obligately acidophilic bacterium described was *Acidithiobacillus ferrooxydans* (formally *Thiobacillus ferrooxydans*). Later thermophilic lithotrophic acidophiles were found, and the hyperacidophilic moderately thermophilic species of the genus *Picrophilus* were found to grow at negative pH. The epoch of study of thermophilic microorganisms starts with the discovery of *Thermus aquaticus*, and presently the maximum temperature for growth at 113 C was found for *Pyrolobus fumarii*. The microorganisms capable of growth at high temperatures and in hyperacidic environments on Earth are good analogs for life that might be able to survive in hot acidic droplets in the upper regimes of the atmosphere of Venus. The study of barophiles was made possible by engineering achievements leading to the development of the submersible crafts used to study the Black Smokers of the Deep-sea Hydrothermal vents. The first described radioresistant bacterium *Deinococcus radiodurans* can survive ionizing irradiation and other DNA-damaging assaults at doses that are lethal to all other organisms. These microbes are models for life that might endure high radiation environments in the ice near the surface of comets or on the icy moons of Jupiter and Saturn and in the seafloor deep beneath icy crusts Europa and Enceladus. This paper presents ESEM and FESEM images showing intact microbes preserved in the deep ice cores extracted from just above Lake Vostok, Antarctica that are considered analogs for life forms that might survive on comets and icy moons.

Author

Meteorites; Exobiology; Extraterrestrial Life; Extraterrestrial Environments; Alkalies; Microorganisms; Acidity

20070038326 NASA Marshall Space Flight Center, Huntsville, AL, USA

Microfossils of Cyanobacteria in Carbonaceous Meteorites

Hoover, Richard B.; August 26, 2007; 16 pp.; In English; SPIE Optics and Photonics: Optical Engineering and Application, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038326>

During the past decade, Environmental and Field Emission Scanning Electron Microscopes have been used at the NASA/Marshall Space Flight Center to investigate freshly fractured interior surfaces of a large number of different types of meteorites. Large, complex, microfossils with clearly recognizable biological affinities have been found embedded in several carbonaceous meteorites. Similar forms were notably absent in all stony and nickel-iron meteorites investigated. The forms encountered are consistent in size and morphology with morphotypes of known genera of Cyanobacteria and microorganisms that are typically encountered in associated benthic prokaryotic mats. Even though many coccoidal and isodiametric filamentous cyanobacteria have a strong morphological convergence with some other spherical and filamentous bacteria and algae, many genera of heteropolar cyanobacteria have distinctive apical and basal regions and cellular differentiation that makes it possible to unambiguously recognize the forms based entirely upon cellular dimensions, filament size and distinctive morphological characteristics. For almost two centuries, these morphological characteristics have historically provided the basis for the systematics and taxonomy of cyanobacteria. This paper presents ESEM and FESEM images of embedded filaments and thick mats found in-situ in the Murchison CM2 and Orgueil carbonaceous meteorites. Comparative images are also provided for known genera and species of cyanobacteria and other microbial extremophiles. Energy Dispersive X-ray

Spectroscopy (EDS) studies indicate that the meteorite filaments typically exhibit dramatic chemical differentiation with distinctive difference between the possible microfossil and the meteorite matrix in the immediate proximity. Chemical differentiation is also observed within these microstructures with many of the permineralized filaments enveloped within electron transparent carbonaceous sheaths. Elemental distributions of these embedded filaments are not consistent with recent cyanobacteria or other living or preserved microbial extremophiles that have been investigated during this research. The meteorite filaments often have nitrogen content below the sensitivity level of the EDS detector. Carbon, Sulphur, Iron or Silicon are often highly enriched and hence anomalous C/N and CIS ratios when compared with modern cyanobacteria. The meteorite forms that are unambiguously recognizable as biological filaments are interpreted as indigenous microfossils analogous to several known genera of modern cyanobacteria and associated trichomic filamentous prokaryotes.

Author

Carbonaceous Meteorites; Microorganisms; Bacteria; Morphology; Fossils; Prokaryotes

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20070039008 Geophysical Observatory, Helsinki, Finland

Finnish Academy of Science: Mathematics, Volume 32, No. 1

Martio, Olli, Editor; Drasin, David, Editor; Gehring, Frederick, Editor; Iwaniec, Tadeusz, Editor; Jutila, Matti; Keen, Linda, Editor; Kulkarni, Ravi S.; Laine, Ilpo, Editor; Olli, Lehto, Editor; Lindenstrauss, J., Editor, et al.; 2007; ISSN 1239-629X; 291 pp.; In English; See also 20070039009 - 20070039027; Copyright; Avail.: Other Sources

The contents include: 1) The Interior of Discrete Projective Structures in the Bers Fiber; 2) BMO on Spaces of Homogeneous Type: A Density Result on C-C Spaces; 3) Borderline Sharp Estimates for Solutions to Neumann Problems; 4) A Reduction for Asymptotic Teichmüller Spaces; 5) Accumulation Constants of Iterated Function Systems with Bloch Target Domains; 6) Apollonian Isometries of Regular Domains are Möbius Mapping; 7) Curvature Integral and Lipschitz Parametrization in 1-Regular Metric Spaces; 8) Thurston Unbounded Earthquake Maps; 9) Some Results Related to a Conjecture of R. Brück Concerning Meromorphic Functions Sharing One Small Function with Their Derivatives; 10) On a Class of Complex Functional Equations; 11) Removable Singularities for Hölder Continuous Quasiregular Mappings in the Plane; 12) On the Shape of Bers-Maskit Slice; 13) Partial Regularity for Higher Order Variational Problems Under Anisotropic Growth Conditions; 14) Topological Locally Finite MV-Algebras and Riemann Surfaces; 15) Configuration of Balls in Euclidean Space that Brownian Motion Cannot Avoid; 16) An Algebraic Characterization of Homeomorphisms Quasi-Möbius; 17) Duality of a Large Family of Analytic Function Spaces; 18) On the Mean Square of the Zeta-Function and the Divisor Problem; and 19) Gromov Hyperbolicity of Certain Conformal Invariant Metrics.

CASI

Analysis (Mathematics); Statistical Analysis; Research; Universities

20070039009 Barcelona Univ., Spain

Removable Singularities for Hölder Continuous Quasiregular Mappings in the Plane

Clop, Albert; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 171-178; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

We give necessary conditions for a set E to be removable for Hölder continuous quasiregular mappings in the plane. We also obtain some removability results for Hölder continuous mappings of finite distortion.

Author

Singularity (Mathematics); Distortion; Conformal Mapping; Functions (Mathematics)

20070039010 Lehman (Herbert H.) Coll., Bronx, NY, USA

Accumulation Constants of Iterated Function Systems with Bloch Target Domains

Keen, Linda; Lakic, Nikola; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 73-82; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

Given a random sequence of holomorphic maps f_1, f_2, f_3, \dots from the unit disk Δ to a subdomain X , we consider the compositions $F_n = f_1 \circ f_2 \circ \dots \circ f_{n-1} \circ f_n$. The sequence $\{F_n\}$ is called the iterated function system coming from the sequence f_1, f_2, f_3, \dots . We ask what points in X or $(\Delta)X$ can

occur as limits. Our main result is that for a non-relatively compact Bloch domain X , any finite set of distinct points in X can be realized as the full set of limits of an IFS.

Author

Random Numbers; Sequencing; Sequential Analysis; Iteration; Convergence; Domains

20070039011 Consiglio Nazionale delle Ricerche, Naples, Italy

Borderline Sharp Estimates for Solutions to Neumann Problems

Alberico, Angela; Cianchi, Andrea; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 27-53; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

A priori estimates for solutions to homogeneous Neumann problems for uniformly elliptic equations in open subsets Ω of \mathbb{R}^n are established, with data in the limiting space $L^{n/2}(\Omega)$, or, more generally, in the Lorentz spaces $L^{n/2,q}(\Omega)$. These estimates are optimal as far as either constants or norms are concerned.

Author

Elliptic Differential Equations; Neumann Problem; Estimates

20070039012 City Univ. of New York, Brooklyn, NY, USA

Thurston Unbounded Earthquake Maps

Hu, Jun; Su, Meiyu; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 125-139; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

In this paper, we obtain an analogue in earthquake theory to the David theorem on the solution to the Beltrami differential equation, that is, we introduce a sufficient condition for a type of Thurston unbounded earthquake measures to be induced by earthquake maps.

Author

Earthquakes; Differential Equations; Analogs; Maps

20070039013 Jyväskylä Univ., Finland

Curvature Integral and Lipschitz Parametrization in 1-Regular Metric Spaces

Hahlomaa, Immo; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 99-123; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

We show that for a bounded 1-regular metric measure space (E, ρ) the finiteness of the Menger curvature integral, guarantees that E is a Lipschitz image of a subset of a bounded subinterval of \mathbb{R} .

Author

Curvature; Metric Space; Parameterization

20070039014 Shandong Univ., Jinan, China

Some Results Related to a Conjecture of R. Brueck Concerning Meromorphic Functions Sharing One Small Function with Their Derivatives

Zhang, Ji-Long; Yang, Lian-Zhong; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 141-149; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

In this paper, we investigate uniqueness problems of meromorphic functions that share a small function with one of its derivatives, and give some results which are related to a conjecture of R. Brueck, and also answer some questions of Kit-Wing Yu.

Author

Meromorphic Functions; Uniqueness; Derivation

20070039015 Okayama Univ., Japan

The Interior of Discrete Projective Structures in the Bers Fiber

Matsuzaki, Katsuhiko; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 3-12; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

The space of all projective structures on a closed surface is a holomorphic vector bundle over the Teichmüller space. In this paper, we restrict the space to the Bers fiber over any fixed underlying complex structure and prove that the interior of

the set of discrete projective structures in the Bers fiber consists of those having quasifuchsian holonomy.

Author

Theorems; Proving; Manifolds (Mathematics); Riemann Manifold; Coordinates

20070039016 Tokyo Denki Univ., Japan

A Reduction for Asymptotic Teichmueller Spaces

Miyachi, Hideki; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 55-71; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

In this paper, we will introduce a new kind of isomorphism theorem (we call it the reducing theorem) for asymptotic Teichmueller spaces. Our isomorphism theorem is induced by (conformal) 2-surgery operations along simple closed loops on surfaces, and yields several interesting and pathological phenomena on the structures of asymptotic Teichmueller spaces.

Author

Isomorphism; Theorems; Surface Properties

20070039017 Belgrade Univ., Serbia

On the Mean Square of the Zeta-Function and the Divisor Problem

Ivic, Aleksandar; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 269-277; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

Let $\Delta(x)$ denote the error term in the Dirichlet divisor problem, and $E(T)$ the error term in the asymptotic formula for the mean square of $[\zeta(1/2 + it)]$. If $E^*(t) = E(t) - 2(\pi)^{\Delta^*(t/2\pi)}$ with $\Delta^*(x) = -\Delta(x) + 2\Delta(2x) - 1/2\Delta(4x)$, then we obtain the asymptotic formula, where P_3 is a polynomial of degree three in $\log T$ with positive leading coefficient. The exponent $7/6$ in the error term is the limit of the method.

Author

Dirichlet Problem; Mean Square Values; Polynomials

20070039018 Helsinki Univ., Helsinki, Finland

Gromov Hyperbolicity of Certain Conformal Invariant Metrics

Linden, Henri; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 279-288; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

The unit ball $B(\sup n)$ is shown to be Gromov hyperbolic with respect to the Ferrand metric $\lambda^{*}(\sub (B(\sup n)))$, and the modulus metric $\mu(\sub (b(\sup n)))$, and dimension dependent upper bounds for the Gromov delta are obtained. In the two-dimensional case Gromov hyperbolicity is proved for all simply connected domains G . For $\lambda^{*}(\sub G)$, also the case $G = R(\sup n) \setminus \{0\}$ is studied.

Author

Hyperbolic Functions; Domains; Hyperbolic Coordinates; Boundaries; Metric Space

20070039019 Osaka City Univ., Japan

On the Shape of Bers-Maskit Slice

Komori, Yohei; Parkkonen, Jouni; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 179-198; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

We consider complex one-dimensional Bers-Maskit slices through the deformation space of quasifuchsian groups which uniformize a pair of punctured tori. In these slices, the pleating locus on one of the components of the convex hull boundary of the quotient three-manifold has constant rational pleating and constant hyperbolic length. We show that the boundary of such a slice is a Jordan curve which is cusped at a countable dense set of points. We will also show that the slices are not vertically convex, proving the phenomenon observed numerically by Epstein, Marden and Markovic.

Author

Shapes; Toruses; Deformation; Boundaries; Convexity

20070039020 Lille-1 Univ., Villeneuve-d'Asoq, France

An Algebraic Characterization of Homeomorphisms Quasi-Moebius

Bourdon, Marc; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 235-250; In French; See also [20070039008](#); Copyright; Avail.: Other Sources

Let $Z(\sub 1)$, $Z(\sub 2)$ be compact metric spaces. Under some natural assumptions, we characterize quasi-Moebius

homeomorphisms between $Z(\text{sub } 1)$ and $Z(\text{sub } 2)$, in terms of isomorphisms between functions algebras on $Z(\text{sub } i)$, which are defined by Besov norms.

Author

Algebra; Metric Space; Norms

20070039021 Catania Univ., Italy

BMO on Spaces of Homogeneous Type: A Density Result on C-C Spaces

Caruso, A. O.; Franciullo, M. S.; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 13-26; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

In the general setting of a space of homogeneous type endowed with an Ahlfors regular measure, we introduce the Banach spaces BMO and VMO defined through suitable cubes, and we prove that these spaces are topologically equivalent to the standard ones usually defined by means of balls. Through this fact we extend a known result of Sarason showing that $C(\text{sup } \infty)$ is locally dense in VMO in the setting of Carnot-Carathéodory metric spaces related to a family of free Hormander vector fields $X(\text{sub } 1), \dots, X(\text{sub } q)$.

Author

Banach Space; Cubes (Mathematics); Metric Space

20070039022 Oulu Univ., Finland

Apollonian Isometries of Regular Domains are Moebius Mapping

Hasto, Peter; Ibragimov, Zair; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 83-98; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

The Apollonian metric is a generalization of the hyperbolic metric, defined in a much larger class of open sets. However, since it was introduced by Beardon in 1998, it has remained an open question what its isometries are. Beardon first raised this question and asked if the Apollonian isometries were just Moebius mappings. In this paper we show that this is the case in open sets with regular, for instance $C(\text{sup } 1)$, boundary.

Author

Domains; Boundaries; Theorems; Hyperbolic Functions

20070039023 Universitaet des Saarlandes, Saarbrucken, Germany

Partial Regularity for Higher Order Variational Problems Under Anisotropic Growth Conditions

Apushkinskaya, Darya; Fuchs, Martin; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 199-214; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

We prove a partial regularity result for local minimizers $u: R(\text{sup } n) \Omega$ approaches $R(\text{sup } M)$ of the variational integral $J(u, \Omega) = \int_{\Omega} \int_{\Omega} (\Delta(\text{sup } k)u)dx$, where k is any integer and f is a strictly convex integrand of anisotropic (p,q) -growth with exponents satisfying the condition $q < p(1 + 2/n)$. This is some extension for the case n greater than or equal to 3 of the regularity theorem obtained in [BF2].

Author

Integers; Regularity; Anisotropy; Convexity

20070039024 Abo Akademi, Turku, Finland

Duality of a Large Family of Analytic Function Spaces

Lindstrom, Mikael; Palmberg, Niklas; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 251-267; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

We study the predual spaces of a large family of analytic function spaces and thereby extend the recently obtained results by PavloviC and Xiao.

Author

Analytic Functions; Function Space; Banach Space; Automorphisms

20070039025 Lappeenranta Univ. of Technology, Finland

Topological Locally Finite MV-Algebras and Riemann Surfaces

Kukkurainen, Paavo; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 215-222; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

It is known that any MV-algebra is a topological MV-algebra. For a locally finite MV-algebra A with some algebraic and

topological conditions the product $A \times A$ becomes a compact Riemann surface (modulo conformal equivalence). Topologically, it is a torus.

Author

Algebra; Topology; Equivalence

20070039026 University Coll., Cork, Ireland

Configuration of Balls in Euclidean Space that Brownian Motion Cannot Avoid

Carroll, Tom; Ortega-Cerda, Joaquim; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 223-234; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

We consider a collection of balls in Euclidean space and the problem of determining if Brownian motion has a positive probability of avoiding all the balls indefinitely.

Author

Euclidean Geometry; Probability Theory

20070039027 Joensuu Univ., Finland

On a Class of Complex Functional Equations

Rieppo, Jarkko; Finnish Academy of Science: Mathematics, Volume 32, No. 1; 2007, pp. 151-170; In English; See also [20070039008](#); Copyright; Avail.: Other Sources

We consider a class of complex functional equations that admit transcendental meromorphic solutions with relatively few distinct poles. The solutions are characterized and it is shown that they must also satisfy a functional equation of the certain simple form. The equations that are considered contains e.g. some delay equations and the generalized Schroder equation as special cases. The reasoning relies on the combination of Nevanlinna theory and algebraic field theory.

Author

Transcendental Functions; Meromorphic Functions; Algebra; Differential Equations; Factorization

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*.

20070038636 Air Force Academy, Colorado Springs, CO USA

A Comparison of the Usability of Notebook and Desktop Computers at the USA Air Force Academy

Revak, Marie A; Halloran, Margaret; Miller, James C; Oct 2001; 42 pp.; In English

Report No.(s): AD-A471940; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study was to assess the effect of portable computers on the USAFA faculty's ability to contribute to teaching, research, and service. The objectives of the study were to determine (1) the criteria under which notebook computers were feasible alternatives to desktop computers; (2) which features of notebook and desktop computers faculty used; (3) which software products faculty used on notebook and desktop computers; (4) the criteria under which a similar investigation should be conducted with cadets; and (5) a research basis to facilitate the identification of potential applications of notebook computers for the Air Force and Department of Defense. The sample consisted of 93 faculty members (experimental $n = 54$, control $n = 39$). Faculty members in the experimental group turned in their desktop computers for notebook computers. Faculty in the control group received new desktop computers, changing their operating system simultaneously. The groups were found to be demographically similar. A series of five surveys were used to collect data over the eleven-month period of the study. The initial survey provided baseline data; three periodic surveys and an exit survey tracked the faculty through the course of the study; and the exit survey provided additional data as the study came to a close. Both quantitative and qualitative data were collected and analyzed. Major findings of the study are reported by computer type.

DTIC

Armed Forces (United States); Computers; United States; Universities

20070038679 Naval Research Lab., Stennis Space Center, MS USA

Using Range and Range Rate for Relative Navigation

Bourgeois, Brian S; Sep 5, 2007; 38 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472033; NRL/FR/7440--07-10153; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents an investigation into the use of range and range rate as an approach for navigating an underwater vessel relative to another vessel for formation maneuvering tasks. Range and range rate between underwater vehicles can be estimated using elapsed time and Doppler shift measurements done by modern acoustic modems. This approach has the potential to allow coordinated team maneuvering using existing vehicle communications without the need for offboard positioning systems, surfacing for GPS fixes, and communicating individual vessel positions periodically throughout the team. The relationship between range rate and Doppler shift is derived and field results from a submarine tracking range are presented to support the hypothesis that this can be an effective measure of relative motion. Equations for range, range rate, and range acceleration are derived and these equations are examined numerically and graphically to determine characteristics that might be useful for relative navigation. The report ends with a summary of potential approaches revealed for using range and range rate measurements for relative navigation.

DTIC

Doppler Effect; Maneuverability; Modems; Navigation; Underwater Vehicles

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.

20070037475 Naval Postgraduate School, Monterey, CA USA

Building a Virtual Cultural Intelligence Community

Zahn, Matthew A; Lacey, Wayne R; Jun 2007; 91 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471070; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471070>

The U.S. intelligence community is without peer in providing high-quality, detailed technical intelligence. Due to the intelligence community's efforts, the USG has a thorough understanding of its adversaries' activities. What we propose is to develop a means by which that same intelligence community can use cultural factors to answer the question 'Why?' Although cultural intelligence plays a key role in many of America's political and military successes, the maintenance of a broad-based, detailed cultural intelligence capability has thus far proven elusive. With the advent of networked collaboration tools, the intelligence community now has the ability to deploy a virtual cultural intelligence community. Such a community, based on a wiki, would incur almost no monetary or bureaucratic overhead, and could be configured so that the loss of any single intelligence organization would have minimal negative effect on its mission.

DTIC

Intelligence; Virtual Reality

20070037491 Army Research Lab., Aberdeen Proving Ground, MD USA

Software Development for Automation of Space- and Time- Varying Pressurization on Small Caliber Gun Barrels

Chen, Michael M; South, Joseph T; Aug 2007; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-622618H80

Report No.(s): AD-A471096; ARL-TR-4197; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471096>

A console application program was developed to automate the process, starting from triggering IBHVG2 (Interior Ballistics of High Velocity Guns, version 2) execution on the fly for pressure calculation, determining pressure gradient along down-bore distance, parsing the LS-DYNA(TM) key word file for element extraction, associating load curves with selected elements, and finally generating a complete LS-DYNA key word file for explicit dynamic analysis. This report presents the architecture and process flows of the software design using the unified modeling language. The software development

integrated IBHVG2 code with LS-DYNA program, greatly streamlining pressure data computation, transformation and application.

DTIC

Computer Programming; Computer Programs; Guns (Ordnance); Pressurizing; Software Engineering; Time

20070037495 Carnegie-Mellon Univ., Pittsburgh, PA USA

How to Compare the Security Quality Requirements Engineering (SQUARE) Method with Other Methods

Mead, Nancy R; Aug 2007; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-02-1-0389; FA8721-05-C-0003

Report No.(s): AD-A471104; CMU/SEI-2007-TN-021; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471104>

The Security Quality Requirements Engineering (SQUARE) method, developed at the Carnegie Mellon Software Engineering Institute, provides a systematic way to identify security requirements in a software development project. This report describes SQUARE and then describes other methods used for identifying security requirements, such as the Comprehensive, Lightweight Application Security Process, the Security Requirements Engineering Process, and Tropos, and compares them with SQUARE. The report concludes with some guidelines for selecting a method and a look at some related trends in requirements engineering.

DTIC

Computer Information Security; Computer Programming; Quality Control; Requirements; Security; Software Engineering

20070037508 Engineering Research and Consulting, Inc., Edwards AFB, CA USA

Experimental and Numerical Examination of the BHT-200 Hall Thruster Plume (Preprint)

Nakles, Michael R; Brieda, Lubos; Reed, Garrett; Hargus, William A; Spicer, Randy L; Jun 6, 2007; 19 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A471121; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471121>

The plume of a Busek BHT-200 xenon Hall thruster has been characterized through measurements from various plasma electrostatic probes. Ion current flux, plasma potential, plasma density, and electron temperatures were measured in the near-field of the plume to 60 cm downstream of the exit plane. These experimentally derived measurements were compared to simulations of the thruster/vacuum chamber environment using the plasma plume code DRACO. The goals of this study were to gain understanding of the effect of the vacuum facility on the thruster plume and to determine the fidelity of the DRACO numerical simulation.

DTIC

Hall Thrusters; Mathematical Models; Plumes

20070037750 Air Force Research Lab., Wright-Patterson AFB, OH USA

Adaptive Distributed Intelligent Control Architecture for Future Propulsion Systems (Preprint)

Behbahani, Alireza R; Apr 2007; 51 pp.; In English; Original contains color illustrations

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

Report No.(s): AD-A471332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Adaptive Distributed Control System (ADCS) architectures have been developing rapidly in all fields to provide for optimal control, prognosis and safety-critical systems. Concepts such as controller decentralization and 'smart' sensor/actuators have been studied by both government agencies and industry. Distributed control is potentially an enabling technology for advanced intelligent propulsion system concepts and is one of the few control approaches that is able to provide improved component and control system prognostics, as well as fault-tolerance. ADCS architectures offer the potential of enhanced reliability and the ability to maintain optimal performance when the propulsion system degrades. An ADCS will reduce the impact of hardware and software obsolescence. Control system weight will be reduced by replacing heavy harness assemblies and FADECs, with distributed processing elements interconnected. This paper reviews current activities that may lead to the development of standards for distributed, safety-critical and supportable intelligent propulsion systems of the future.

DTIC

Active Control; Adaptive Control; Distributed Parameter Systems; Fault Tolerance; Optimization; Propulsion System Configurations; Propulsion System Performance; Reliability

20070037765 Office National d'Etudes et de Recherches Aérospatiales, Toulouse, France
Using Roughness Textures in Target Modelling - Impact on ISAR Images Calculations of the ZSU 23-4
Mametsa, H J; Berges, A; Latger, J; May 2005; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471355; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Electromagnetic Scattering; Radar Cross Sections; Radar Targets; Surface Roughness; Targets; Textures

20070037879 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Passive Geolocation of Low-Power Emitters in Urban Environments Using TDOA
Montminy, Myrna B; Mar 2007; 116 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471571; AFIT/GE/ENG/07-16; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Low-power devices are commonly used by the enemy to control Improvised Explosive Devices (IEDs), and as communications nodes for command and control. Quickly locating the source of these signals is difficult, especially in an urban environment where buildings and towers can cause interference. This research presents a geolocation system that combines several geolocation and error mitigation methods to locate an emitter in an urban environment. The proposed geolocation system uses a Time Difference of Arrival (TDOA) technique to estimate the location of the emitter of interest. Using sensors at known locations, TDOA estimates are obtained by cross-correlating the signal received at all the sensors. A Weighted Least Squares (WLS) solution is used to estimate the emitter's location. If the variance of the location estimate is too high, a sensor is detected as having a Non-Line of Sight (NLOS) path from the emitter, and is removed from the geolocation system and a new position estimate is calculated with the remaining sensor TDOA information. The performance of the system is assessed through modeling and simulations. The test results confirm the feasibility of identifying a NLOS sensor, thereby improving the geolocation system's accuracy in an urban environment.

DTIC

Cities; Emitters; Position (Location)

20070037887 Army Engineer Research and Development Center, Vicksburg, MS USA
Full-Plane STWAVE with Bottom Friction. 2. Model Overview
McKee Smith, Jane; Aug 2007; 16 pp.; In English
Report No.(s): AD-A471582; ERDC-TN-SWWRP-07-5; ERDC/CHL-CHETN-1-75; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this System-Wide Water Resources (SWWRP) Technical Note is to describe the full-plane version of the STWAVE wave generation and transformation model (Smith et al. 2001; Smith 2001; Smith and Smith 2002; and Smith and Zundel 2006).

DTIC

Computerized Simulation; Friction; Mathematical Models; Spectral Theory; Steady State; Surface Water; Water Resources; Water Waves

20070038118 Air Force Academy, Colorado Springs, CO USA
The Impact of the DoD Mobile Code Policy on Advanced Distributed Learning, Web-Based Distance Learning and Other Educational Missions
Halloran, Margaret F; West, Jerry; Briggs, Gina; Kamai, Moses; Keefer, Karen; Nugent, Jim; Morrison, Leslie M; Salyars, Marty; Ziring, Neal; Zuckerman, Susan; Aug 30, 2001; 49 pp.; In English
Report No.(s): AD-A471401; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Mobile code is software that downloads via the Internet and runs on users' workstations without the users' knowledge. Mobile code can be both potentially beneficial and harmful to systems and networks in the Department of Defense (DoD). The DoD Memorandum, dated 7 November 2000, Policy Guidance for Use of Mobile Code Technologies in Department of Defense (DoD) Information Systems establishes DoD wide policy on the use of mobile code in DoD information systems and computers. The memorandum, also referred to as the DoD Mobile Code Policy or just the Policy, defines mobile code and mobile code technologies as follows: Mobile code is defined (for the purposes of the Policy) as software obtained from systems outside the enclave boundary, transferred across a network, downloaded and executed on a local system (e.g., a computer with a Web browser) without explicit installation or execution by the recipient. Mobile code technologies are software technologies that provide the mechanisms for the production and use of mobile code (e.g., Sun Microsystems' Java and JavaScript; Microsoft Corporation's VBScript and ActiveX). Many of the interactive components of web-based distance

learning and Advanced Distributed Learning (ADL) are programmed using mobile code and mobile code technologies. In addition, distance learning and ADL often requires access to materials outside of the enclave as defined by the DoD Mobile Code Policy, as the course content or assignments of this instruction requires users to access web sites that are not developed and/or maintained by personnel within the DoD. For these reasons, ADL and web-based distance learning programs may be more sensitive to the DoD Mobile Code Policy than other base operations and a thorough test of the effect of the implementation of the DoD Mobile Code Policy is warranted.

DTIC

Coding; Computer Programs; Education; Information Systems; Policies

20070038142 Carnegie-Mellon Univ., Pittsburgh, PA USA

Introduction to the Architecture of the CMMI Framework

Jul 2007; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A471060; CMU/SEI-2007-TN-009; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471060>

This document is an introduction to the CMMI(Registered) (Capability Maturity Model(Registered) Integration) Framework architecture, which guides how CMMI products are developed and integrated. The architecture describes the structure, terminology, and required content of every CMMI model.

DTIC

Models; Architecture (Computers); Systems Integration

20070038185 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Fast Implementation of the ISODATA Clustering Algorithm

Memarsadeghi, Nargess; Mount, David M.; Netanyahu, Nathan S.; LeMoigne, Jacqueline; 31 Dec. 2005; 31 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NSF CCR-00-98151; Copyright; Avail.: CASI: **A03**, Hardcopy

Clustering is central to many image processing and remote sensing applications. ISODATA is one of the most popular and widely used clustering methods in geoscience applications, but it can run slowly, particularly with large data sets. We present a more efficient approach to ISODATA clustering, which achieves better running times by storing the points in a kd-tree and through a modification of the way in which the algorithm estimates the dispersion of each cluster. We also present an approximate version of the algorithm which allows the user to further improve the running time, at the expense of lower fidelity in computing the nearest cluster center to each point. We provide both theoretical and empirical justification that our modified approach produces clusterings that are very similar to those produced by the standard ISODATA approach. We also provide empirical studies on both synthetic data and remotely sensed Landsat and MODIS images that show that our approach has significantly lower running times.

Author

Algorithms; Cluster Analysis; Image Processing; Remote Sensing; Pattern Recognition; Image Analysis; Imaging Techniques

20070038209 Spatial Technologies, LLC, Cape Canaveral, FL, USA

Software for Automated Image-to-Image Co-registration

Benkelman, Cody A.; Hughes, Heidi; Proceedings of the 2006 Civil Commercial Imagery Evaluation Workshop; January 2007; 24 pp.; In English; See also [20070038198](#); Original contains color illustrations; Copyright; Avail.: CASI: **A03**, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The project objectives are: a) Develop software to fine-tune image-to-image co-registration, presuming images are orthorectified prior to input; b) Create a reusable software development kit (SDK) to enable incorporation of these tools into other software; d) provide automated testing for quantitative analysis; and e) Develop software that applies multiple techniques to achieve subpixel precision in the co-registration of image pairs.

Derived from text

Software Engineering; Pattern Registration; Image Processing; Computer Programming

20070038296 Los Alamos National Lab., NM USA

Conceptual Specification for Defensive Technology Evaluation Code (DETEC)

Christman, Ronald D; Dana, Arthur L; Henderson, Dale B; Shafer, Barry P; Wood, Juan A; Wood, Merri M; Jan 1986; 127 pp.; In English

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

Report No.(s): AD-A471542; LA-10547-MS; UC-32; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defensive Technology Evaluation Code (DETEC) is being developed to assess the potential of a realistically diverse assortment of strategic defense and offense assets deployed on all sides in possible global conflict. Principal applications of the code will be to study the roles of the various weapon technology concepts being explored for strategic defense. Technology requirements and sensitivities will be studied in the context of complete wars built up from many individual one-on-one engagements. DETEC will also provide an important vehicle with which to develop and test various possible algorithms for battle management and for communications and control. The DETEC simulation features a wide span of capabilities. It includes each important object with separate modular representations of each replica decoy, reentry vehicle, missile, submarine, satellite, etc. Such complete offensive and defensive inventories are employed on all sides of an arbitrarily many-sided conflict. The one-on-one engagement modules are statistical processes based upon accurate physical models. Damage to individual assets is simulated by operating parameters that may be continuously varying, giving simulated performance from full to zero capability.

DTIC

Coding; Military Operations; System Effectiveness; Strategy

20070038315 Teledyne Brown Engineering, Huntsville, AL, USA

Middleware Trade Study for NASA Domain

Bowman, Dan; September 19, 2007; 19 pp.; In English; 2007 Fall Simulation Interoperability Workshop, 17-21 Sep. 2007, Orlando, FL, USA; Original contains color illustrations

Contract(s)/Grant(s): NAS8-02060; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038315>

This presentation presents preliminary results of a trade study designed to assess three distributed simulation middleware technologies for support of the NASA Constellation Distributed Space Exploration Simulation (DSES) project and Test and Verification Distributed System Integration Laboratory (DSIL). The technologies are: the High Level Architecture (HLA), the Test and Training Enabling Architecture (TENA), and an XML-based variant of Distributed Interactive Simulation (DIS-XML) coupled with the Extensible Messaging and Presence Protocol (XMPP). According to the criteria and weights determined in this study, HLA scores better than the other two for DSES as well as the DSIL.

Author

Applications Programs (Computers); Distributed Interactive Simulation; Space Exploration; Systems Integration; Constellations

20070038369 bd Systems, Inc., Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

SPARTAN: A High-Fidelity Simulation for Automated Rendezvous and Docking Applications

Turbe, Michael A.; McDuffie, James H.; DeKock, Brandon K.; Betts, Kevin M.; Carrington, Connie K.; August 20, 2007; 21 pp.; In English; AIAA Modeling and Simulation Technologies Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNM06AB28C; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038369>

bd Systems (a subsidiary of SAIC) has developed the Simulation Package for Autonomous Rendezvous Test and Analysis (SPARTAN), a high-fidelity on-orbit simulation featuring multiple six-degree-of-freedom (6DOF) vehicles. SPARTAN has been developed in a modular fashion in Matlab/Simulink to test next-generation automated rendezvous and docking guidance, navigation, and control algorithms for NASA's new Vision for Space Exploration. SPARTAN includes autonomous state-based mission manager algorithms responsible for sequencing the vehicle through various flight phases based on on-board sensor inputs and closed-loop guidance algorithms, including Lambert transfers, Clohessy-Wiltshire maneuvers, and glideslope approaches. The guidance commands are implemented using an integrated translation and attitude control system to provide 6DOF control of each vehicle in the simulation. SPARTAN also includes high-fidelity representations of a variety of absolute and relative navigation sensors that maybe used for NASA missions, including radio frequency, lidar, and video-based rendezvous sensors. Proprietary navigation sensor fusion algorithms have been developed that allow the integration of these sensor measurements through an extended Kalman filter framework to create a single optimal estimate of the relative state of

the vehicles. SPARTAN provides capability for Monte Carlo dispersion analysis, allowing for rigorous evaluation of the performance of the complete proposed AR&D system, including software, sensors, and mechanisms. SPARTAN also supports hardware-in-the-loop testing through conversion of the algorithms to C code using Real-Time Workshop in order to be hosted in a mission computer engineering development unit running an embedded real-time operating system. SPARTAN also contains both runtime TCP/IP socket interface and post-processing compatibility with bdStudio, a visualization tool developed by bd Systems, allowing for intuitive evaluation of simulation results. A description of the SPARTAN architecture and capabilities is provided, along with details on the models and algorithms utilized and results from representative missions.

Author

Simulation; Degrees of Freedom; Orbital Rendezvous; Mission Planning; Spacecraft Docking; Systems Simulation; Computerized Simulation

20070038375 Air Force Academy, Colorado Springs, CO USA

Developing a Digital Human-Computer Interaction Laboratory

Andre, Terence S; Jul 2005; 28 pp.; In English

Report No.(s): AD-A470777; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA470777>

The Behavioral Sciences and Leadership Department at the USA Air Force Academy (USAFA) recently initiated an effort to develop a low-cost usability evaluation system for undergraduate education and research. Based on student input, they knew they needed a flexible and portable system that would be cost-effective for both data capture and analysis. Their overarching goal was to develop a system that would be easy for students and faculty to learn and maintain. In addition to creating a system that would be flexible, portable, and easy to learn, they wanted to develop a learning environment around that system for undergraduate students in human factors, computer science, and systems engineering. This paper documents the process the Leadership Department followed to design and implement their lab, and provides a step-by-step solution for developing similar low-cost usability laboratories at other universities, both for teaching and research. By integrating a software-based usability recording tool (Morae) as the main component of the laboratory, they were able to develop the solution they needed and provide cadets at the Air Force Academy with the same capability as high-end laboratories. They plan to integrate other methods and tools in the future to support efficient usability diagnosis and evaluation for university faculty and students.

DTIC

Commercial Off-the-Shelf Products; Digital Systems; Evaluation; Human Factors Engineering; Human-Computer Interface; Laboratories; Low Cost; System Effectiveness

20070038392 Carnegie-Mellon Univ., Pittsburgh, PA USA

The Diagnostic Roadmap: Progress in Developing an Integrated View of Risk Identification and Analysis Techniques

Williams, Ray; Ambrose, Kate; Bentrem, Laura; Jan 2004; 22 pp.; In English

Report No.(s): AD-A471639; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471639>

These briefing charts deal with the identification and analysis techniques of risk management software engineering programs.

DTIC

Computer Programming; Progress; Risk; Software Engineering

20070038403 Defence Science and Technology Organisation, Edinburgh, Australia

Scheduling Operational Operational-Level Courses of Action

Zhang, Lin; Janczura, Chris; Oct 1, 2003; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471659; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471659>

Outline: 1. Introduction * Characteristics of operational-level planning * Motivation of this work 2. Operational-level course of action (COA) modelling * A conceptual task model * Formalising the conceptual model with Coloured Petri Nets 3. Model Execution and Analysis * COAST demonstration 4. Conclusions and future work

DTIC

Computerized Simulation; Military Operations; Planning; Scheduling

20070038457 Army Engineer Research and Development Center, Vicksburg, MS USA

The TeleEngineering Toolkit Software Reference Manual

Jorgeson, Jeffrey D; Berry, Woodman W; Taylor, Rhonda D; Fairley, Sandra K; Jackson, Jill M; Williamson, Jeffrey L; Webb, Benjamin T; Aug 2007; 337 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471784; ERDC-TR-07-7; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471784>

The TeleEngineering Toolkit software was developed to provide a mechanism by which deployed engineers could view and analyze geospatial data, collect and display data required for engineering analyses conducted by subject matter experts via reachback, track previously conducted analyses, organize requests for information, maintain interoperability with other software used by deployed personnel, and provide requestors a more efficient means to display analyses provided by subject matter experts. The capabilities of the TeleEngineering Toolkit include tools to display and analyze many types of geospatial data (maps, imagery, and various other raster and vector data), manage documents in a geospatial environment, create and share annotations, plot data points, import and export vector data in several common formats, and process and view reconnaissance data. This document provides a detailed reference to the TeleEngineering Toolkit software including installation of the software, working with geospatial data and the Data Depot format, creating and working with Projects and viewing maps and imagery, using all of the menus and toolbars, using the various Project components, importing and exporting data, and working with data collected from the Automated Route Reconnaissance Kit. Complete descriptions of all of the software functions, example applications, and images of the interface to support understanding of the software are included.

DTIC

Deployment; Engineering; Manuals; Software Development Tools

20070038462 Naval Postgraduate School, Monterey, CA USA

System Requirements Analysis and Technological Support for the Ballistic Missile Defense System (BMDS) - FY07 Progress Report

Auguston, M; Drusinsky, D; Hutchins, R; Knorr, J B; Michael, J B; Otani, T; Pace, P E; Sting, M; Tummala, M; Cook, T; Jul 1, 2007; 61 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): MD7080101P0630

Report No.(s): AD-A471799; NPS-CS-07-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471799>

Engineering of the Ballistic Missile Defense System (BMDS) requires one to take a holistic approach that includes the physical modeling and analysis of the missile defense operating environment, development of metrics and techniques to analyze the communication requirements of the net-centric Ballistic Missile Defense warfare, and the use of architectural patterns and other software technologies to shape the emergent behavior of the BMDS taking into account of the system's interoperability, composability, extensibility, and dynamic reconfigurability. This report summarizes the work in FY07 to investigate new technologies to support the development of the BMDS. We developed new scoring functions for the fusion of sensor data, an algorithm for multiple hypothesis tracking, a distributed medium access control protocol and data dissemination algorithm for wireless networks of cooperative radar systems, simulation models for network-centric electronic warfare metrics study and for the prediction of the over the horizon radar system footprints, technologies for the correct specification and validation of temporal behaviors in a Service-Oriented Architecture (SOA) based system-of-systems, runtime verification of system-level requirements of distributed reactive systems using MSC-Assertions, and safety assurance of reconfigurable and self-reconfigurable systems. We also evaluated the effectiveness of the real-time Java technology for BMDS software and the potential impact of integrating the Air Force YAL-1A Attack Laser into the BMDS.

DTIC

Antimissile Defense; Ballistic Missiles; Missile Defense

20070038480 Air Force Research Lab., Wright-Patterson AFB, OH USA

Simulating a Bilateral Teleoperation System Using Matlab and SIMULINK

Alise, Marc; Roberts, Rodney G; Repperger, Daniel W; Aug 2007; 14 pp.; In English

Contract(s)/Grant(s): Proj-2313

Report No.(s): AD-A471836; AFRL-HE-WP-JA-2007-0008; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471836>

Teleoperation provides a human-machine interface that allows an operator to control machines at a large distance. It has

recently been the subject of a significant amount of research in the robotics community. Teleoperation can also provide an instructor with an excellent motivating example for a control systems course where it can serve as a platform for introducing several key controls issues such as noise compensation and time delay. Computer packages such as MatLab and SIMULINK are readily available in most engineering schools for simulating teleoperation systems. In this article, SIMULINK is used to present a case study of a simple teleoperation system.

DTIC

Control; Man Machine Systems; Simulation; Software Development Tools; Teleoperators

20070038584 Texas Univ., Austin, TX USA

Documentation and Testing of the WEAP Model for the Rio Grande/Bravo Basin

Danner, Constance L; Aug 1, 2006; 92 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62271-97-G-0073

Report No.(s): AD-A471843; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Rio Grande/Bravo basin is located in North America between two riparian nations the USA (US) and Mexico. This river is currently considered a water scarce area with less than 500 m³ per person per year of water available. Throughout the decades there has been a lot of population growth in the basin with population expected to double over the next three decades. The Physical Assessment Project promotes regional cooperation between the US and Mexico to work towards more effectively managing the Rio Grande/Bravo's resources. This report falls under Task 3 of the project by documenting and testing the basin-wide model constructed using WEAP software. The documentation of the model addresses all of the inputs for demands and supplies for the river. The model is also set up to include operating policies of the different countries and how they each allocate water to their demands. The supplies in the model include tributary inflows as well as reservoir and groundwater storage. This report is the first of many testing phases. The two items that were evaluated here by comparing them against historical records were the reservoir storage volumes and the streamflow for six IBWC gages. This testing demonstrated that the model has the right logic and flow pattern however adjustments need to be made to the reservoir releases in order to fully represent the existing system.

DTIC

Computer Programs; Ground Water; Water

20070038667 Department of Defense, Arlington, VA USA

Information Technology Management: Acquisition of the Armed Forces Health Longitudinal Technology Application

May 18, 2006; 40 pp.; In English

Contract(s)/Grant(s): Proj-D2005-D000AS-0117.000

Report No.(s): AD-A472015; DOD-IG-D-2006-089; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Armed Forces Health Longitudinal Technology Application (AHLTA) is a medical and dental clinical information system that will generate and maintain a comprehensive, lifelong, computer-based patient record for every soldier, sailor, airman, and marine; their family members; and others entitled to DoD military health care. The AHLTA program is expected to support 9.2 million beneficiaries. As of September 30, 2005, there were 7.01 million patients with records on-line at 51 Medical Treatment Facilities. The initial program provides support capabilities in the outpatient arena. Currently, the Armed Forces Health Longitudinal Technology Application program management office is planning for the development of capabilities for inpatient care. The estimated cost of the entire program is just over \$5 billion. Although the Armed Forces Health Longitudinal Technology Application program management office is using risk mitigation techniques such as risk management, lessons learned, and performance monitoring, the program remains at high risk because of the complexities of integrating commercial off-the-shelf software into the existing Armed Forces Health Longitudinal Technology Application program. The audit was announced on January 25, 2005, with the objective to review AHLTA budgeting, accounting, performance, and user satisfaction. In April 2005, the audit was re-scoped to evaluate program requirements, the related acquisition strategy, and system testing to determine whether the system was being implemented to meet cost, schedule, and performance requirements.

DTIC

Armed Forces; Computer Networks; Health; Information Systems; Patients; Records Management; Technology Utilization

20070038901 Army Aviation and Missile Research Development Engineering Center, Redstone, AL USA

Mini-Rocket User Guide

Sanders, III, George A; Sells, Ray; Aug 2007; 70 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471792; TR-AMR-SS-07-27; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471792>

This document describes the use of a missile/rocket fly-out model that represents a significant advance in efficiency for these type of simulations given its modest requirements for complexity and runtime efficiency. The model is useful for generating trajectories and associated flight parameters for multi-stage powered missiles flying over a rotating, spherical earth. The model uses a unique osculating plane formulation that preserves relatively high fidelity while maintaining run-time efficiency and simplicity of input. This formulation provides for user-specified flight guidance options including ballistic flight and profiles for acceleration, flight path angle rate, and flight path angle. This model was designed to expedite many of the same analyses conducted with the old industry-standard ROCKET code - hence the name 'Mini-Rocket.' While this manual documents the use of a standalone, executable version of Mini-Rocket, it also provides enough information to configure the Mini-Rocket source code as an embedded model and/or to modify it for a specific application. Mini-Rocket was built with C++ Model Developer (CMD). CMD is a highly-refined C++ source code environment for building missile simulations such as this one. CMD provides a common platform for building a wide range of missile simulations ranging from simple fly-out models to high-fidelity six Degree-of-Freedom (DOF) simulations. The benefit is a clearly structured architecture that makes it easy to maintain and discern model source code. However, no C++ knowledge is needed to use Mini-Rocket.

DTIC

Computer Programs; Computerized Simulation; Manuals; Missile Trajectories; Missiles; Simulation

20070038924 Library of Congress, Washington, DC USA

Congress and the Internet: Highlights

Oleszek, Walter J; Aug 29, 2007; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471747; CRS-RL34148; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471747>

The relationship between Congress and the Internet is complex and multifaceted. Today, scores of technology measures are introduced in the House and Senate, influencing the work of nearly all congressional committees and Members and spawning the growth of a new array of interest groups. The Internet's influence is evident within and between the chambers of Congress. Despite widespread discussion about how the Internet will revolutionize legislative politics and policymaking, Congress usually reacts cautiously to the use of new technologies. This report explores how new technologies are introduced to Congress; discusses the impact of the Internet on two key centers of institutional power committees and political parties and provides a number of summary observations about the internet and congressional governance. This report will be updated only if warranted by new developments.

DTIC

Internets; Technology Utilization

62

COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20070037476 Naval Postgraduate School, Monterey, CA USA

The Defense Messaging System (DMS) in the Navy Regional Enterprise Messaging System (NREMS) Environment: Evidence that Size Does Matter in DoD Business Process Engineering

Liburd, Alice Y; Ramsey, Avonna S; Jun 2007; 159 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471073; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471073>

Since the migration of DOD messaging to the DM8 has been mandated, implementation has been less than ideal and otherwise unsuccessful. DM8 users have reported dissatisfaction with the systems maintenance and security support burdens in the current client-server model. MREM8 introduces a networked environment capable of push technology and centralized database and security management which should significantly reduce the DM8 shortfalls that have made the system lack appeal to the end user. As the DOD seeks to solve these issues, other potential issues are introduced that must be reviewed

and addressed to ensure a successful implementation of the MREM8. The Architecture Trade-off Analysis Method (ATAM) and user surveys formed the basis for analysis, conclusions, and recommendations. The goal of the ATAM is to understand the consequences of architectural decisions with respect to the quality attribute requirements of the system. User surveys provided the data to characterize the current naval messaging business process for each naval command and across the Navy with the prospect of properly defining future NREMS users. Combined analysis provided a clear understanding of the alternative architecture to the existing DM8 architecture.

DTIC

Commerce; Message Processing; Navy; Networks; Product Development

20070037484 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

Cognitive Networks

Thomas, Ryan W; Jun 15, 2007; 195 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471086; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471086>

For complex computer networks with many tunable parameters and network performance objectives, the task of selecting the ideal network operating state is difficult. To improve the performance of these kinds of networks, this research proposes the idea of the cognitive network. A cognitive network is a network composed of elements that, through learning and reasoning, dynamically adapt to varying network conditions in order to optimize end-to-end performance. In a cognitive network, decisions are made to meet the requirements of the network as a whole, rather than the individual network components. We examine the cognitive network concept by first providing a definition and then outlining the difference between it and other cognitive and cross-layer technologies. From this definition, we develop a general, three-layer cognitive network framework, based loosely on the framework used for cognitive radio. In this framework, we consider the possibility of a cognitive process consisting of one or more cognitive elements, software agents that operate somewhere between autonomy and cooperation. To understand how to design a cognitive network within this framework we identify three critical design decisions that affect the performance of the cognitive network: the selfishness of the cognitive elements, their degree of ignorance, and the amount of control they have over the network. To evaluate the impact of these decisions, we created a metric called the price of a feature, defined as the ratio of the network performance with a certain design decision to the performance without the feature. To further aid in the design of cognitive networks, we identify classes of cognitive networks that are structurally similar to one another. We examined two of these classes: the potential class and the quasi-concave class. Both classes of networks will converge to Nash Equilibrium under selfish behavior and in the quasi-concave class this equilibrium is both Pareto and globally optimal.

DTIC

Computer Networks; Topology

20070037550 Library of Congress, Washington, DC USA

State E-Government Strategies: Identifying Best Practices and Applications

Seifert, Jeffrey W; McLoughlin, Glenn J; Jul 23, 2007; 62 pp.; In English

Report No.(s): AD-A471212; CRS-RL34104; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471212>

Although electronic government ('e-government') is currently one of the leading approaches to government reform, a lack of coordination or communication between various initiatives increases the risk of creating more so-called 'islands of automation' and 'stovepipes' within and between levels of government. To address these issues, Congress is actively overseeing e-government initiatives and is attempting to work with the Office of Management and Budget (OMB) and state governments to identify best practices, standards, and strategies. This report is based on research conducted under contract by the Lyndon B. Johnson School of Public Affairs as a Policy Research Project (PRP). For this project, graduate students in the Masters of Public Affairs program at the LBJ School of Public Affairs undertook a two semester research program in 2005-2006 to identify some of the best practices in e-government strategies and management being carried out by state governments. Surveys were sent to all 50 states and the District of Columbia, yielding 38 completed surveys. The study also included site visits to six case study states: California, Kentucky, Massachusetts, Texas, Utah, and Washington. A set of core questions was used for each case study interview along with state-specific questions. Based on the results of the surveys and interviews, the students identified several critical factors that influence state e-government programs.

DTIC

Electronic Commerce; Identifying; Procedures

20070037848 International Inst. of Information Technology, Hyderabad, India

An Optimal Symmetric Secret Distribution of Star Networks

Bezawada, Bruhadeshwar; Kulkarni, Sandeep S; Jan 2007; 14 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0744

Report No.(s): AD-A471506; MSU-CSE-07-188; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we present a lower bound on secret distribution in star network. Examples of star communication network exist in various systems including sensor networks where there is one base station and several sensors that need to communicate with it. While the previous result had shown the possibility of performing secret distribution in a star network using $2 \log n$ secrets, the lower bound for this problem was unknown. With this motivation, in this paper, we derive a tight bound for the number of secrets required for secret distribution in a star network. We show that as n , the number of satellite nodes in the star network, tends to infinity, it suffices to maintain $\log n + 1/2 \log \log n + 1$ secrets at the center node. However, $\log n + 1/2 \log \log n$ secrets do not. Even in the absence of the constraint of n approaches infinity, we argue that these bounds are reasonably tight, i.e., there are several examples for finite values of n where $\lceil \log n + 1/2 \log \log n \rceil$ secrets do not suffice although $\lceil \log n + 1/2 \log \log n + 1 \rceil$ secrets suffice for virtually all cases of practical interest. We also show that our protocol could provide a tradeoff between internal and external attacks and to reduce the number of secrets in acyclic, planar and fully connected bipartite graphs.

DTIC

Communication Networks; Data Links; Protocol (Computers)

20070037862 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Cyberspace as a Theater of Conflict: Federal Law, National Strategy and the Departments of Defense and Homeland Security

Arwood, Sam; Jun 2007; 138 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471536; AFIT/IC4/ENG/07-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The research is divided into three distinct parts, each linked and dependent upon one another. First is a review and an evaluation of the legal relationships between the Combatant Commanders, the Services, and DoD Agencies with respect to cyberspace. What roles are tasked to each and what limitations are in place based upon those assigned roles. And are any of these current relationships at odds with federal law? Second, linked National Strategy to a Service's targeting strategy via the Effects Based Planning process. This demonstrates the ability to link target selection to the elements of national power as well as identify possible desired effects based upon adversary target selection. Last, is an evaluation of military cyberspace activities and responsibilities based upon the conclusions and observations of the first two sections. Included in this evaluation is a brief look at cyberspace activities not yet addressed by the DoD but soon to be a responsibility of the Department.

DTIC

Computer Networks; On-Line Systems; Security; Warfare

20070037890 Odyssey Research Associates, Inc., Ithaca, NY USA

AppMon: Application Monitors for Not-Yet-Trusted Software

Marceau, Carla; Kozen, Dexter; Jun 8, 2007; 28 pp.; In English

Contract(s)/Grant(s): FA9550-06-C-0098

Report No.(s): AD-A471585; ORA-TR-07-0005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Report developed under STTR contract for topic OSD06-SP2. AppMon represents a novel approach to monitoring the behavior of not-yet-trusted applications that avoids the disadvantages of current approaches. It is based on a self-customizing monitor that constrains the application's use of computer resources. A self-customizing monitor learns how the application normally uses computer resources and does not interfere with normal use. However, when the application uses resources in an unusual way, AppMon prevents potentially harmful accesses. Self-customizing monitors satisfy three important requirements on application security monitors. First, the application can be run immediately without testing or training. Second, customization is automatic, so only minimal demands are made on the user and system administrator. Finally, the self-customizing monitors are applicable to a wide variety of applications, including those that read and write files, read and write registry keys, invoke other processes, and use the Internet.

DTIC

Computer Techniques; Functional Design Specifications; Monitors; Software Development Tools

20070038378 Naval Research Lab., Washington, DC USA

Xenon Formal Security Policy Model

McDermott, John; Kirby, James; Kang, Myong; Montrose, Bruce; Aug 14, 2007; 31 pp.; In English

Report No.(s): AD-A471608; NRL/MR/5540--07-9067; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471608>

Xenon is a high-assurance virtual machine monitor based on the Xen open-source hypervisor. We model the Xenon high-assurance virtual machine monitor's security policy as a conditional non-interference policy, using an event-based paradigm and the Communicating Sequential Processes (CSP) formalism. Our single model formally describes not only the separation of information flow but also the sharing. We also present our strategy for showing correspondence between this model and the Xenon interface.

DTIC

Computer Information Security; Information Flow; Monitors; Policies; Security; Xenon

20070038576 Naval Undersea Warfare Center, Newport, RI USA

Method for Time Coding of Asynchronous Data Transmission

Moretti, David J, Inventor; Sep 5, 2007; 15 pp.; In English

Report No.(s): AD-D020307; PAT-APPL 11 101 115; No Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/100.2/ADD020307>

A method of transmitting data includes synchronizing a system clock with a real time clock. Digital data is collected from multiple sources at a system clock time. A sample counter provides a count for each system clock time. The digital data for each source is associated with the count. A data cell is composed from the digital data associated with at least one count and a source identifier. A data frame is created from the data cells from every source. A cell frame is created from a plurality of data frames, and a time frame is composed from a plurality of cell frames. A heads-up cell including the count is transmitted before the time frame. A time/count cell including the count and the real time is transmitted with the associated time frame.

DTIC

Asynchronous Transfer Mode; Coding; Data Transmission; Patent Applications; Synchronism

20070038655 Air Force Academy, Colorado Springs, CO USA

Computer Network Attack and the Use of Force in International Law: Thoughts on a Normative Framework

Schmitt, Michael N; Jun 1999; 42 pp.; In English

Report No.(s): AD-A471993; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This article explores the acceptability under the 'jus ad bellum', that body of international law governing the 'resort to force' as an instrument of national policy of computer network attack. Analysis centers on the United Nations Charter's prohibition of the use of force in Article 2(4), its Chapter VII security scheme, and the inherent right to self-defense codified in Article 51. Concluding that traditional applications of the use of force prohibition fail to adequately safeguard shared community values threatened by CNA, the Article proposes an alternative normative framework based on scrutiny of the consequences caused by such operations.

DTIC

Computer Networks; International Law

20070038911 Library of Congress, Washington, DC USA

Data Security: Federal Legislative Approaches

Stevens, Gina M; Aug 30, 2007; 18 pp.; In English

Report No.(s): AD-A471978; CRS-RL33273; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Several data breach notification and data security bills were considered in the 109th Congress to respond to increasing incidences of data breaches involving personal information, and several congressional hearings were held on various aspects of the issue. In the 109th Congress, The Veterans Benefits, Health Care, and Information Technology Act of 2006 (P.L. 109-461) was passed which, among other things, requires the Department of Veterans Affairs (VA) to provide notice to veterans in case of breach of veterans personal data, notice to law enforcement officials and certain congressional committees when a data breach occurs, for the performance of a risk analysis if unauthorized access to sensitive personal information occurs, and for notification to those affected and for free credit monitoring services if this reveals a 'reasonable risk' for misuses of personal information. Although six other data security bills were reported out of committee in the 109th Congress,

none were enacted into law. Three data security bills were reported by the Senate Commerce and Judiciary committees: S. 1326, S. 1408, and S. 1789. Three other data security bills were reported by the House Energy and Commerce, Financial Services, and Judiciary committees: H.R. 4127, H.R. 3997, and H.R. 5318. The passage of such comprehensive data breach legislation in the 109th Congress was precluded by jurisdictional conflicts, along with unreconcilable approaches on credit freezes, exceptions for law enforcement and intelligence agencies, exemptions for financial institutions, notice requirements, notification triggers, enforcement authorities, and preemption.

DTIC

Computer Information Security; Data Processing Equipment

20070038912 Air War Coll., Maxwell AFB, AL USA

Flying and Fighting in Cyberspace

Convertino, II, Sebastian M; DeMattei, Lou Anne; Knierim, Tammy M; Jul 2007; 92 pp.; In English

Report No.(s): AD-A471618; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471618>

This research paper develops the foundation for a new military operating concept for 'fighting the net' in support of Eighth Air Force's requirements and its stand-up as the new Cyber Command. It applies the Air Force Concept Development framework to examine cyberspace as a newly designated warfare domain and proposes cyber capabilities as well as effects that the Air Force should develop and apply as it seeks to execute its mission in cyberspace. Before the Air Force can effectively lead in the cyber domain, it must first not only fully characterize cyber conditions, threats, and vulnerabilities, but also clearly define how and where it can contribute to the national cyberspace strategy. Once the service completes these tasks, it can then focus on the nature of war in the cyber domain and consider the implications for military doctrine and operations. In order to successfully build capability and capacity for operating in cyberspace, the Air Force needs to institutionalize 'cyber-mindedness' to underpin investments in organization, research and development, and human capital that it needs to 'fly and fight' effectively in cyberspace.

DTIC

Warfare; Internets; Free Flight

20070038936 Queensland Univ., Brisbane, Australia

The Role of Formal Methods in High-Grade InfoSec Evaluations

Long, Benjamin W; Mar 2007; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471787; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471787>

With the increasing use of computer systems in governmental, commercial and industrial equipment, we must be sure that these systems remain secure. The Common Criteria is an internationally recognised criteria for evaluating IT products with security functionality. To achieve a high level of assurance from the Common Criteria, formal methods should be applied in the development process. This report concentrates on formal methods support for development and evaluation of security-critical systems in the Common Criteria. In particular, the Defence Signal Directorate (DSD) is charged with the oversight of the security evaluations program in Australia. The report attempts to indicate what DSD should know about formal methods for the high-grade evaluations, and where they can find out more as desired.

DTIC

Security; Warning Systems; Information Systems

20070039046 National Inst. of Information and Communications Technology, Tokyo, Japan

Mobile Ethernet and its Security Toward Ubiquitous Network

Miyamoto, Goh; Kuroda, Masahiro; Journal of the National Institute of Information and Communications Technology, Volume 53, No. 4 (Special Issue on New Generation Mobile Network); December 2006, pp. 51-60; In English; See also [20070039040](#); Copyright; Avail.: Other Sources

The ubiquitous environment is a seamless integration of radio systems, such as the 3 G, WLAN and wireless MANs, and is expected popular in near future combined with small RF devices. The Mobile Ethernet is an architecture to integrate different types of radio systems and provide transparent network access anytime anywhere. We explain the Mobile Ethernet architecture for future ubiquitous environment from the viewpoint of 3 GPP and IEEE802 LMSC. We, then, talk the Mobile Ethernet Security which is the security framework to accommodate both application and network authentications. We, then, discuss wireless security issues. One is to have a common mechanism to keep confidentiality among radio systems. The other

is to provide functions to maintain availability. The wireless security discussion is still on the way and we need to investigate privacy issues for security of future ubiquitous network.

Author

Ethernet; Communication Networks; Security

63

CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20070037486 Army Research Lab., Adelphi, MD USA

A Description on the Second Dataset of the U.S. Army Research Laboratory Force Protection Surveillance System

Chan, Alex L; Aug 2007; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471088; ARL-MR-0670; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471088>

This memorandum report provides a concise description on the second set of moving target image data, collected by the Image Processing Branch (AMSRD-ARL-SE-SE) of the U.S. Army Research Laboratory (ARL), for a force protection project. We describe the sensor and setting of this data collection effort, the purpose and content of this dataset, as well as the ground-truthing tool developed and used for this dataset. With these detail descriptions, we hope a reader may be able to understand the ARL force protection surveillance system (FPSS) datasets and the associated ground-truth information easily and to use them for his or her project readily.

DTIC

Image Processing; Laboratory Equipment; Protection; Surveillance; Targets

20070037524 Hypres, Inc., Elmsford, NY USA

Look-Up Table for Superconductor Digital-RF Predistorter

Filippov, Timur V; Sahu, Anubhav; Kirichenko, Alex F; Gupta, Deepnarayan; Jun 2007; 5 pp.; In English

Report No.(s): AD-A471148; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471148>

We have developed a high-speed pipelined superconductor look-up table to generate programmable predistortion functions for direct linearization of radio frequency 'RF' power amplifiers. The look-up table comprises an address decoder and a memory matrix with throughput above 10 GHz. The decoder performs code-matching of each input word and its conversion into a row address of the memory matrix. We discuss different possible implementations of the address decoder, including a preferred one for integrated circuit implementation. The memory matrix consists of RS flip-flops with nondestructive readout connected in series for slow-speed contents writing. Each row of the memory matrix contains a number, which can be read out by signal from the decoder. We present the design and the results of experimental evaluation of the look-up table and its components.

DTIC

Amplifiers; Decoders; Radio Frequencies; Superconductors (Materials)

20070037536 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling, Germany

Influence of Camouflage on the ATR Performance for Highly Resolved ISAR-Images of Relocatable Targets

Kempf, Timo; Peichl, Markus; Dill, Stephan; Seuss, Helmut; May 2005; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471172; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471172>

No abstract available

Camouflage; Radar Signatures; Targets

20070037537 Defence Research and Development Canada, Valcartier, Quebec Canada
Development and Test of a Millimetre-Wave ISAR Images ATR System
Villers, de, Yves; May 1, 2005; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471173; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471173>
No abstract available
Millimeter Waves; Target Recognition

20070037539 Forschungsinstitut fuer Hochfrequenzphysik, Wachtberg-Werthhoven, Germany
Robust Target Acquisition using Consecutive Range Doppler Maps
Schimpf, Hartmut; Billner, Johann; May 1, 2005; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471176; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471176>
No abstract available
Synthetic Aperture Radar; Target Acquisition; Target Recognition

20070037564 California Inst. of Tech., Pasadena, CA USA
Conversion and Verification Procedure for Goal-Based Control Programs
Braman, Julia M; Murray, Richard M; Aug 15, 2007; 19 pp.; In English
Report No.(s): AD-A471257; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471257>
Fault tolerance and safety verification of control systems are essential for the success of autonomous robotic systems. A control architecture called Mission Data System, developed at the Jet Propulsion Laboratory, takes a goal-based control approach. In this paper, a method for converting goal network control programs into linear hybrid systems is developed. The linear hybrid system can then be verified for safety in the presence of failures using existing symbolic model checkers. An example task is developed and successfully verified using HyTech, a symbolic model checking software for linear hybrid systems.
DTIC
Control; Fault Tolerance; Proving; Robotics

20070037740 MBDA, Villacoublay, France
ATR from Medium Resolution Images for All Weather Terminal Guidance
Beauvais, Boris; Teissier, Lionel; May 1, 2005; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471297; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
False Alarms; Target Recognition; Terminal Guidance

20070037741 Cranfield Univ., Cranfield, UK
The Who, What, Where and When of Radar Targeting: Key Note Speech
Alabaster, Clive; Lewis, M; May 1, 2005; 66 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471298; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Requirements; Target Recognition

20070037772 Naval Postgraduate School, Monterey, CA USA
Navy Requirements for Controlling Multiple Off-Board Robots Using the Autonomous Unmanned Vehicle Workbench
Monroe, Dennis W; Jun 2007; 147 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471375; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The Autonomous Unmanned Vehicle Workbench (AUVW) is an ongoing project at NPS that allows rehearsal, real-time control, and replay of diverse autonomous unmanned vehicle (AUVs) missions. The AUVW increases the situational awareness of operators while allowing operators to learn valuable insights in a robots performance before, during, and after a mission. This thesis examines a variety of strategic authoritative plans for autonomous vehicles to determine functional mission requirements that autonomous vehicles are expected to be performing in the near future. Excellent agreement on

tactical needs and requirements was found among these diverse documents. A series of exemplar missions corresponding to specific requirements are presented as a way to explore and evaluate different tactical capabilities. These missions are then compared to the current capabilities of the AUVW by planning, running, and evaluating them in the workbench. Although the AUVW is a powerful tool it still lacks some functionality to make it tactically usable. Nevertheless, perhaps two thirds of the necessary capabilities are already supported in the workbench and further capabilities can be feasibly integrated. The result of this work is a roadmap for future work to add functionality so that the workbench can thoroughly perform user tasks in all mission areas.

DTIC

Autonomous Navigation; Autonomy; Navy; Robots

20070037774 Army Research Lab., Aberdeen Proving Ground, MD USA

Assessment of Stereoscopic Display Systems for Assisting in Route Clearance Manipulation Planning Tasks

Bodenhamer, Andrew S; Aug 2007; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471379; ARL-TR-4195; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study was conducted to objectively compare how the use of a three-dimensional (3-D) or two-dimensional (2-D) visual display affects manipulation planning performance in a spatial perception task relevant to the operation of the Buffalo vehicle manipulator arm. Portions of the results are also generalizable to any tele-operated precision manipulation task. The task evaluated involves judging the position of the Buffalo arm relative to targets and obstacles as seen in the visual display from the arm camera. Thirty-two Soldiers trained to use the route clearance vehicle participated in this study at Fort Leonard Wood, Missouri, during the summer of 2006. Significant planning performance benefits were found when the 3-D visual display was used as opposed to the 2-D display. A significant correlation between subjective confidence ratings and objective performance was found with 3-D displays but not with 2-D displays. Most participants indicated that they preferred using the 3-D display instead of the 2-D display.

DTIC

Clearances; Display Devices; Manipulators; Robotics; Routes

20070037780 Army Research Lab., Aberdeen Proving Ground, MD USA

Effects of Tactile Alerts on Concurrent Performance of the Gunner's and Robotic Operator's Tasks in a Simulated Mounted Environment

Chen, Jessie Y; Terrence, Peter I; Aug 2007; 40 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-AH70

Report No.(s): AD-A471386; ARL-TR-4227; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this study, we simulated a generic mounted environment and conducted an experiment to examine the performance and workload of the combined position of gunner and robotics operator. More specifically, we compared the performance and workload of the operator when his/her gunnery tasks were assisted by the aided target recognition (ATR) capabilities (delivered through tactile cueing or a combination of tactile and visual cueing) versus when the gunnery task was unassisted. While performing gunnery tasks, participants also had to control a semi-autonomous unmanned ground vehicle (UGV) or tele-operate a UGV. Participants also performed a tertiary communication task concurrently. Results showed that participants gunnery task performance improved significantly when it was assisted by ATR. The performance of those participants with higher spatial ability exceeded that of participants with lower spatial ability. It was also found that significantly fewer neutral targets (which were not cued) in the gunnery environment were detected (which implies less visual attention being devoted to the gunnery station) when participants concurrently tele-operated a robotic asset or when the gunnery task was assisted by ATR. Participants robotics (tele-operation) task improved significantly when the ATR was available to assist them with their gunnery task. It was also found that the performance gap between those participants with higher and lower spatial ability appeared to be narrower when the ATR was available. A similar pattern was also observed for the perceived attentional control factor. Participants communication task performance also improved significantly when the gunnery task was assisted by ATR. Participants robotics (tele-operation) task improved significantly when the ATR was available to assist them with their gunnery task.

DTIC

Cues; Robotics

20070037832 Oregon State Univ., Corvallis, OR USA

Toward Harnessing User Feedback For Machine Learning

Stumpf, Simone; Rajaram, Vidya; Li, Lida; Burnett, Margartet; Dietterich, Thomas; Sullivan, Erin; Drummond, Russell; Herlocker, Jonathan; Oct 2, 2006; 12 pp.; In English

Contract(s)/Grant(s): HR0011-04-1-0005; NBCHD-030010

Report No.(s): AD-A471484; CS-06-10-1-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There has been little research into how end users might be able to communicate advice to machine learning systems. If this resource-the users themselves-could somehow work hand-in-hand with machine learning systems, the accuracy of learning systems could be improved and the users' understanding and trust of the system could improve as well. We conducted a think-aloud study to see how willing users were to provide feedback and to understand what kinds of feedback users could give. Users were shown explanations of machine learning predictions and asked to provide feedback to improve the predictions. We found that users had no difficulty providing generous amounts of feedback. The kinds of feedback ranged from suggestions for reweighting of features to proposals for new features, feature combinations, relational features, and wholesale changes to the learning algorithm. The results show that user feedback has the potential to significantly improve machine learning systems, but that learning algorithms need to be extended in several ways to be able to assimilate this feedback.

DTIC

Feedback; Machine Learning

20070037882 Air Force Research Lab., Kirkland AFB, NM USA

Noise Reduction in Support-Constrained Multi-Frame Blind-Deconvolution Restorations as a Function of the Number of Data Frames and the Support Constraint Sizes (Preprint)

Matson, Charles; Haji, Alim; Dec 6, 2006; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F29601-01-D-0083/0006; Proj-D0D0

Report No.(s): AD-A471576; AFRL-DE-PA-JA-2007-1004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Multi-frame blind deconvolution (MFBD) algorithms seek to estimate jointly an object being imaged along with all the system point spread functions (PSFs) present in the measured data frames. It is well known that the quality of an object restoration improves as the number of data frames included in the restoration process is increased and as the sizes of the support constraints used in the algorithm decrease in size (while still including the true support). This improvement is due to both a greater likelihood of finding the global minimum of the MFBD cost function (when a cost-function based approach is used, of course) and the decreased noise levels in the restored image. In this paper we report on results we have obtained while investigating the latter source of improvement. We show that the amount of relative noise reduction in multi-frame blind deconvolution image restorations is greatest for just a few data frames and is a more complicated function of the support constraint sizes.

DTIC

Noise Reduction; Restoration

20070038349 NASA Ames Research Center, Moffett Field, CA, USA; University Coll., London, UK; Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany

Intelligent Motion and Interaction Within Virtual Environments

Ellis, Stephen R., Editor; Slater, Mel, Editor; Alexander, Thomas, Editor; June 15, 2007; 194 pp.; In English; Intelligent Motion and Interaction Within Virtual Environments Conference Proceedings, 15-17 Sep. 2003, London, UK; See also 20070038350 - 20070038360; Original contains color and black and white illustrations

Contract(s)/Grant(s): WU 21-131-20-30-00

Report No.(s): NASA/CP-2007-213468; A-070003; TH-061; Copyright; Avail.: CASI: [A09](#), Hardcopy

What makes virtual actors and objects in virtual environments seem real? How can the illusion of their reality be supported? What sorts of training or user-interface applications benefit from realistic user-environment interactions? These are some of the central questions that designers of virtual environments face. To be sure simulation realism is not necessarily the major, or even a required goal, of a virtual environment intended to communicate specific information. But for some applications in entertainment, marketing, or aspects of vehicle simulation training, realism is essential. The following chapters will examine how a sense of truly interacting with dynamic, intelligent agents may arise in users of virtual environments.

These chapters are based on presentations at the London conference on Intelligent Motion and Interaction within a Virtual Environments which was held at University College, London, U.K., 15-17 September 2003.

Author

Artificial Intelligence; Virtual Reality; Human Factors Engineering; Motion; Telerobotics

20070038350 Technische Hochschule, Aachen, Germany

Hierarchically Structured Non-Intrusive Sign Language Recognition, Chapter 2

Zieren, Jorg; Zieren, Jorg; Kraiss, Karl-Friedrich; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 21-30; In English; See also [20070038349](#); Original contains color illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

This work presents a hierarchically structured approach at the nonintrusive recognition of sign language from a monocular frontal view. Robustness is achieved through sophisticated localization and tracking methods, including a combined EM/CAMSHIFT overlap resolution procedure and the parallel pursuit of multiple hypotheses about hands position and movement. This allows handling of ambiguities and automatically corrects tracking errors. A biomechanical skeleton model and dynamic motion prediction using Kalman filters represents high level knowledge. Classification is performed by Hidden Markov Models. 152 signs from German sign language were recognized with an accuracy of 97.6%.

Author

Biodynamics; Languages; Symbols; Character Recognition

20070038351 Polish-Japanese Inst. of Information Technology, Research Center, Warsaw, Poland

Pavlovian, Skinner, and Other Behaviourists' Contributions to AI, Chapter 9

Kosinski, Withold; Zaczek-Chrzanowska, Dominika; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 133-146; In English; See also [20070038349](#); Copyright; Avail.: CASI: [A03](#), Hardcopy

A version of the definition of intelligent behaviour will be supplied in the context of real and artificial systems. Short presentation of principles of learning, starting with Pavlovian's classical conditioning through reinforced response and operant conditioning of Thorndike and Skinner and finishing with cognitive learning of Tolman and Bandura will be given. The most important figures within behaviourism, especially those with contribution to AI, will be described. Some tools of artificial intelligence that act according to those principles will be presented. An attempt will be made to show when some simple rules for behaviour modifications can lead to a complex intelligent behaviour.

Author

Artificial Intelligence; Behavior; Mental Performance; Learning Theory; Cognition

20070038352 NASA Ames Research Center, Moffett Field, CA, USA

Current Status and Future Development of Structuring and Modeling Intelligent Appearing Motion, Chapter 11

Alexander, Thomas; Ellis, Stephen R.; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 169-187; In English; See also [20070038349](#); Copyright; Avail.: CASI: [A03](#), Hardcopy

The two topics covered by this symposium were intelligent appearing motion and Virtual Environments (VE). Both of these are broad research areas with enough content to fill large conferences. Their intersection has become important due to conceptual and technological advances enabling the introduction of intelligent appearing motion into Virtual Environments. This union brings new integration challenges and opportunities, some of which were examined at this symposium. This chapter was inspired by the contributions of several of the conference participants, but is not a complete review of all presentations. It will hopefully serve as a basis for formulating a new approach to the understanding of motion within VE

Author

Models; Virtual Reality; Human Beings; Motion Perception

20070038353 NASA Ames Research Center, Moffett Field, CA, USA

Human Activity Behavior and Gesture Generation in Virtual Worlds for Long-Duration Space Missions, Chapter 8

Sierhuis, Maarten; Clancey, William J.; Damer, Bruce; Brodsky, Boris; vanHoff, Ron; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 101-131; In English; See also [20070038349](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

A virtual worlds presentation technique with embodied, intelligent agents is being developed as an instructional medium suitable to present in situ training on long term space flight. The system combines a behavioral element based on finite state automata, a behavior based reactive architecture also described as subsumption architecture, and a belief-desire-intention agent

structure. These three features are being integrated to describe a Brahms virtual environment model of extravehicular crew activity which could become a basis for procedure training during extended space flight.

Author

Human Reactions; Long Duration Space Flight; Automata Theory; Activity (Biology); Education

20070038354 CAE, Inc., Saint Laurent, Quebec, Canada

Intelligent Entity Behavior Within Synthetic Environments, Chapter 3

Kruk, R. V.; Howells, P. B.; Siksik, D. N.; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 31-44; In English; See also [20070038349](#); Original contains black and white illustrations; Copyright; Avail.: CASI:

A03, Hardcopy

This paper describes some elements in the development of realistic performance and behavior in the synthetic entities (players) which support Modeling and Simulation (M&S) applications, particularly military training. Modern human-in-the-loop (virtual) training systems incorporate sophisticated synthetic environments, which provide: 1. The operational environment, including, for example, terrain databases; 2. Physical entity parameters which define performance in engineered systems, such as aircraft aerodynamics; 3. Platform/system characteristics such as acoustic, IR and radar signatures; 4. Behavioral entity parameters which define interactive performance, including knowledge/reasoning about terrain, tactics; and, 5. Doctrine, which combines knowledge and tactics into behavior rule sets. The resolution and fidelity of these model/database elements can vary substantially, but as synthetic environments are designed to be compose able, attributes may easily be added (e.g., adding a new radar to an aircraft) or enhanced (e.g. Amending or replacing missile seeker head/ Electronic Counter Measures (ECM) models to improve the realism of their interaction). To a human in the loop with synthetic entities, their observed veridicality is assessed via engagement responses (e.g. effect of countermeasures upon a closing missile), as seen on systems displays, and visual (image) behavior. The realism of visual models in a simulation (level of detail as well as motion fidelity) remains a challenge in realistic articulation of elements such as vehicle antennae and turrets, or, with human figures; posture, joint articulation, response to uneven ground. Currently the adequacy of visual representation is more dependant upon the quality and resolution of the physical models driving those entities than graphics processing power per Se. Synthetic entities in M&S applications traditionally have represented engineered systems (e.g. aircraft) with human-in-the-loop performance characteristics (e.g. visual acuity) included in the system behavioral specification. As well, performance affecting human parameters such as experience level, fatigue and stress are coming into wider use (via AI approaches) to incorporate more uncertainty as to response type as well as performance (e.g. Where an opposing entity might go and what it might do, as well as how well it might perform).

Author

Military Technology; Simulation; Architecture (Computers); Models; Artificial Intelligence

20070038355 State Univ. of New York, Binghamton, NY, USA

Telerobotic Surgery: An Intelligent Systems Approach to Mitigate the Adverse Effects of Communication Delay, Chapter 4

Cardullo, Frank M.; Lewis, Harold W., III; Panfilov, Peter B.; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 45-56; In English; See also [20070038349](#); Original contains color illustrations; Copyright; Avail.:

CASI: A03, Hardcopy

An extremely innovative approach has been presented, which is to have the surgeon operate through a simulator running in real-time enhanced with an intelligent controller component to enhance the safety and efficiency of a remotely conducted operation. The use of a simulator enables the surgeon to operate in a virtual environment free from the impediments of telecommunication delay. The simulator functions as a predictor and periodically the simulator state is corrected with truth data. Three major research areas must be explored in order to ensure achieving the objectives. They are: simulator as predictor, image processing, and intelligent control. Each is equally necessary for success of the project and each of these involves a significant intelligent component in it. These are diverse, interdisciplinary areas of investigation, thereby requiring a highly coordinated effort by all the members of our team, to ensure an integrated system. The following is a brief discussion of those areas. Simulator as a predictor: The delays encountered in remote robotic surgery will be greater than any encountered in human-machine systems analysis, with the possible exception of remote operations in space. Therefore, novel compensation techniques will be developed. Included will be the development of the real-time simulator, which is at the heart of our approach. The simulator will present real-time, stereoscopic images and artificial haptic stimuli to the surgeon. Image processing: Because of the delay and the possibility of insufficient bandwidth a high level of novel image processing is necessary. This image processing will include several innovative aspects, including image interpretation, video to graphical conversion, texture extraction, geometric processing, image compression and image generation at the surgeon station.

Intelligent control: Since the approach we propose is in a sense predictor based, albeit a very sophisticated predictor, a controller, which not only optimizes end effector trajectory but also avoids error, is essential. We propose to investigate two different approaches to the controller design. One approach employs an optimal controller based on modern control theory; the other one involves soft computing techniques, i.e. fuzzy logic, neural networks, genetic algorithms and hybrids of these. Derived from text

Surgery; Time Lag; Telerobotics; Artificial Intelligence; Telecommunication

20070038356 USC Information Sciences Inst., Marina Del Rey, CA, USA

Dramatic Expression in Opera, and Its Implications for Conversational Agents, Chapter 7

Johnson, W. Lewis; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 91-100; In English; See also [20070038349](#); Original contains color illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

This article has discussed principles, techniques, and methods of dramatic portrayal in opera, and their application to the development of embodied conversational agents. Investigations such as this complement studies of natural human behavior, and offer insights as to how to make such behavior understandable and interesting when adapted for use by embodied conversational agents. However, one should use caution in applying such lessons. The unique characteristics of computer-based media are still being identified and explored. In any case, one must always be careful about applying principles blindly to any artistic form. Such principles are post-hoc analysis of the intuitive skill of great artists; this was as true in Aristotle's day as it is today. We should not let structural principles stand in the way of injecting creativity into the design of ECAs. Opera at its best possesses an element of magic that is difficult to describe, much less analytically reconstruct. We can only hope to achieve a similar result with conversational agents.

Author

Computer Techniques; Creativity; Human Behavior; Data Acquisition

20070038357 University Coll., London, UK

Interactions with Virtual People: Do Avatars Dream of Digital Sheep?, Chapter 6

Slater, Mel; Sanchez-Vives, Maria V.; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 75-89; In English; See also [20070038349](#); Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

This paper explores another form of artificial entity, ones without physical embodiment. We refer to virtual characters as the name for a type of interactive object that have become familiar in computer games and within virtual reality applications. We refer to these as avatars: three-dimensional graphical objects that are in more-or-less human form which can interact with humans. Sometimes such avatars will be representations of real-humans who are interacting together within a shared networked virtual environment, other times the representations will be of entirely computer generated characters. Unlike other authors, who reserve the term agent for entirely computer generated characters and avatars for virtual embodiments of real people; the same term here is used for both. This is because avatars and agents are on a continuum. The question is where does their behaviour originate? At the extremes the behaviour is either completely computer generated or comes only from tracking of a real person. However, not every aspect of a real person can be tracked every eyebrow move, every blink, every breath rather real tracking data would be supplemented by inferred behaviours which are programmed based on the available information as to what the real human is doing and her/his underlying emotional and psychological state. Hence there is always some programmed behaviour it is only a matter of how much. In any case the same underlying problem remains how can the human character be portrayed in such a manner that its actions are believable and have an impact on the real people with whom it interacts? This paper has three main parts. In the first part we will review some evidence that suggests that humans react with appropriate affect in their interactions with virtual human characters, or with other humans who are represented as avatars. This is so in spite of the fact that the representational fidelity is relatively low. Our evidence will be from the realm of psychotherapy, where virtual social situations are created that do test whether people react appropriately within these situations. We will also consider some experiments on face-to-face virtual communications between people in the same shared virtual environments. The second part will try to give some clues about why this might happen, taking into account modern theories of perception from neuroscience. The third part will include some speculations about the future developments of the relationship between people and virtual people. We will suggest that a more likely scenario than the world becoming populated by physically embodied virtual people (robots, androids) is that in the relatively near future we will interact more and more in our everyday lives with virtual people- bank managers, shop assistants, instructors, and so on. What is happening in the movies with computer graphic generated individuals and entire crowds may move into the space of everyday life.

Derived from text

Virtual Reality; Psychotherapy; Robots; Instructors; Behavior; Computer Graphics; Neurology

20070038358 Glasgow Univ., UK

V-Man Generation for 3-D Real Time Animation, Chapter 5

Nebel, Jean-Christophe; Sibiryakov, Alexander; Ju, Xiangyang; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 57-73; In English; See also [20070038349](#); Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The V-Man project has developed an intuitive authoring and intelligent system to create, animate, control and interact in real-time with a new generation of 3D virtual characters: The V-Men. It combines several innovative algorithms coming from Virtual Reality, Physical Simulation, Computer Vision, Robotics and Artificial Intelligence. Given a high-level task like 'walk to that spot' or 'get that object', a V-Man generates the complete animation required to accomplish the task. V-Men synthesise motion at runtime according to their environment, their task and their physical parameters, drawing upon its unique set of skills manufactured during the character creation. The key to the system is the automated creation of realistic V-Men, not requiring the expertise of an animator. It is based on real human data captured by 3D static and dynamic body scanners, which is then processed to generate firstly animatable body meshes, secondly 3D garments and finally skinned body meshes.

Author

Human Beings; Real Time Operation; Three Dimensional Models; Animation; Bionics

20070038359 Massachusetts Inst. of Tech., Cambridge, MA, USA

Constraint, Intelligence, and Control Hierarchy in Virtual Environments, Chapter 1

Sheridan, Thomas B.; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 9-19; In English; See also [20070038349](#); Copyright; Avail.: CASI: [A03](#), Hardcopy

This paper seeks to deal directly with the question of what makes virtual actors and objects that are experienced in virtual environments seem real. (The term virtual reality, while more common in public usage, is an oxymoron; therefore virtual environment is the preferred term in this paper). Reality is difficult topic, treated for centuries in those sub-fields of philosophy called ontology- 'of or relating to being or existence' and epistemology- 'the study of the method and grounds of knowledge, especially with reference to its limits and validity' (both from Webster s, 1965). Advances in recent decades in the technologies of computers, sensors and graphics software have permitted human users to feel present or experience immersion in computer-generated virtual environments. This has motivated a keen interest in probing this phenomenon of presence and immersion not only philosophically but also psychologically and physiologically in terms of the parameters of the senses and sensory stimulation that correlate with the experience (Ellis, 1991). The pages of the journal Presence: Teleoperators and Virtual Environments have seen much discussion of what makes virtual environments seem real (see, e.g., Slater, 1999; Slater et al. 1994; Sheridan, 1992, 2000). Stephen Ellis, when organizing the meeting that motivated this paper, suggested to invited authors that 'We may adopt as an organizing principle for the meeting that the genesis of apparently intelligent interaction arises from an upwelling of constraints determined by a hierarchy of lower levels of behavioral interaction. 'My first reaction was 'huh?' and my second was 'yeah, that seems to make sense.' Accordingly the paper seeks to explain from the author's viewpoint, why Ellis's hypothesis makes sense. What is the connection of 'presence' or 'immersion' of an observer in a virtual environment, to 'constraints' and what types of constraints. What of 'intelligent interaction,' and is it the intelligence of the observer or the intelligence of the environment (whatever the latter may mean) that is salient? And finally, what might be relevant about 'upwelling' of constraints as determined by a hierarchy of levels of interaction?

Derived from text

Virtual Reality; Intelligence; Computer Programs; Sensory Stimulation; Hypotheses

20070038360 Kurzweil Technologies, Wellesley Hills, MA, USA

The Emergence and Impact of Intelligent Machines, Chapter 10

Kurzweil, Raymond; Intelligent Motion and Interaction Within Virtual Environments; June 15, 2007, pp. 147-168; In English; See also [20070038349](#); Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The following issues are addressed in this essay: a) Models of Technology Trends: A discussion of why nanotechnology and related advanced technologies are inevitable. The underlying technologies are deeply integrated into our society and are advancing on many diverse fronts; and b) The Economic Imperatives of the Law of Accelerating Returns: The exponential advance of technology, including the accelerating miniaturization of technology, is driven by economic imperative, and, in turn, has a pervasive impact on the economy.

Derived from text

Economics; Miniaturization; Nanotechnology

20070038642 SRA Adroit C4ISR Center, Dayton , OH USA

Commander's Decision Aid for Predictive Battlespace Awareness (CDA4PBA)

Calhoun, Christopher S; Fitzhugh, Elisabeth W; Klinger, David W; Dec 2006; 169 pp.; In English

Contract(s)/Grant(s): FA8650-04-D-6405; Proj-2830

Report No.(s): AD-A471959; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of Information Warfighter Effectiveness (IWE), Commander's Decision Aid for Predicted Battlespace Awareness (CDA4PBA), was to develop and demonstrate human-centered decision-making technologies to improve processes, performance, tools, and training to support a commander's predictive battlespace awareness ability. The program provided an understanding of the decisions and other cognitive work associated with Predicted Battlespace Awareness (PBA) for Joint Force and Air Force Commanders, their staff, and intelligence support functions. CDA4PBA supports a commander's PBA by proposing algorithms and high-level concept visualizations supporting these algorithms. This allows the commander to identify and rehearse actions to counter the enemy's actions before the enemy acts. This program addressed these advanced visualizations and work-centered decision aides.

DTIC

Decision Support Systems; Expert Systems; Military Operations; Planning; Predictions; Situational Awareness

20070038646 Academy of Sciences (USSR), Moscow, Russian Federation

Simulation and Experimental Elaboration of Acoustic Sensors for Mobile Robots

Pavlovsky, V E; Khashan, T S; May 1, 2005; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471973; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Acoustics; Control; Remote Control; Robots; Signal Detectors; Simulation

20070038718 Northrop Grumman Corp., El Segundo, CA USA

All Source Adaptive Fusion for Aided Navigation in Non-GPS Environment

Klausutis, Timothy J; Wehling, Ric; Lames, Matthew; Aboutalib, Omar; Awalt, Bruce; Fund, Alex; Thai, Bea; Leibs, Jeremy; Apr 2007; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8651-05-C-0174; Proj-2068

Report No.(s): AD-A472080; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An innovative approach for navigation in non-GPS environment is presented based on all source adaptive fusion of any available information encompassing passive imaging data, digital elevation terrain data, IMU/GPS, altimeters, and star tracker. The approach provides continuous navigation through non-GPS environment and yields an improved navigation in the presence of GPS. The approach also provides reduced target location error and moving target indication.

DTIC

Air Navigation; Autonomous Navigation; Global Positioning System; Multisensor Fusion; Navigation Aids

20070038881 University of Southern California, Marina del Rey, CA USA

Intelligent Tutoring for Interpersonal and Intercultural Skills

Lane, H C; Core, Mark G; Gomboc, David; Karnavat, Ashish; Rosenberg, Milton; Jan 2007; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471951; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe some key issues involved in building an intelligent tutoring system for the ill-defined domain of interpersonal and intercultural skill acquisition. We discuss the consideration of mixed-result actions (actions with pros and cons), categories of actions (e.g., required steps vs. rules of thumb), the role of narrative, and reflective tutoring, among other topics. We present these ideas in the context our work on an intelligent tutor for ELECT BiLAT, a game-based system to teach cultural awareness and negotiation skills for bilateral engagements. The tutor provides guidance in two forms: (1) as a coach that gives hints and feedback during an engagement with a virtual character, and (2) during an after-action review to help the learner reflect on their choices. Learner activities are mapped to learning objectives, which include whether the actions represent positive or negative evidence of learning. These underlie an expert model, student model, and models of coaching and reflective tutoring that support the learner. We describe several other cultural and interpersonal training systems that situate learners in goal-based social contexts that include interaction with virtual characters and automated guidance. Finally, our future work includes

evaluations of learning, expansion of the coach and reflective tutoring strategies, and integration of deeper knowledge-based resources that capture more nuanced cultural aspects of interaction.

DTIC

Expert Systems; Human Relations; Training Devices

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20070037466 Naval Research Lab., Bay Saint Louis, MS USA

Why Do Intrathermocline Eddies Form in the Japan/East Sea? A Modeling Perspective

Hogan, Patrick J; Hurlburt, Harley E; Sep 2006; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A470735; NRL/JA/7320-06-6239; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA470735>

Intrathermocline eddies (ITEs) are characterized by a subsurface lens of relatively homogeneous water. By definition, they are situated within the thermocline and therefore split the stratified water column, taking the form of a dome in the upper part of the thermocline and a bowl in the lower part. Observations of ITEs in diverse regions of the world ocean indicate typical spatial scales of 10-100 km horizontally and 100 m vertically. In the Japan/East Sea (JES) there are at least three mechanisms for the formation of ITEs from pre-existing non-ITE eddies based on results from the HYbrid Coordinate Ocean Model (HYCOM). Those mechanisms include advection of the stratified seasonal variations of temperature and salinity through the Tsushima Strait, restratification of the upper water column due to seasonal heating and cooling of the upper ocean, and subduction of ITE water originating from the Tsushima Strait beneath the wintertime Subpolar Front. The formation mechanisms are not mutually exclusive. Indeed, all three are shown to be interactively affecting the formation of an ITE in at least one case. Gordon et al. (2002) reported the existence of ITEs in the JES based on observations from SeaSoar instrumentation, conductivity-temperature depth (CTD) sensors, and airborne expendable bathythermographs (AXBTs). Their paper contains extensive analysis of ITEs in the JES and observational evidence of formation mechanisms based on cruise data collected during 1999-2000 as part of the Office of Naval Research (ONR) JES Department Research Initiative as well as results from earlier studies. The Gordon et al. work inspired a numerical modeling study to examine whether or not similar features could be simulated. If they could be simulated, could the ocean model be used as a tool to elucidate the formation mechanisms of the ITEs? This study uses HYCOM to simulate JES ITEs that have domed stratification at the top, forming a lens-shaped interior of nearly unstratified water.

DTIC

Annual Variations; Computerized Simulation; Japan; Ocean Currents; Ocean Models; Seas; Thermoclines; Vortices

20070037467 Montana State Univ., Bozeman, MT USA

Sensitivity Analysis for the Optimal Design and Control of Advanced Guidance Systems

Davis, Lisa G; Jun 1, 2007; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-03-1-0326

Report No.(s): AD-A471057; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471057>

The main goal of the research project is to use Continuous Sensitivity Equation Methods in order to design actuators and sensors for distributed parameter systems. Investigations for parameterized sensor/actuator placement indicate that computational challenges exist for certain types mathematical models. When the governing equations are partial differential equations and the sensitivity analysis is with respect to parameters that determine placement of sensors and/or actuators, there can be a loss of regularity between the model equations and that of the corresponding sensitivity equations. This issue is particularly important for accuracy and convergence of numerical sensitivity calculations that may be used within a control design framework.

DTIC

Actuators; Detectors; Guidance (Motion); Linear Quadratic Regulator; Mathematical Models; Optimal Control; Partial Differential Equations; Sensitivity; Sensitivity Analysis

20070037481 Duke Univ., Durham, NC USA

Optimization and Comparison of Different Digital Mammographic Tomosynthesis Reconstruction Methods

Chen, Ying; Dobbins, James T; Apr 2007; 60 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0462

Report No.(s): AD-A471081; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471081>

Digital breast tomosynthesis is a three dimensional imaging technique with limited angle series of projection images that allows the reconstruction of an arbitrary set of planes in the breast. Compared with standard mammography techniques, this method improves conspicuity of structures by removing the visual clutter associated with overlying anatomy. The objective of this project is to optimized and compare different tomosynthesis methods and choose the optimal one for breast imaging. Optimization of acquisition parameters will provide better reconstruction images of the breast, and related deblurring methods can remove out of plane blurred structures. We investigated several 3D tomosynthesis reconstruction algorithms and studied the effect of acquisition parameters for different reconstruction algorithms, according to physical measurements of impulse response analysis, modulation transfer function (MTF) and noise power spectrum.

DTIC

Digital Systems; Matrices (Mathematics); Optimization; Tomography; Transfer Functions

20070037520 California Univ., San Diego, La Jolla, CA USA

Topology and Foundations of Quantum Algorithms

Meyer, David; Jul 1, 2005; 9 pp.; In English

Contract(s)/Grant(s): DAAD19-01-1-0520

Report No.(s): AD-A471140; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471140>

This project developed new results in the topology and foundations of quantum algorithms. It made major developments in the program for topological quantum field computation, including the design of substantially simplified lattice models with topological phases, and new insights into the universality classes of such models. Lattice gas simulations of various classical and quantum systems were investigated. In addition, several new algorithms for structured search, concept learning, and image processing were discovered.

DTIC

Algorithms; Quantum Theory; Topology

20070037528 Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany

The Issue of Robustness in the Acquisition of Relocatable Targets - An Overview

Schimpf, Hartmut; May 1, 2005; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471157; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471157>

No abstract available

Algorithms; Robustness (Mathematics); Targets

20070037728 Massachusetts Inst. of Tech., Cambridge, MA USA

MPC for Large-Scale Systems via Model Reduction and Multiparametric Quadratic Programming

Hovland, S; Willcox, K; Gravdahl, J T; Dec 2006; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-06-1-0271

Report No.(s): AD-A471269; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper we present a methodology for achieving real-time control of systems modeled by partial differential equations. The methodology uses the explicit solution of the model predictive control (MPC) problem combined with model reduction. The explicit solution of the MPC problem leads to online MPC functionality without having to solve an optimization problem at each time step. Reduced-order models are derived using a goal-oriented, model-based optimization formulation that yields efficient models tailored to the application at hand. The approach is demonstrated for reduced-order output feedback control of a large-scale linear time invariant state space model of the discretized heat equation.

DTIC

Control; Partial Differential Equations; Predictions; Quadratic Programming; Real Time Operation

20070037733 Naval Research Lab., Bay Saint Louis, MS USA

Bounded Elliptical Modes

Smith, George B; Aug 7, 2007; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471286; NRL/MR/7183--07-9062; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Pekeris waveguide is used to derive an estimation technique for radial wavenumbers for the modal structure of an acoustic field in a given environment. While these estimates are inadequate for coherent processing (such as matched field processing), they are nonetheless useful since they are adequate for waveguide invariant calculations and for environmental province boundary calculations.

DTIC

Acoustics; Ellipses; Wave Propagation

20070037757 Naval Postgraduate School, Monterey, CA USA

Masking a Compact AES S-box

Canright, David; Aug 7, 2007; 25 pp.; In English

Report No.(s): AD-A471345; NPS-MA-07-002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

When the Advanced Encryption Standard (AES) is implemented in hardware or software, it may be vulnerable to side-channel attacks such as differential power analysis. One countermeasure against such attacks is adding a random mask to the data; this randomizes the statistics of the calculation at the cost of computing mask corrections. The single nonlinear step in each round of the AES algorithm is called the S-box, which involves the greatest computational cost in a round (to find the inverse in the Galois field), as well as the greatest cost for mask corrections. Oswald et al.[9] showed how the tower field representation allows maintaining an additive mask throughout the Galois inverse calculation. This work combines that masking approach with the compact S-box of Canright, to give a masked Sbox that requires minimal circuitry, and hence the chip area.

DTIC

Algorithms; Coding; Cryptography; Masking

20070037824 Carnegie-Mellon Univ., Pittsburgh, PA USA

Computational Analysis of Merchant Marine GPS Data

Davis, George B; Carley, Kathleen M; Nov 2006; 23 pp.; In English

Contract(s)/Grant(s): N00014-02-1-0973

Report No.(s): AD-A471469; CMU-ISRI-07-109; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A series of quantitative and structural analyses are applied to geospatial data regarding the movement of Merchant Marine vessels in the English Channel. CASOS has been tasked with developing new computational techniques for analyzing data about Merchant Marine behavior under a Social Network Analysis framework. In this paper we describe an experiment doing so for geospatial data from AIS transponders in 1700+ Merchant Marine vessels during exercise in the English Channel. Our analysis has three phases: Spatial clustering algorithms are used to detect places of interest and relationships between entities the data. Extracted relational information is analyzed in network form. A suite of network analytic measures are applied to find patterns on the network and individual node levels. We apply an intervention analysis which models an intervention (surveying ships at ports) and suggests a strategy for allocating surveillance. The analysis framework is unusual in taking a relational perspective to spatial data, and novel in its principled treatment of the relationship between spatial, two mode, and one mode network representations of data, and in its approach to proposing intervention strategy.

DTIC

Analysis (Mathematics); Global Positioning System; Industries

20070037904 University of Southern California, Los Angeles, CA USA

Classification of Modes in Suspended-Membrane, 19-Missing-Hole Photonic-crystal Microcavities

Kuang, Wan; Cao, Jiang R; Yang, Tian; Choi, Sang-Jun; Lee, Po-Tsung; O'Brien, John D; Dapkus, P D; Jun 1, 2005; 9 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0403; ECS-0094020

Report No.(s): AD-A471604; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Suspended-membrane 19-missing-hole microcavities in triangular lattice photonic crystals are numerically modeled by a three-dimensional finite-difference time-domain method. The resonance frequencies and the quality factors are calculated by

interpolation of the discrete Fourier transformation series of the field with a Pad polynomial. The numerical results are compared with the photoluminescent spectra measured on the cavity of a nearly identical dimension. The symmetry properties of the defect modes are analyzed with the group theory, and resonance modes in the photonic-crystal cavities are identified as irreducible representations of the C_{6v} point group. The far-field radiations of the identified modes in the free space are also calculated by use of a vector Green's function. It is found that the numerical results agree very well with the experimental measurement in various aspects.

DTIC

Classifications; Crystals; Discrete Functions; Finite Difference Theory; Fourier Transformation; Membranes

20070038103 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

An Artificial Immune System-Inspired Multiobjective Evolutionary Algorithm with Application to the Detection of Distributed Computer Network Intrusions

Haag, Charles R; Mar 2007; 224 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471537; AFIT/GCS/ENG/07-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Today's predominantly-employed signature-based intrusion detection systems are reactive in nature and storage-limited. Their operation depends upon catching an instance of an intrusion or virus after a potentially successful attack, performing post-mortem analysis on that instance and encoding it into a signature that is stored in its anomaly database. The time required to perform these tasks provides a window of vulnerability to DoD computer systems. Further, because of the current maximum size of an Internet Protocol-based message, the database would have to be able to maintain 256 (to the power of 65535) possible signature combinations. In order to tighten this response cycle within storage constraints, this thesis presents an Artificial Immune System-inspired Multiobjective Evolutionary Algorithm intended to measure the vector of trade-off solutions among detectors with regard to two independent objectives: best classification fitness and optimal hypervolume size. Modeled in the spirit of the human biological immune system and intended to augment DoD network defense systems, our algorithm generates network traffic detectors that are dispersed throughout the network. These detectors promiscuously monitor network traffic for exact and variant abnormal system events, based on only the detector's own data structure and the ID domain truth set, and respond heuristically. The application domain employed for testing was the MIT-DARPA 1999 intrusion detection data set, composed of 7.2 million packets of notional Air Force Base network traffic. Results show our proof-of-concept algorithm correctly classifies at best 86.48% of the normal and 99.9% of the abnormal events, attributed to a detector affinity threshold typically between 39-44%. Further, four of the 16 intrusion sequences were classified with a 0% false positive rate.

DTIC

Algorithms; Bionics; Computer Networks; Immune Systems; Intrusion

20070038393 Massachusetts Inst. of Tech., Cambridge, MA USA

Multigrid Solution for High-Order Discontinuous Galerkin Discretizations of the Compressible Navier-Stokes Equations

Oliver, Todd A; Aug 2004; 75 pp.; In English

Report No.(s): AD-A471640; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471640>

A high-order discontinuous Galerkin finite element discretization and p-multigrid solution procedure for the compressible Navier-Stokes equations are presented. The discretization has an element-compact stencil such that only elements sharing a face are coupled, regardless of the solution space. This limited coupling maximizes the effectiveness of the p-multigrid solver, which relies on an element-line Jacobi smoother. The element-line Jacobi smoother solves implicitly on lines of elements formed based on the coupling between elements in a $p = 0$ discretization of the scalar transport equation. Fourier analysis of 2-D scalar convection-diffusion shows that the element-line Jacobi smoother as well as the simpler element Jacobi smoother are stable independent of p and flow condition. Mesh refinement studies for simple problems with analytic solutions demonstrate that the discretization achieves optimal order of accuracy of $O(h^{p+1})$. A subsonic, airfoil test case shows that the multigrid convergence rate is independent of p but weakly dependent on h . Finally, higher-order is shown to outperform grid refinement in terms of the time required to reach a desired accuracy level.

DTIC

Fourier Analysis; Galerkin Method; Navier-Stokes Equation; Partial Differential Equations

20070038414 Forschungsgesellschaft fuer Angewandte Naturwissenschaften e.V, Wachtberg-Werthhoven, Germany

A Comparison between Modeled and Measured ZSU 23-4 at 35 GHz

Bicker, Tanja; van den Broek, Bert; Schimpf, Hartmut; May 1, 2005; 38 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471689; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471689>

No abstract available

Algorithms; Measurement; Target Recognition; Targets

20070038420 Naval Undersea Warfare Center, Newport, RI USA

Deployable Air Beam Fender System (DAFS): Energy Absorption Performance Analysis

Cavallaro, Paul V; Mar 30, 2007; 48 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471699; NUWC-NPT-TR-11; 799; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471699>

Performance curves detailing the energy absorption parameters of selectively sized deployable air beam fender systems (DAFSs) were established to enable future efficiencies in fender design. Numerical solutions were generated using the ABAQUS/Explicit Finite Element Analysis (FEA) Program for two mooring configurations: ship-to-ship and ship-to-causeway (non-ballasted). The governing energy balance was presented and the contributions of strain energy and air compressibility were assessed for various inflation pressures and DAFS sizes. The applicability and limitations of analytical methods based on assumptions of material inextensibility were also discussed. Comparisons were made between the numerical and analytical methods to demonstrate the importance of admitting strain energies of the fender material in the energy balance. Equations and conditions for proper scaling of pressure and volume terms in energy absorption calculations were developed and discussed.

DTIC

Energy Absorption; Finite Element Method; Reliability Analysis; Seas

20070038471 Yale Univ., New Haven, CT USA

A Fast Randomized Algorithm for the Approximation of Matrices

Woolfe, Franco; Liberty, Edo; Rokhlin, Vladimir; Tygert, Mark; Jul 31, 2007; 43 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0197; FA9550-06-1-0239

Report No.(s): AD-A471819; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471819>

We introduce a randomized procedure that, given an $m \times n$ matrix A and a positive integer k , approximates A with a matrix Z of rank k . The algorithm relies on applying a structured $l \times m$ random matrix R to each column of A , where l is an integer near to, but greater than, k . The structure of R allows us to apply it to an arbitrary $m \times 1$ vector at a cost proportional to $m \log l$; the resulting procedure can construct a rank- k approximation Z from the entries of A at a cost proportional to $mn \log k + l^2 m + n$. We prove several bounds on the accuracy of the algorithm; one such bound guarantees that the spectral norm $\|kA - Zk\|$ of the discrepancy between A and Z is of the same order as $\max\{m, n\}$ times the $(k+1)$ 'st greatest singular value $k+1$ of A , with small probability of large deviations. In contrast, the classical pivoted QR decomposition algorithms 'such as Gram-Schmidt or Householder' require at least kmn floating-point operations in order to compute a similarly accurate rank- k approximation. In practice, the algorithm of this paper is faster than the classical algorithms, as long as k is neither very small nor very large. Furthermore, the algorithm operates reliably independently of the structure of the matrix A , can access each column of A independently and at most twice, and parallelizes naturally. The results are illustrated via several numerical examples.

DTIC

Algorithms; Approximation; Matrices (Mathematics); Random Variables

20070038585 Wyoming Univ., Laramie, WY USA

Efficient High-Order Accurate Methods using Unstructured Grids for Hydrodynamics and Acoustics

Mavriplis, Dimitri J; Stanescu, Dan; Aug 31, 2007; 49 pp.; In English

Contract(s)/Grant(s): N00014-04-1-0602

Report No.(s): AD-A471844; DODONR44500EXT; DODONR44500USL; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this project has been the development of high-order accurate simulation techniques for fluid flow

problems of interest to the US Navy, such as hydrodynamics and acoustics. Efficient solution techniques for high-order Discontinuous Galerkin methods have been investigated from both a theoretical and practical standpoint. An h-p multigrid solution strategy which delivers optimal convergence rates which are independent of both the order of accuracy p of the discretization, and the resolution h of the mesh has been developed and demonstrated on steady and unsteady problems, showing good efficiency and parallel scalability using up to 2000 processors. Sensitivity analysis techniques-based on the solution of the adjoint problem have also been developed, and used to drive h and p adaptive refinement techniques for increasing accuracy at optimal cost. Future work will concentrate on extending these techniques to three dimensional Reynolds-averaged Navier-Stokes (RANS) simulations and large eddy simulations LES for important flows of Naval interest.

DTIC

Acoustics; Computational Fluid Dynamics; Computerized Simulation; Hydrodynamics; Unstructured Grids (Mathematics)

20070038587 Yale Univ., New Haven, CT USA

A New Class of Analysis-Based Fast Transforms

O'Neil, Michael; Rokhlin, Vladimir; Aug 6, 2007; 59 pp.; In English

Contract(s)/Grant(s): N00014-07-1-0711; FA9550-06-1-0197

Report No.(s): AD-A471850; YALEU/DCS/TR-1384; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We introduce a new approach to the rapid numerical application to arbitrary vectors of certain types of linear operators. Inter alia, our scheme is applicable to many classical integral transforms, and to the expansions associated with most families of classical special functions; among the latter are Bessel functions, Legendre, Hermite, and Laguerre polynomials, Spherical Harmonics, Prolate Spheroidal Wave functions, and a number of others. In all these cases, the CPU time requirements of our algorithm are of the order $O(n \log n)$, where n is the size of the matrix to be applied. The performance of our algorithm is illustrated via a number of numerical examples.

DTIC

Integral Transformations; Transformations (Mathematics)

20070038588 Yale Univ., New Haven, CT USA

Fast Dimension Reduction Using Rademacher Series on Dual BCH Codes

Ailon, Nir; Liberty, Edo; Jul 2007; 17 pp.; In English

Report No.(s): AD-A471857; YALEU/DCS/TR-1385; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ABSTRACT: The Fast Johnson-Lindenstrauss Transform (FJLT) was recently discovered by Ailon and Chazelle as a novel technique for performing fast dimension reduction with small distortion.... The connection between geometry and discrete coding theory discussed here is interesting in its own right and may be useful in other algorithmic applications as well. INTRODUCTION: Applying random matrices is by now a well known technique for reducing dimensionality of vectors in Euclidean space while preserving certain properties (most notably distance information). Beginning with the classic work of Johnson and Lindenstrauss who used projections onto random subspaces, other variants of the technique using different distributions are known and have been used in many algorithms.

DTIC

BCH Codes; Error Correcting Codes

20070038600 Michigan Univ., Ann Arbor, MI USA

A Grid-Free Particle Method for Electrostatic Plasma Simulations

Krasny, Robert; Aug 27, 2007; 10 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0529

Report No.(s): AD-A471878; MU-F016052; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This grant provided support for a postdoc at the University of Michigan to assist in developing a grid-free particle method for electrostatic plasma simulations. The aim of the work is to substantially improve the accuracy and efficiency of these simulations. The proposed method is an alternative to traditional mesh-based methods such as particle-in-cell (PIC). In the new approach, the standard Eulerian formulation of the Vlasov-Poisson equation is replaced by a Lagrangian formulation in which the charge flow map is the key unknown quantity. Discretizing the Lagrangian formulation leads to a grid-free particle method. The investigators made progress in formulating and testing this approach. Numerical results are presented for the cold one-stream and two-stream instabilities. The method is especially well suited for tracking charge transport and resolving fine structures in phase space.

DTIC

Electrostatics; Energy Conservation; Plasmas (Physics); Simulation

20070038603 Massachusetts Inst. of Tech., Cambridge, MA USA

Wave Propagation in Finite Element and Mass-Spring-Dashpot Lattice Models

Holt-Phoenix, Marianne S; Jun 1, 2006; 64 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62271-97-G-0026

Report No.(s): AD-A471882; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Numerical efficiency comparisons of a four-node finite element model (FEM), a mass-spring lattice model (MSLM), and a mass-spring-dashpot lattice model (MSDLM) are investigated. Specifically, the error in the ultrasonic phase speed with variations in Poisson's ratio and angle of incidence is evaluated in each model of an isotropic elastic solid. With regard to phase speed, materials with constant N grid spaces per P-wavelength having Poisson's ratios between 0.0 and 0.25 are modeled more accurately with the MSLM. Materials with Poisson's ratios between 0.35 and 0.5 and N grid spaces per P-wavelength are more accurately modeled with the FEM. Materials whose Poisson's ratio is between 0.25 and 0.35 are modeled equally accurately. With regard to phase speed, viscoelastic materials modeled with FEM and MSDLM show good agreement with known analytical solutions. The computational expense of all three models is also examined. The number of floating point operations (FLOPS) needed to achieve a specified phase speed accuracy is calculated for each different model. While the FEM and MSLM have nearly the same computation cost, the MSDLM is 5 times more costly than either the FEM or MSLM.

DTIC

Finite Element Method; Numerical Analysis; Wave Propagation

20070038604 California Univ., Los Angeles, CA USA

Simulated Groundwater Tracer Study of the Alamitos Barrier Project, Los Angeles, California

Pope, Joseph C; Jan 2006; 38 pp.; In English

Report No.(s): AD-A471884; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A simulated tracer study is performed on the Alamitos Groundwater Barrier Project (ABP), Los Angeles, California. The ABP consists of 43 injection wells that create a freshwater barrier to prevent intrusion of seawater into the coastal aquifer of southern Los Angeles County. The injection wells currently use a blend of recycled and imported water. Regional water quality regulations dictate the quantity of recycled water that can be injected into the aquifer. The regulations also require that the travel-time between the injection wells and the local production wells be greater than one year. The purpose of this study is to analyze the travel time of injected water into the ABP. A previously calibrated three-dimensional, finite element, coupled groundwater flow and transport model is used to simulate the movement of a conservative tracer in the Alamitos Barrier Project. The results of the simulations show that tracer travel times between the injection wells and the production wells typically exceed 60 years. The model results exhibit a high amount of numerical error when large time steps are used. Time-step sensitivity analysis indicates that a time step of one day or less will minimize model error. Further analysis of local head boundary conditions is recommended in order to provide a wider range of tracer travel times given variations in boundary hydraulic head levels.

DTIC

Aquifers; Ground Water; Sensitivity Analysis; Simulation

65

STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20070037530 QinetiQ Ltd., Worcestershire, UK

Assessment of a Bayesian Approach to Recognising Relocatable Targets

Lane, Richard O; Copsey, Keith D; Webb, Andrew R; May 1, 2005; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471159; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471159>

No abstract available

Bayes Theorem; Homing Devices; Radar Targets; Recognition; Synthetic Aperture Radar; Target Recognition; Targets

20070037749 NorthWest Research Associates, Inc., Bellevue, WA USA

Simulations and Data Analysis for Air Force Optical Turbulence Forecasting Applications

Werne, Joseph; Fritts, David; Lund, Thomas; May 22, 2007; 70 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-02-C-0037; Proj-1010

Report No.(s): AD-A471328; NWRA-CORA-07-R360; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We completed a series of Direct-Numerical and Large-Eddy Simulations (DNS and LES) of wind-shear instability and gravity wave breaking and associated analysis to characterize atmospheric turbulence and its optical impacts. We also analyzed hundreds of rawinsonde profiles to determine the parameters associated with turbulence layers observed in the troposphere and stratosphere. Finally, we developed a Bayesian Hierarchical Modeling (BHM) framework for combining the simulation and observational results so that atmospheric turbulence and optical turbulence atmospheric decision aids can be developed and improved. These results can also be used to develop subgrid-scale turbulence and optical turbulence parameterizations for operational mesoscale Numerical Weather Prediction models, e.g., the Weather Research and Forecasting Model (WRF).

DTIC

Atmospheric Circulation; Forecasting; Large Eddy Simulation; Simulation; Turbulence

20070037778 Naval Postgraduate School, Monterey, CA USA

Historical Review of Cost Performance Index Stability

Mitchell, Robby J; Jun 2007; 89 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471384; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The focus of this study is to determine when the cumulative Cost Performance Index (CPIcum) stabilizes for different contract characteristics. The CPI is the relationship between the budgeted costs for work performed divided by the actual costs of work performed. Once the CPIcum stabilizes, program managers and analyst are able to use this index as a predictor in estimating the final cost of the contract. The range method and the narrowing interval method were used to test for CPIcum stability at the 50% complete point. For the range method, stability was declared if the range, which is the maximum CPIcum value minus the minimum CPIcum value over a specified interval, was less than or equal to .20. The results for the range method indicated that the CPIcum was stable at the 50% complete point. Further analysis showed that the CPIcum was stable as early as the 10% to 20% complete point. For the narrowing interval method, stability was declared when the variance of the CPIcum is less than or equal to plus or minus .10 over a specified percent complete interval. The results for this method indicated that the CPIcum could only be declared stable from the 50% complete point.

DTIC

Cost Analysis; Costs; Histories; Stability

20070037781 Nottingham Univ., UK

Current and Historical Sediment Loads in the Lower Mississippi River

Thorne, Colin; Harmar, Oliver; Wason, Chester; Clifford, Nick; Measures, Richard; Biedenharn, David; Aug 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62558-07-C-0004; 1106-EN-01; Proj-1526

Report No.(s): AD-A471387; TR-1526-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Questions concerning past, present and future temporal trends in the sediment load of the Lower Mississippi River are relevant to the redistribution of available Mississippi River sediment as part of efforts to reduce loss and restore coastal lands in Louisiana. The aim of this project is to compile a comprehensive data base on measured loads in the Lower Mississippi River and supply the evidence base necessary to inform debate on the way that sediment loads have changed through time. Results from this research will then inform plans to divert water and sediment out of the river to support coastal wetland enhancement and rehabilitation in the delta.

DTIC

Histories; Loads (Forces); Mississippi River (US); Sediment Transport; Sediments; Statistical Analysis

20070037783 Naval Postgraduate School, Monterey, CA USA

Optimal Randomized Surveillance Patterns to Detect Intruders Approaching a Military Installation

McLemore, Trevor D; Jun 2007; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471394; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis addresses a two-person, zero-sum game between an intruder and a defender of a military installation. The

intruder attempts to penetrate the military installation by choosing one of its many entry points, each of which is monitored by a surveillance camera and may require a different amount of time to transit. Although the real-time video of each surveillance camera is fed to a surveillance room simultaneously, the defender has only one surveillance monitor and can monitor only one entry point at a time. The author considers a discrete-time model such that the intruder will be detected if, during his travel time, the defender spends one time unit monitoring the entry point chosen by the intruder. The problem facing the defender is how to switch among entry points to monitor from one time unit to the next to maximize the detection probability of the intruder. The intruder's goal is, of course, to infiltrate without being detected, and so he wishes to minimize this probability. The author formulates the problem as a two-person, zero-sum game, and develops a linear program to solve it. Numerical experiments provide insights into the design of such surveillance systems.

DTIC

Cameras; Detection; Installing; Optimization; Probability Theory; Security; Surveillance; Switching; Warning Systems

20070037787 Universiteit Twente, Enschede, Netherlands

Importance Sampling for Characterizing STAP Detectors

Srinivasan, Rajan; Rangaswamy, Muralidhar; Jan 2007; 15 pp.; In English

Contract(s)/Grant(s): FA8655-04-1-3059; Proj-2311

Report No.(s): AD-A471402; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes the development of adaptive importance sampling (IS) techniques for estimating false alarm probabilities of detectors that use space-time adaptive processing (STAP) algorithms. Fast simulation using IS methods has been notably successful in the study of conventional constant false alarm rate (CFAR) radar detectors, and in several other applications. The principal objectives here are to examine the viability of using these methods for STAP detectors, develop them into powerful analysis and design algorithms and, in the long term, use them for synthesizing novel detection structures. The adaptive matched filter (AMF) detector has been analyzed successfully using fast simulation. Of two biasing methods considered, one is implemented and shown to yield good results. The important problem of detector threshold determination is also addressed, with matching outcome. As an illustration of the power of these methods, two variants of the square-law AMF detector that are thought to be robust under heterogeneous clutter conditions have also been successfully investigated. These are the envelope-law and geometric-mean STAP detectors. Their CFAR property is established and performance evaluated. It turns out the variants have detection performances better than those of the AFF detector for training data contaminated by interferers.

DTIC

Adaptation; Detectors; Sampling; Signal Processing; Space-Time Adaptive Processing

20070037797 Pisa Univ., Italy

Statistical Analysis of Measured Polarimetric Clutter Data at Different Range Resolutions

Greco, Maria; Gini, Fulvio; Rangaswamy, Muralidhar; Dec 2006; 11 pp.; In English

Contract(s)/Grant(s): FA8655-04-1-3059; Proj-2311

Report No.(s): AD-A471423; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper deals with the statistical modelling of radar backscattering from sea surface at low-grazing angles in high resolution radar systems. High-Resolution polarimetric data at different range resolutions (60, 30, 15, 9, and 3m) are analyzed to highlight the differences in clutter statistical behavior due to changes of resolution and/or polarization. The clutter data were recorded by the IPIX radar of McMaster University in Grimsby, Ontario Canada.

DTIC

Backscattering; Clutter; Mathematical Models; Polarimetry; Seas; Statistical Analysis

20070038408 Defence Science and Technology Organisation, Edinburgh, Australia

Using Bayesian Network Analysis to Support Operational Planning

Falzon, Lucia; Priest, Jayson; de Poel, Melissa; Jul 2003; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471668; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471668>

PRESENTATION PLAN: (1) Current ADF Ops planning * Where does the Centre of Gravity (COG) concept fit in? (2) Bayesian net representation of COG analysis (3) The COG Network Effects Tool (COGNET) * Generic models database *

Impact analysis tool * Model population * Model checking * Compiling large and complex COG networks.
DTIC

Bayes Theorem; Network Analysis; Operational Problems; Planning; System Effectiveness

20070038473 Library of Congress, Washington, DC USA

USA Military Casualty Statistics: Operation Iraqi Freedom and Operation Enduring Freedom

Fischer, Hannah; Aug 17, 2007; 7 pp.; In English

Report No.(s): AD-A471825; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471825>

This report presents difficult-to-find statistics regarding U.S. military casualties in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF, Afghanistan), including those concerning medical evacuations, amputations, and the demographics of casualties. Some of these statistics are publically available at the Department of Defense's (DOD's) website, while others have been obtained through contact with experts a DOD. Daily updates of total U.S. military casualties in OIF and OEF can found at the DOD's website.

DTIC

Casualties; Military Operations; Military Personnel; United States

20070038623 Colorado Univ., Denver, CO USA

Models for Serially Correlated Over or Underdispersed Unequally Spaced Longitudinal Count Data with Applications to Asthma Inhaler Use

Bruce, Stephanie L; Aug 2007; 77 pp.; In English

Report No.(s): AD-A471917; UC-SOM-CI07-0065; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research focuses on longitudinal count data methods that do not conform to the well-behaved properties of normality. Potential complications that can arise with longitudinal count data are serial correlation, subject heterogeneity, underdispersion (or overdispersion), and unequally spaced or missing data. Many of the current models in the literature address one or two of the potential complications, but currently there is not a model that addresses all of the complications listed previously, so our goal, given enough data, was to develop a model capable of accommodating all the listed complications. We applied this model to a National Jewish Medical and Research Center study of asthma inhaler use in asthmatic children during school. Using a likelihood based approach, the data were clearly underdispersed relative to the Poisson distribution so a generalized Poisson process was used. Physical activity was the most influential independent variable resulting in a decrease of inhaler usage when the children did not participate in gym class.

DTIC

Asthma; Mathematical Models

20070038871 Defence Science and Technology Organisation, Edinburgh, Australia

Playing Abstract Games with Hidden States (Spatial and Non-Spatial)

Calbert, Gregory; Kwok, Hing-Wah; Smet, Peter; Scholz, Jason; Webb, Michael; Jul 2003; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471681; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471681>

OUTLINE: * Our domain of research * The mathematics of strategically complex game playing - Move evaluation - Min/max depth search - temporal difference learning. * Application to our network checkers game * the HARD PROBLEM: hidden spatial states - Information theoretic advisors - Combine with TD(O) - Open research questions.

DTIC

Armed Forces (United States); Combat; Game Theory; Games

20070038875 Army Engineer Research and Development Center, Vicksburg, MS USA

Camp Humphreys, Korea, Groundwater Assessment

Harrelson, Danny W; Zakikhani, Mansour; Waterbury, Mathew J; Sep 2007; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471650; ERDC-TR-07-8; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471650>

This study was conducted to (a) determine the current groundwater production capacity using the pumping data from 21

production wells; (b) estimate potential recharge from rainfall and surface water sources; (c) determine total groundwater availability using precipitation and soil data, and predict the future water use assuming a potential increase of camp population from 7,500 to 40,000; and (d) estimate water availability in a land zone adjacent to the Camp Humphreys area. Several modeling approaches were evaluated for the preliminary calculation of water budget at the site. Among these approaches, the Hydrologic Evaluation of Landfill Performance computer program suited the limited hydrogeological data that were available for the site. The recharged and stored water in the subsurface of the existing Camp Humphreys appears to be adequate for the current camp population usage. This assessment's model conditions predicted a potential recharge of nearly 4 billion gallons per year to the aquifer beneath land adjacent to the west side of Camp Humphreys and terminating at the Anseong River. If all of this aquifer recharge were available for withdrawal, it would meet future population needs for the expansion of Camp Humphreys (assuming a population of 40,000). However, the actual availability of this estimated aquifer recharge to new supply wells constructed in the adjacent land will depend highly on the density and hydrogeologic characteristics of bedrock fracturing, overlying soil and land use conditions, and groundwater quality conditions.

DTIC

Ground Water; Korea; Water Quality

66

SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20070037502 Lockheed Martin Aeronautics Co., Fort Worth, TX USA

Pulsed Injection Flow Control for Throttling in Supersonic Nozzles - A Computational Fluid Dynamics Design Study (Preprint)

Baruzzini, Dan; Domel, Neal D; Miller, Daniel N; May 14, 2007; 16 pp.; In English

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

Report No.(s): AD-A471114; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471114>

A vehicle propelled by an engine with a variable geometry nozzle allows the nozzle expansion ratio to vary with altitude and flight condition, thereby optimizing engine performance. Active flow control offers a method of providing the functionality of a variable throat area system without requiring variable geometry. Throttling the mass flow rate through the nozzle throat controls the effective throat area, subsequently controlling the effective expansion ratio of the overall nozzle. This paper presents findings from the Pulsed Injection for Rocket Flow Control Technology (PIRFCT) program, which evaluated potential gains in the overall performance of a rocket using active flow control to optimize nozzle expansion ratio for an Earth to orbit mission. Lockheed Martin Aeronautics Company utilized Computational Fluid Dynamics (CFD) to simulate the rocket nozzle with active flow control. Simulations were performed with steady and pulsed flow control jets which were oriented near the geometric throat and inclined upstream against the primary flow. A low stagnation pressure, steady, tertiary injection stream when combined with a steady, high momentum secondary injector was witnessed to increase throttling performance beyond that of a secondary injector alone. Nozzle discharge coefficient was largely unaffected by changes in pulsation frequency or pulsation duty cycle. Pulsed injection approached, but did not exceed, the throttling performance of a time invariant injector when compared on a equivalent mass flux, momentum flux, and energy flux basis. Simulations incorporating a single injector and large area modulations predicted a 50% area reduction when injecting approximately 18% baseline reference mass flow at Mach 2 conditions. However, the PIRFCT program concluded that secondary injection at the nozzle throat is not a good candidate for this type of throttling/altitude compensation technology for an Earth to orbit mission.

DTIC

Computational Fluid Dynamics; Gas Turbines; Injection; Nozzle Flow; Nozzles; Supersonic Nozzles; Throttling

20070037515 Soumekh (Mehrdad), Amherst, NY USA

Adaptive Processing of SAR Data for ATR

Soumekh, Mehrdad; May 1, 2005; 59 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471128; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471128>

No abstract available

Adaptation; Slopes; Synthetic Aperture Radar; Target Recognition

20070037544 Army Research Lab., Aberdeen Proving Ground, MD USA

GPUs: An Emerging Platform for General-Purpose Computation

Boggan, Sha'Kia; Pressel, Daniel M; Aug 2007; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-7UH7

Report No.(s): AD-A471188; ARL-SR-154; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471188>

The affordability and computational power of GPUs have made them the focus of an emerging area of research designed to explore their performance for general-purpose computation. GPGPU, as this area of research is called, involves the exploration of the computational power of programmable GPUs and their suitability for non-graphics applications through algorithm and software development. Although there are some challenges with using these specialized devices for numerous applications, their attributes and significant speedup for some applications continue to make them an attractive platform for research.

DTIC

Computation; Computer Programming; Computer Techniques; Graphs (Charts); Software Engineering

20070037560 Oregon State Univ., Corvallis, OR USA

Recovery from Interruptions: Knowledge Workers' Strategies, Failures and Envisioned Solutions

Stumpf, Simone; Burnett, Margaret; Dietterich, Thomas G; Johnsrude, Kevin; Herlocker, Jonathan; Oct 3, 2005; 5 pp.; In English

Contract(s)/Grant(s): 55-000656; IIS-0133994

Report No.(s): AD-A471248; CS05-10-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471248>

This paper presents qualitative results from interviews with knowledge workers about their recovery strategies after interruptions. Special focus is given to when these strategies fail due to the nature of the interruption and existing computer support. Potential solutions offered by participants to overcome some of these problems are presented. These findings will benefit researchers and designers in the area of task-centric applications, especially in the area of support for recovery from interruptions.

DTIC

Failure; Interruption; Personnel

20070037891 Carnegie-Mellon Univ., Pittsburgh, PA USA

Advanced Risk Analysis for High-Performing Organizations

Alberts, Christopher; Dorofee, Audrey; Jan 2006; 38 pp.; In English

Report No.(s): AD-A471587; No Copyright; Avail.: Defense Technical Information Center (DTIC)

CONCLUSIONS: Many types of risk prevalent in today's operational environments (e.g., event risks, inherited risk) are not readily identified using traditional risk analysis techniques. High-performing organizations have the basic skills needed to identify and manage these new types of risk, but lack sufficient techniques. Average or poor performers will not have the skills needed to identify and manage new types of risk (and probably have bigger, more obvious risks to deal with). MAAP is one technique that high performers can use to identify and mitigate the risks arising from operational complexity.

DTIC

Organizations; Protocol (Computers); Risk

20070037893 Army Engineer Research and Development Center, Vicksburg, MS USA

Modeling Nearshore Waves for Hurricane Katrina

Smith, Jane M; Aug 2007; 15 pp.; In English

Report No.(s): AD-A471589; ERDC-TN-SWWRP-07-6; ERDC/CHL-CHETN-1-76; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Modeling of nearshore waves under extreme events presents challenges, including the interaction of waves with storm surge, wave generation by complex wind files, and wave dissipation in wetlands. The purpose of this technical note is to demonstrate the application of the Steady-State Spectral Wave model STWAVE for modeling nearshore waves during Hurricane Katrina. STWAVE is under development in the System-Wide Water Resources Program (SWWRP).

DTIC

Beaches; Hurricanes; Mathematical Models; Ocean Surface; Water Waves

20070038396 Defence Science and Technology Organization, Australia

Development of a Postgraduate Program in Defence Operations Research

Wood, David; Lokan, Chris; Oct 1, 2003; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471647; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471647>

Briefing on the joint development (between DSTO and UNSW at ADFA) of a postgraduate program in Defence Operations Research.

DTIC

Military Operations; Operations Research

20070038398 Defence Science and Technology Organisation, Edinburgh, Australia

An Approach to Modelling the Effects of Network Centricity in Maritime Warfare

Fewell, Matthew; Grivell, Ian; Oct 1, 2003; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471652; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471652>

Partial context: TTCP MAR AG-1 Quantitative modelling of NCW, Outline, TACSITS and hypotheses, Maritime interception a coastline of recent interest, Platform-Centric Case Interceptors have an area of responsibility, Queueing Systems describe demand for service, MIO attributes \Leftrightarrow queueing-theory quantities, Parameters and outputs, Networking Enables Adaptive Redeployment, Effect of adaptive redeployment, Effect of increased classification performance, Summary so far, Two-stage analysis (from Chris Davis), Notional network architecture (from Meredith Hue), Medium Level of Networked Capability, Proposed stage-2 analysis a simulation, Participants in the Auckland Workshop, MIF Commander's flow chart a first attempt, Application to anti-submarine warfare, ASW classification attributes \Leftrightarrow QT quantities, Effect of improved shared situational awareness, Range of service-time distributions explored, Effect on probability of acquiring service, The equations of queueing theory.

DTIC

Antisubmarine Warfare; Mathematical Models; Warfare

20070038399 Defence Science and Technology Organisation, Edgecliff, Australia

A Dynamic Conceptual Model to Explore Technology-Based Perturbations to a Complex System: The Land Force

Curtis, Neville J; Dortmans, Peter J; Oct 1, 2003; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471653; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471653>

Outline: The problem of trying to enhance a complex system like the Land Force with technology. A conceptual model of the Land Force and technological change. A means of gaining semiquantitative insights. Application examples: Which items are more important for technology insertion? What broad areas of research should we undertake? For a specific technology, what strategy should we adopt?

DTIC

Dynamic Models; Models; Perturbation; Technology Assessment

20070038401 Defence Science and Technology Organisation, Edgecliff, Australia

Robustness of Communication Networks in Complex Environments - A Simulations using Agent-based Modelling

Forsyth, Adam; Fry, Ash; Oct 1, 2003; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471655; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471655>

Briefing on agent-based simulation of the robustness of communication networks in complex environments.

DTIC

Communication Networks; Computerized Simulation; Robustness (Mathematics); Simulation

20070038404 New Zealand Defence Force, Wellington, New Zealand

Fractal Approaches to Combat Modelling

Lauren, Michael; Oct 1, 2003; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471662; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471662>

Hypothesis: * Assume combat is a self-organising system * Further assume combat data can be characterised in terms of

fractal dimensions * Then, fractal dimension of combat data can be related the attrition function
DTIC

Combat; Fractals; Mathematical Models; Warfare

20070038405 Defence Science and Technology Organisation, Edgecliff, Australia

A Multi-Dimensional Operations Research Approach to Investigate Future Technology Innovation, Integration and Vulnerabilities

Boswell, Sharon; Curtis, Neville; Dortmans, Peter; Tri, Niem; Jul 2003; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471663; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471663>

OVERVIEW: Aim of the study is to support Future Land Warfare Branch of Army HQ in studies of the effects and implications of future technologies. Our inputs and tools are: * Army as a System (AAAS) descriptors of warfare * Agent Based Distillations (ABD) * Field Anomaly Relaxation (FAR) to identify inconsistencies * Historical analysis to identify success factors.

DTIC

Military Operations; Operations Research; Technology Assessment; Vulnerability; Warfare

20070038407 Defence Science and Technology Organisation, Edgecliff, Australia

Measures of Merit for Command and Control in the Context of Network Centric Warfare

Yue, Yi; Filar, Jerzy A; Wu, Ming-Lu; Jul 2003; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471665; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471665>

CONTENTS: * Background * Measures of Merit (MoMs) frameworks * C2 MoMs in the NCW context * Aggregation of MoMs * An application in a MOLE scenario * Conclusions.

DTIC

Command and Control; Warfare

20070038409 Defence Science and Technology Organisation, Edinburgh, Australia

Dynamic Network Flow Methods for Manoeuvre Path Planning

Wang, Yue-Jin; Oct 1, 2003; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471673; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471673>

The objectives of these briefing charts are to explore the application of Network Flow modeling to quantifying maneuvers space. The scope of these charts discusses maneuvers operations, dynamic network flow modelling for maneuvers, path planning, risk modelling, and mine threat examples.

DTIC

Maneuvers; Trajectory Planning

20070038410 Defence Science and Technology Organisation, Edinburgh, Australia

Systems Engineering, Knowledge Management, Artificial Intelligence, the Semantic Web and Operations Research

Staker, Rod; Oct 1, 2003; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471674; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471674>

No abstract available

Artificial Intelligence; Engineering Management; Information Management; Operations Research; Systems Engineering

20070038413 Defence Science Technology Lab., Farnborough, UK

Modelling Information Age Warfare: Remaining Challenges

Moffat, Jim; Jul 2003; 63 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471680; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471680>

CHALLENGES FOR the INFORMATION AGE: (1) Quantifying the benefit of good Command -- command

effectiveness/force effectiveness (2) Understanding Emergent Behaviour -- local collaboration/force level effects (3) Modelling the clustering of decision makers across an information network -- local information sharing/collaboration.
DTIC

Combat; Simulation; Warfare

20070038626 Army Tank-Automotive Research and Development Command, Warren, MI USA

Vector-Valued Support Vector Regression

Brudnak, Mark J; Jul 18, 2006; 35 pp.; In English

Report No.(s): AD-A471921; TARDEC-15999; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Algorithms; Classifications

20070038681 BAE Systems, Farnborough, UK

On the Use of Synthetic Environments for the Through Life Delivery of Capability

Daw, Andrew J; Apr 1, 2005; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472035; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Delivery; Life (Durability); Systems Engineering

20070038683 Air Force Studies and Analyses Agency, Washington, DC USA

The USA Air Force Approach to Capabilities-Based Planning & Programming (CBP&P), Part 1: Planning

Jones, James; Herslow, Robert; Apr 2005; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472037; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Decision Support Systems; Management Planning; United States

20070038684 Air Force Studies and Analyses Agency, Washington, DC USA

The USA Air Force Approach to Capabilities-Based Planning and Programming (CBP&P), Part 2: Programming

Jeffery, Kira; Chapman, Ray; Apr 1, 2005; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472038; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Budgeting; Decision Support Systems; Management Planning; United States

20070038920 Washington Univ., Saint Louis, MO USA

Nonlinear Control Systems

Byrnes, Christopher I; Isidori, Alberto; Mar 2007; 27 pp.; In English

Contract(s)/Grant(s): FA9550-04-1027

Report No.(s): AD-A471765; WU22-1331-59017; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471765>

This report describes a research effort to develop a systematic feedback design methodology for complex dynamical systems, Particular attention is given to the problem of shaping the response of lumped and distributed parameter systems having nonlinear dynamics.

DTIC

Nonlinear Systems; Control Systems Design; Complex Systems; Dynamical Systems

20070038926 Defence Science and Technology Organisation, Edinburgh, Australia

Bhopal and Bagasse: Understanding Combustion Using Mathematics

Sexton, Jane; Jul 2003; 10 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471667; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471667>

OUTLINE: * What is ignition? * Describe two examples: Bhopal; Bagasse * Mathematics of combustion * Analytic tools * Outcomes.

DTIC

Combustion; Branching (Mathematics)

20070038927 Defence Science and Technology Organisation, Edinburgh, Australia

Modelling the Organisational Behaviour of Military Headquarters: A Social Scientist's Perspective

Fidock, Justin; Oct 1, 2003; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471661; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471661>

Overview: * Rationale - why model organisations? * Representing organisational behaviour - what features are important?
* Existing models of organisations - how do they fare? * A way ahead

DTIC

Computerized Simulation; Models; Military Technology

67

THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20070037562 North Carolina State Univ., Raleigh, NC USA

Sensitivity Functions and Their Uses in Inverse Problems

Banks, H T; Dediu, Sava; Ernstberger, Stacey L; Jul 21, 2007; 34 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0220; 9R01A1071915-05

Report No.(s): AD-A471254; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471254>

In this note we present a critical review of some of the positive features as well as some of the shortcomings of the generalized sensitivity functions 'GSF' of Thomaseth-Cobelli in comparison to traditional sensitivity functions 'TSF'. We do this from a computational perspective of ordinary least squares estimation or inverse problems using two illustrative examples: the Verhulst-Pearl logistic growth model and a recently developed agricultural production network model. Because GSF provide information on the relevance of data measurements for the identification of certain parameters in a typical parameter estimation problems, we argue that they provide the basis for new tools for investigators in design of inverse problem studies.

DTIC

Matrix Theory; Probability Distribution Functions; Sensitivity

20070037792 Naval Postgraduate School, Monterey, CA USA

Application of Artificial Boundary Conditions in Sensitivity-Based Updating of Finite Element Models

Mentzer, John R; Jun 2007; 111 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471415; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In structural dynamics the ability of a finite element model, or (FEM), to accurately represent a structure's dynamic response (natural frequencies and mode shapes) determines its utility as a solution tool. Often the model needs to be updated or improved to better represent the structure it is modeling. An updated or improved model of an undamaged structure is often needed in order to identify damage in an in-service structure. A difficulty generally arises in trying to solve for this error because it is often represented by an underdetermined problem, as the number of parameters potentially in error in the FEM is typically much larger than the number of measured parameters. The method of Artificial Boundary Conditions (ABC) can help to resolve the problem and lead to an improved solution. The ABC systems provide the natural frequencies for the structure under test, under a variety of boundary conditions which are imposed computationally. Specifically, the use of ABC in sensitivity based updating will be investigated and its improvement on performance reviewed.

DTIC

Boundary Conditions; Dynamic Response; Finite Element Method; Mathematical Models; Sensitivity

20070038580 Yale Univ., New Haven, CT USA

A New Class of Highly Accurate Solvers for Ordinary Differential Equations

Glaser, Andreas; Rokhlin, Vladimir; Jul 17, 2007; 40 pp.; In English

Contract(s)/Grant(s): N00014-07-1-0711; FA9550-06-1-0197

Report No.(s): AD-A471824; YALEU/DCS/TR-1382; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We introduce a new class of numerical schemes for the solution of the Cauchy problem for non-stiff ordinary differential equations (ODEs). Our algorithms are of the predictor-corrector type; they are obtained via the decomposition of the solutions of the ODEs into combinations of appropriately chosen exponentials, whereas the classical schemes are based on the

approximation of solutions by polynomials. The resulting schemes have the advantage of significantly faster convergence, given fixed lengths of predictor and corrector vectors. The performance of the approach is illustrated via a number of numerical examples.

DTIC

Differential Equations; Predictor-Corrector Methods

70

PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics, or 92 Solar Physics*.

20070037489 Academy of Sciences (USSR), Nizhny Novgorod, Russian Federation

Artificial Ionospheric Turbulence and Radio Wave Propagation (Sura - HAARP)

Frolov, Vladimir L; Nov 1, 2006; 164 pp.; In English

Contract(s)/Grant(s): FA8655-03-D-0001

Report No.(s): AD-A471091; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471091>

This report results from a contract tasking Radio Physical Research Institute (NIRFI) as follows: The objectives of the project were: (i) integrated experimental, theoretical and computer simulation studies of non-linear plasma phenomena, produced in the upper ionosphere by powerful HF radiation and giving rise to plasma density irregularities with a wide range of cross-field (relatively to geomagnetic field lines) scales from centimeters to tens of kilometers, (ii) investigation of an influence of these irregularities on characteristics of HF and VHF radio waves passed through the ionosphere disturbed volume, and (iii) control for long distance propagation of HF radio waves through an ionosphere wave-guide channel by means of radio wave scattering from small-scale field-aligned irregularities.

DTIC

Ionospheres; Radio Transmission; Radio Waves; Sky Waves; Turbulence; Wave Propagation

20070037746 Delaware Univ., Newark, DE USA

A Time Domain Integral Equation Approach to Electromagnetic Interference Simulation

Weile, Daniel S; Jun 29, 2007; 8 pp.; In English

Contract(s)/Grant(s): N00014-04-1-0564

Report No.(s): AD-A471318; ELEG332159; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this project, which lasted from June 1, 2004 to May 31, 2007 was to develop new analysis methods for the modeling of broadband electromagnetic radiation in the time-domain useful for solving electromagnetic interference (EMI) problems. The work was based on a new approach for solving time-domain integral equations (TDIEs) with stability and accuracy, but was soon extended to some other approaches. The results produced by the research done under the auspices of this project lead the way to an EM simulation tool for EMI problems that is accurate, efficient, and stable for the first time ever. The accomplishments of the project can be grouped into two categories: improvements/modifications to the core solution algorithm, and extensions of that algorithm to different physical problems. We will discuss these contributions in the next sections.

DTIC

Electromagnetic Interference; Integral Equations; Simulation

20070037764 Washington State Univ., Pullman, WA USA

Evanescent Acoustic Wave Scattering by Targets and Diffraction by Ripples Graduate Traineeship Award in Ocean Acoustics

Osterhoudt, Curtis F; Marston, Philip L; Aug 2007; 9 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0262

Report No.(s): AD-A471354; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This grant was a 'Graduate Trainee ship Award' in Ocean Acoustics for the support of Curtis F. Osterhoudt. The purpose of his research was to improve the understanding of the way that acoustic evanescent waves interact with targets buried in sediments in situations encountered in underwater acoustics. A method was developed and tested for the stable laboratory

production of acoustic evanescent waves in water based on the reflection of a beam of sound at an interface between the water and an adjacent liquid. Responses of targets illuminated by this evanescent wave field were measured and the major features were modeled. The emphasis was on backscattering from cylindrical targets having strong resonances. The research is discussed in detail in Osterhoudt's Ph. D. Thesis completed at Washington State University in April 2007. The title of the thesis is: 'Evanescent acoustic waves: production and scattering by resonant targets.'

DTIC

Acoustic Scattering; Acoustics; Backscattering; Diffraction; Evanescent Waves; Oceans; Ripples; Sound Waves; Targets; Underwater Acoustics; Wave Scattering

20070037766 California Univ., Berkeley, CA USA

A Baseband, Impulse Ultra-Wideband Transceiver Front-end for Low Power Applications

O'Donnell, Ian D; May 8, 2006; 278 pp.; In English

Contract(s)/Grant(s): N00014-00-1-0223

Report No.(s): AD-A471358; UCB/EECS-2006-47; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Interest in indoor wireless communications has been increasing. In addition to high throughput WLAN systems such as 802.11a/b/g/n, attention is also being focused on lower rate, short distance systems such as Bluetooth and Zigbee. These low rate radios are being proposed for a variety of applications including automation/security, smart toys, remote sensing/control, asset tracking, and as a replacement for computer peripheral wires. While not demanding aggressive throughput, these radios do require low cost, power efficient operation and optionally the ability to perform ranging. Unfortunately, currently reported radios are up to an order of magnitude away from these power and cost targets or do not support ranging. However, a recent ruling from the FCC has opened up nearly 8GHz of unlicensed spectrum (from dc to 960MHz and from 3.1GHz to 10.6GHz) for ultra-wideband (UWB) deployment. One attractive method of UWB signaling that seems suited to a low power, highly integrated implementation communicates with short pulses, on the order of a nanosecond, that spread energy over at least 500MHz of bandwidth. Termed 'impulse-UWB,' the baseband nature of this signaling promises low cost and low power consumption through design simplicity, pulsed (or 'duty-cycled') operation, and a 'mostly-digital' implementation. The benefits of this approach are balanced by the risk of jamming from in-band interference, of stricter sampling and gain constraints, and of increased digital complexity. This dissertation presents the system exploration, specification, design, and demonstration of a low power, highly integrated, flexible, baseband, impulse ultra-wideband transceiver front-end.

DTIC

Broadband; Impulses; Transmitter Receivers; Wireless Communication

20070037808 Norwegian Defence Research Establishment, Kjeller, Norway

Development and Applications of Full-Scale Ship Hull Health Monitoring Systems for the Royal Norwegian Navy

Torkildsen, Hans E; Grovlen, Aslaug; Skaugen, Atle; Wang, Gunnar; Jensen, Alf E; Pran, Karianne; Sagvolden, Geir; Apr 1, 2005; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471439; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Detectors; Fiber Optics; Health; Navy; Ship Hulls

20070037880 Optonor SA, Trondheim, Norway

Application of Shearography Techniques for Vibration Characterization and Damage Detection in Sandwich Structures

Vollen, Marianne W; Vikhagen, Eiolf; Wang, Gunnar; Jensen, Alf E; Haugland, Svein J; Apr 1, 2005; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471574; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Characterization; Damage; Detection; Excitation; Sandwich Structures; Shearography; Static Loads; Vibration; Vibration Tests

20070038386 California Univ., San Diego, La Jolla, CA USA

Optical Characterization of Two-Dimensional Photonic Crystal Cavities with Indium Arsenide Quantum Dot Emitters

Yoshie, Tomoyuki; Scherer, Axel; Chen, Hao; Huffaker, Diana; Deppe, Dennis; Apr 16, 2001; 4 pp.; In English

Report No.(s): AD-A471617; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471617>

We have characterized the modes within two-dimensional photonic crystal nanocavities with self-organized indium

arsenide quantum dots as an active material. Highly localized donor mode resonances with 3 to 5 nm linewidth were observed when spatially selective optical pumping the cavities. These modes could be lithographically tuned from 1100 to 1300 nm. Other, more extended modes, were also characterized and exhibited narrower resonance line widths ranging from 0.6 to 2 nm.

DTIC

Cavities; Crystals; Emitters; Indium Arsenides; Optical Pumping; Quantum Dots

20070038419 Rutgers - The State Univ., New Brunswick, NJ USA

Synchrotron Based X-Ray Strain Mapping in Fatigued Materials Subjected to Overload

Tsakalakos, Thomas; Croft, Mark; Jan 2007; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-04-1-0194; Proj-O7PR04210-00

Report No.(s): AD-A471698; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471698>

Fatigue crack growth involves localized fracture at the crack tip, and it intrinsically depends upon the local internal strain/stress fields and accumulated damage in the vicinity of the tip. The purpose of this report is to directly correlate variations in crack growth rate with variations in the relevant local strains around the crack tip. The so-called 'overload effect', namely the prominent crack growth rate retardation after a single overload cycle in an otherwise constant amplitude is studied. Our high spatial resolution measurements around fatigue crack are greatly facilitated by indexing our measurements to the fatigue crack itself. This crack based positioning is accomplished by measuring the beam intensity transmitted through the sample, with a transmission detector, so that a radiographic transmission profile can be constructed. Such transmission profiles enabled precise location of the crack and the crack tip in the x-ray beam.

DTIC

Crack Propagation; Synchrotrons; X Rays

20070038454 Library of Congress, Washington, DC USA

Manipulating Molecules: Federal Support for Nanotechnology Research

Devey, Michael E; Aug 2, 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471780; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471780>

The Bush Administration requested \$1.447 billion for nanotechnology research in FY2008, a \$56 million increase over the estimated \$1.391 billion for FY2007. (See Table 1.) Nanotechnology is a newly emerging field of science where scientists and engineers are beginning to manipulate matter at the molecular and atomic levels in order to obtain materials and systems with significantly improved properties. Ten nanometers is equal to one-ten thousandth the diameter of a human hair. Proponents of this technology argue that nanotechnology will lead to a new industrial revolution in the 21st century. Scientists note that nanotechnology is still in its infancy, with large scale practical applications 10 to 30 years away. Congressional concerns include the distribution of Program Component Area funding levels, the potential environmental and health concerns associated with the development and deployment of nanotechnology, and the role of the Food and Drug Administration as nano products move into the marketplace.

DTIC

Federal Budgets; Nanotechnology; Research Management

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*.

20070038337 NASA Langley Research Center, Hampton, VA, USA

Calibration of High Frequency MEMS Microphones

Shams, Qamar A.; Humphreys, William M.; Bartram, Scott M.; Zuckewar, Allan J.; [2007]; 3 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.14.02; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038337>

Understanding and controlling aircraft noise is one of the major research topics of the NASA Fundamental Aeronautics Program. One of the measurement technologies used to acquire noise data is the microphone directional array (DA).

Traditional direction array hardware, consisting of commercially available condenser microphones and preamplifiers can be too expensive and their installation in hard-walled wind tunnel test sections too complicated. An emerging micro-machining technology coupled with the latest cutting edge technologies for smaller and faster systems have opened the way for development of MEMS microphones. The MEMS microphone devices are available in the market but suffer from certain important shortcomings. Based on early experiments with array prototypes, it has been found that both the bandwidth and the sound pressure level dynamic range of the microphones should be increased significantly to improve the performance and flexibility of the overall array. Thus, in collaboration with an outside MEMS design vendor, NASA Langley modified commercially available MEMS microphone as shown in Figure 1 to meet the new requirements. Coupled with the design of the enhanced MEMS microphones was the development of a new calibration method for simultaneously obtaining the sensitivity and phase response of the devices over their entire broadband frequency range. Over the years, several methods have been used for microphone calibration. Some of the common methods of microphone calibration are Coupler (Reciprocity, Substitution, and Simultaneous), Pistonphone, Electrostatic actuator, and Free-field calibration (Reciprocity, Substitution, and Simultaneous). Traditionally, electrostatic actuators (EA) have been used to characterize air-condenser microphones for wideband frequency ranges; however, MEMS microphones are not adaptable to the EA method due to their construction and very small diaphragm size. Hence a substitution-based, free-field method was developed to calibrate these microphones at frequencies up to 80 kHz. The technique relied on the use of a random, ultrasonic broadband centrifugal sound source located in a small anechoic chamber. Phase calibrations of the MEMS microphones were derived from cross spectral phase comparisons between the reference and test substitution microphones and an adjacent and invariant grazing-incidence 1/8-inch standard microphone.

Author

Microphones; Calibrating; Frequency Ranges; Dynamic Range; Electrostatics; Sound Pressure; High Frequencies; Centrifugal Force

20070038383 Notre Dame Univ., IN USA

Experiments in Sound and Structural Vibrations Using an Air-Analog Model Ducted Propulsion System

Morris, Scott C; Aug 2007; 104 pp.; In English

Contract(s)/Grant(s): N00014-04-1-0522

Report No.(s): AD-A471613; UND-SM07-329; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471613>

The prediction of the radiated acoustic signature of underwater structures has been and will continue to be of great importance for the Navy. New and innovative designs of maneuvering and propulsion systems present challenging problems for the prediction of radiated acoustics. The present research focused on the development of structural acoustic experiments that use air as the working fluid. The test specimens were designed using very light weight structures such that the fluid loading effects would be non-negligible, and in some cases dominant. A number of configurations have been investigated, including flat membranes, rib-stiffened cylindrical structures, and a ducted rotor with elastic shell. The ducted rotor facility is part of a continuing effort involving the effects of inlet distortion on the elastic shell vibrations. A substantial database of flow field, acoustic, and vibration measurements has resulted. The data show a significant sensitivity of the structural vibration to the spatial distribution of the acoustic sources.

DTIC

Acoustic Properties; Analog Simulation; Ducts; Hydrodynamics; Propulsion; Structural Vibration; Underwater Acoustics; Underwater Structures

20070038438 Air Force Research Lab., Wright-Patterson AFB, OH USA

Air and Space Operations Center (AOC) Facility Design Guidelines: A Human Factors Engineering Perspective

Monk, Don; Popik, Dianne; Jul 2006; 21 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-6475; Proj-2830

Report No.(s): AD-A471733; AFRL-HE-WP-TP-2007-0011; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471733>

This document addresses the human factors design aspects of users' workspace and the facility's habitability. The workspace covers the users' individual work environment (i.e., seats, desks, storage space, etc.) and the arrangements of the individual workspaces into team (i.e., cell) workspaces and into the larger aspect of the group (i.e., collections of cells) workspace. Workspace arrangement of teams and groups which facilitates collaboration has been shown to increase mission effectiveness and reduce manpower requirements in other U.S. weapon systems. Habitability factors are those living and

working conditions that are necessary to sustain the health, comfort, safety, and morale of users. Specifically addressed are the environmental factors of lighting, temperature, ventilation, humidity, and acoustical noise.

DTIC

Acoustics; Habitability; Human Factors Engineering; Layouts; Plant Design; Weapon Systems; Workstations

20070038459 Duke Univ., Beaufort, NC USA

Investigation of the Impact of Sonar Transmission on Fisheries and Habitat in the U.S. Navy's USWTR: Summary of Stakeholder Concerns and Appropriate Research Areas

Read, Andrew; Hazen, Elliott; Sep 2007; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00244-06-P-1717

Report No.(s): AD-A471794; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471794>

Public comments responding to the Draft Environmental Impact Statement (October 2005) for the proposed Undersea Warfare Training Range (USWTR) off North Carolina were analyzed to provide a comprehensive view of stakeholder concerns. Three main areas of public concern -- short- and long-term effects on fish from mid-frequency sonar operations, displacement of fishermen during training exercises, and habitat modification/destruction -- were identified. Research areas that might address these concerns also were identified and examined. Finally, an abridged table of specific public comments is included.

DTIC

Education; Environmental Surveys; Fisheries; Habitats; Sonar; Warfare

20070038463 Duke Univ., Beaufort, NC USA

Research Required to Understand the Impact of Tactical Mid-Frequency Sonar Transmission on Fish, Fisheries and Fisheries Habitat: Summary of Stakeholder Concerns and Prioritized Research Plan from the Workshop on Mid-Frequency Sonar and Marine Fishes

Read, Andrew; Hazen, Elliott; Hazen, Lucie; Thorne, Lesley; Sep 2007; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00244-06-P-1717

Report No.(s): AD-A471800; NPS-OC-07-005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471800>

As reported in NPS-OC-07-004, analysis of public comments responding to the Draft Environmental Impact Statement (October 2005) for the proposed Undersea Warfare Training Range (USWTR) in Onslow Bay off North Carolina identified three main areas of public concern. One of these concerns, the effects on fish and fisheries habitats of mid-frequency active (MFA) sonar, further identified four sub-areas of concern: catch rates, spawning choruses, distribution and migratory behavior, and physiological effects. A workshop was held in April 2007 at Duke University to address these sub-areas of concern. The purpose of the workshop was to outline a program of research that could help determine how MFA sonar might affect fish and fisheries resources. This report summarizes the recommendations that emerged from that workshop. Specifically, a long-term research and development plan is articulated, as well as the priorities within that plan.

DTIC

Fisheries; Fishes; Frequencies; Sonar

20070038592 Massachusetts Inst. of Tech., Cambridge, MA USA

Seafloor Ripples Created by Waves from Hurricane Ivan on the West Florida Shelf

Bowers, Colleen M; Sep 2006; 96 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N62271-97-G-0026

Report No.(s): AD-A471865; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent studies have shown that the presence of sand ripples on the seabed improves sonar detection of buried mines at sub-critical angles. Sidescan sonar data of ripples off on the west Florida shelf were collected as part of ONR's Ripples Departmental Research Initiative (DRI) September 26-29th and November 7-9th, 2004. Hurricane Ivan, the strongest storm of the 2004 hurricane season, passed over the experiment site a week before the first data collection. This study focuses on the ripples created by Ivan. Average relict ripple wavelengths left after the storm were found to increase with water depth (50 cm, 62 cm, and 83 cm in 20, 30, and 50 meter water depths) despite the fact that orbital diameter decreases with water depth. Ripple prediction requires information about surface gravity waves and sediment grain size. The most reliable offshore wave

field available was created with Wavewatch III by Naval Postgraduate School scientists. These waves were inputted into Delft3D WAVE, incorporating the nearshore wave model SWAN to predict waves at the locations where ripples were measured. Orbital motions at the seabed and grain size were inputted into a time-dependent ripple model with varying dissipation parameters to estimate sand ripples created by Hurricane Ivan. Ripple wavelength was found to be more strongly dependent on grain size than wave dissipation.

DTIC

Hurricanes; Ocean Bottom; Ocean Surface; Ripples; Sonar; Water Waves

20070038598 Monopole Research, Thousand Oaks, CA USA

Hearing Protection for High-Noise Environments. Part 1

Bleszynski, Elizabeth; Bleszynski, Marek; Jaroszewicz, Thomas; May 31, 2007; 60 pp.; In English

Contract(s)/Grant(s): FA9550-06-C-0034

Report No.(s): AD-A471876; MON0003; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Report developed under STTR contract for topic AFO6-T035. The objective of our effort was to develop powerful software tools and to perform high fidelity simulation which would allow identification and understanding of relevant bioacoustic and psychoacoustic mechanisms responsible for the transmission of acoustic energy through non-airborne pathways to the cochlea. As the main achievements of our Phase I work we consider: - development of a set of algorithms (including non-lossy, error-controlled matrix compression techniques) for general, i.e., variable-density, volumetric equations of acoustics, and development of a solution technique overcoming ill-conditioning difficulties arising in large density contrast problems.

DTIC

Ear Protectors; Environment Protection; Hearing; Noise Pollution; Sound Waves

20070038618 Monopole Research, Thousand Oaks, CA USA

Hearing Protection for High-Noise Environments. Part 2: Finite Element Modeling

Bleszynski, Elizabeth; Bleszynski, Marek; Jaroszewicz, Thomas; May 31, 2007; 51 pp.; In English

Contract(s)/Grant(s): FA9550-06-C-0034

Report No.(s): AD-A471904; MON-0003; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Report developed under STTR contract for topic AF06-T035. The objective of our effort was to develop powerful software tools and to perform high fidelity simulation which would allow identification and understanding of relevant bio-acoustic and psycho-acoustic mechanisms responsible for the transmission of acoustic energy through non-airborne pathways to the cochlea. As the main achievements of our Phase I work we consider: (1) development of a set of algorithms (including non-lossy, error-controlled matrix compression techniques) for general, i.e., variable-density, volumetric equations of acoustics, and (2) development of a solution technique overcoming ill-conditioning difficulties arising in large density contrast problems.

DTIC

Bioacoustics; Ear Protectors; Finite Element Method; Mathematical Models; Psychoacoustics; Simulation; Software Development Tools

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*.

20070037816 Naval Research Lab., Bay Saint Louis, MS USA

Microbial Reduction of Chromium from the Hexavalent to Divalent State

Daulton, Tyrone L; Little, Brenda J; Jones-Meehan, Joanne; Blom, Douglas A; Allard, Lawrence F; Jan 2007; 11 pp.; In English

Report No.(s): AD-A471451; NRL/JA/7303-06-6222; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We demonstrate that *Shewanella oneidensis*, a metal-reducing bacteria species with cytoplasmic-membrane-bound reductases and remarkably diverse respiratory capabilities, reduced Cr(VI) to Cr(II) in anaerobic cultures where chromate was the sole terminal electron acceptor. Individual cell microanalysis by transmission electron microscopy (TEM) using electron energy-loss spectroscopy (EELS) and energy dispersive X-ray spectroscopy (EDXS) demonstrates Cr(II) concentrated near

the cytoplasmic membrane, suggesting the terminal reduction pathway is intracellularly localized. Further, estimated cellular Cr(II) concentrations are relatively high at upwards of 0.03-0.09 g Cr/g bacterium. Accumulation of Cr(II) is observed in *S. oneidensis* cells prior to the formation of submicron-sized precipitates of insoluble Cr(III) on their surfaces. Furthermore, under anaerobic conditions, Cr(III) precipitates that encrust cells are shown to contain Cr(II) that is likely bound in the net negatively charged extracellular biopolymers which can permeate the surfaces of the precipitates. In otherwise nearly identical incubations, Cr(III) precipitate formation was observed in cultures maintained anaerobic with bubbled nitrogen but not in three replicate cultures in an anaerobic chamber.

DTIC

Chromium; Microorganisms; Valence

20070037830 California Univ., Los Angeles, CA USA

Observation of Raman Emission in Silicon Waveguides at 1.54 Micrometers

Claps, Ricardo; Dimitropoulos, Dimitri; Han, Yan; Jalali, Bahram; Jun 1, 2005; 10 pp.; In English
Report No.(s): AD-A471480; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Emission; Observation; Raman Spectra; Silicon; Waveguides

20070037885 San Diego Supercomputer Center, San Diego, CA USA

Spectral-Product Methods for Electronic Structure Calculations (Preprint)

Langhoff, P W; Mills, J E; Boatz, J A; Nov 20, 2006; 27 pp.; In English

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

Report No.(s): AD-A471580; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Progress is reported in development, implementation, and application of a spectral method for ab initio studies of the electronic structure of matter. In this approach, antisymmetry restrictions are enforced subsequent to construction of the many-electron Hamiltonian matrix for an atom or molecule in an orthonormal spectral-product basis. The spectral-product approach to molecular electronic structure avoids the repeated evaluations of the one- and two-electron integrals required in construction of polyatomic Hamiltonian matrices in the antisymmetric basis states commonly employed in conventional calculations of adiabatic potential energy surfaces, providing an alternative ab initio formalism potentially suitable for computational applications more generally.

DTIC

Atomic Structure; Electron States; Electronic Structure; Spectral Methods

20070038425 EAI Corp., Abingdon, MD USA

Validation and Support of a Quantitative Infrared Instrument Facility and Generation of a Library of Chemical Warfare and Related Materials by Fourier Transform Infrared Spectroscopy

Williams, Barry R; Hulet, Melissa S; Ben-David, Avishai; Miles, Ronald W; Samuels, Alan C; Zhu, Chiang-Jiang; Green, Norman; Nov 2006; 98 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD13-03-D-0017

Report No.(s): AD-A471712; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471712>

This report summarizes the effort to generate a library of quantitative infrared spectra of chemical warfare agents and related materials and biosimulants. The results of tests to validate the equipment and procedures to be used in the laboratory are discussed.

DTIC

Chemical Warfare; Infrared Instruments; Infrared Spectra; Infrared Spectroscopy; Libraries

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*.

20070037522 Library of Congress, Washington, DC USA

North Korea's Nuclear Weapons Development and Diplomacy

Niksich, Larry A; Jul 2, 2007; 13 pp.; In English

Report No.(s): AD-A471146; CRS-RL33590; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471146>

The six parties to the North Korean nuclear negotiations concluded an agreement on February 13, 2007, that specifies two Phases of implementation. The phases provided for a freeze of North Korean nuclear installations at the Yongbyon site, a subsequent disablement of all North Korean nuclear facilities, and a North Korean declaration of 'all nuclear programs.' The Agreement also establishes working groups of the six parties on subjects such as U.S.-North Korean normalization of relations, denuclearization of the Korean peninsula, energy and economic cooperation, Japan-North Korea normalization of relations, and a North Korean peace and security mechanism. The Six Party Agreement was negotiated following a North Korean nuclear test in October 2006, the imposition of sanctions against North Korea by the United Nations Security Council, and mounting congressional criticism of Administration policy. The Agreement also came about because of changes in Bush Administration policy. Tactically, the Administration ended its unwillingness to negotiate bilaterally with North Korea and actively sought bilateral meetings. The implementation of the Initial Phase of the Agreement, which had a 60-day deadline, has been delayed because of North Korean demands for access to foreign banks to deposit \$25 million from frozen accounts at the Banco Delta in Macau -- the object of U.S. financial sanctions since September 2005 because of Banco Delta's involvement in North Korean criminal counterfeiting. Implementation of Phase Two, which has no timetable, likely will involve new rounds of negotiations, especially between the Bush Administration and North Korea over issues in contention like the definition of disablement, the U.S. claim that North Korea has a secret highly enriched uranium program, verification of any disablement or declaration of nuclear programs, and issues unresolved in the working groups. This report will be updated periodically.

DTIC

Agreements; International Relations; North Korea; Nuclear Weapons; Weapons Development

20070037755 Library of Congress, Washington, DC USA

Nuclear Energy Policy

Holt, Mark; Jul 12, 2007; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471339; CRS-RL33558; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nuclear energy policy issues facing Congress include the implementation of federal incentives for new commercial reactors, radioactive waste management policy, research and development priorities, power plant safety and regulation, and security against terrorist attacks. The Bush Administration has called for an expansion of nuclear power. For Department of Energy (DOE) nuclear energy research and development and infrastructure, the Administration is requesting \$801.7 million for FY2008, a nearly 30% increase from the FY2007 appropriation. The request would boost funding for the Advanced Fuel Cycle Initiative (AFCI) from \$167.5 million in FY2007 to \$395.0 million in FY2008 as the primary component of the Administration's Global Nuclear Energy Partnership (GNEP). The House Appropriations Committee recommended cutting AFCI to \$120.0 million while providing a total funding level of \$835.2 million (H.R. 2641, H.Rept. 110-185). The Senate Appropriations Committee recommended \$242.0 million for AFCI and \$795.5 million for nuclear energy overall (S. 1751, S.Rept. 110-127). Significant incentives for new commercial reactors are included in the Energy Policy Act of 2005 (P.L. 109-58), signed by the President on August 8, 2005. These include production tax credits, loan guarantees, insurance against regulatory delays, and extension of the Price-Anderson Act nuclear liability system. Together with higher fossil fuel prices and the possibility of greenhouse gas controls, the federal incentives for nuclear power have helped spur renewed interest by utilities and other potential reactor developers. Plans for about 30 reactor license applications have been announced, although no commitments have been made to build the plants. No reactor has been ordered in the USA since 1978, and all orders since 1973 were subsequently canceled.

DTIC

Energy Policy; Federal Budgets; Law (Jurisprudence); Nuclear Power Plants; Safety; Security; United States; Waste Management

20070037767 Army War Coll., Carlisle Barracks, PA USA

An Examination of US Policy Toward Iranian Nuclear Proliferation

Miller, William K; Mar 30, 2007; 24 pp.; In English

Report No.(s): AD-A471360; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The consequences of Iranian development, declaration, and demonstration of nuclear weapons are too dire to ignore; they are in fact potentially catastrophic. This paper concludes that to date, U.S. policy has been ineffectual in curbing Iranian nuclear proliferation efforts and recommends the development of a new policy that moves away from a primarily confrontational policy model to one which includes direct diplomatic and economic engagement options. Furthermore, the new policy should seek to achieve the following goals: (1) Iran does not acquire, declare, or demonstrate a nuclear weapons capability, (2) Iranian acceptance of, and adherence to, all Nuclear Non-Proliferation Treaty (NPT) protocols, and (3) renunciation by Iran of the intent to field the full nuclear fuel cycle, thereby ending Iran's need for an industrial level Iranian uranium enrichment capability. Finally, the paper argues that any new policy must be underwritten by a robust strategic communications plan as well as thorough military deterrent options.

DTIC

Iran; Policies

20070037822 Army Command and General Staff Coll., Fort Leavenworth, KS USA

The Use of Land Power to Counter the Iranian Nuclear Proliferation Challenge

Terry, Bruce W; Jun 15, 2007; 121 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471463; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Since the 9/11 attacks the USA has declared a policy to stop emerging threats before they become dangerous. President Bush has declared that Iran will not be allowed to develop nuclear weapons, and to prevent Iran from doing so, a number of strategies have been suggested. These strategies include making a diplomatic 'Grand Bargain,' building a system of containment and deterrence, and using military power to destroy Iran's nuclear infrastructure. In the case of using military power, air strikes are the most frequent recommendation, and the use of land power is largely ignored. If land power were used to destroy Iran's nuclear infrastructure, there are three major options that could be taken: an invasion and occupation, a strategic raid to destroy known nuclear facilities, and a special operations raid to destroy a single nuclear facility. Each ground option would rely on significant air and naval power to be successful. The invasion option is feasible, though with great effort, and it is the most suitable ground option because it provides a certainty of effect that no other course of action can match. However, the invasion option is not acceptable due to its high costs. The strategic raid option is marginally feasible, but the costs are not acceptable and it lacks significant advantage over the pure air option, thus rendering it only marginally suitable. The special operations raid is conditionally an acceptable course of action, but it is neither feasible nor suitable given the lack of intelligence the USA has about Iranian nuclear facilities and the limited effect a special operations raid would have on a large industrial target.

DTIC

Iran; Military Operations; Reactor Technology; Strategy; Warfare

20070037888 Stanford Univ., Stanford, CA USA

Towards Reduced Wall Effect Hall Plasma Accelerators

Cappelli, Mark A; Jul 2007; 17 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0122

Report No.(s): AD-A471583; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary objective of our existing grant, as stated in our original proposal, was to (i) develop a better understanding of the electron transport in Hall thrusters; (ii) greatly reduce or eliminate the influence of the walls on the electron transport; and (iii) replace the role of the wall in electron conduction with enhancement and control of the bulk conductivity. In this way, the selection of wall material and thruster geometry can be made independently of its effect that the wall will have on conductivity, so as to optimize the thruster performance with respect to reliability and service life.

DTIC

Electron Transfer; Hall Accelerators; Hall Thrusters; Plasma Accelerators; Walls

20070038379 Federal Aviation Administration, Oklahoma City, OK USA

Optical Radiation Transmittance of Aircraft Windscreens and Pilot Vision

Nakagawara, Van B; Montgomery, Ron W; Marshall, Wesley J; Jul 2007; 20 pp.; In English

Report No.(s): AD-A471609; DOT/FAA/AM-07/20; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471609>

Optical radiation can have acute and chronic effects on the tissues of the eye, especially if exposure levels exceed normal repair capabilities. In support of a Department of Homeland Security project, the transmittance properties of aircraft windscreens were measured at the FAA's Civil Aerospace Medical Institute (CAMI) for both visible and invisible optical radiation. This paper focuses on windscreen transmittance in the ultraviolet (UV) (< 380 nm) and visible (380-780 nm) portions of the optical spectrum. Transmission measurements were performed on eight aircraft windscreens. Three windscreens were from large commercial jets (MD 88, Airbus A320, and Boeing 727/737); two from commercial, propeller-driven passenger planes (Fokker 27 and the ATR 42); one from a small private jet (Raytheon Aircraft Corporation Hawker Horizon); and two from small general aviation (GA), single-engine, propeller-driven planes (Beech Bonanza and Cessna 182). The two GA aircraft windscreens were plastic (polycarbonate); the others were multilayer (laminated) composite glass. UV transmittance for both glass and plastic windscreens was less than 1% for UV-B (280-320 nm) radiation. In the UV-A portion (320-380 nm) of the spectrum, transmittance differences increased from 0.41% to 53.5%, with plastic attenuating more UV radiation than glass. For visible light, average transmittance from 400-600 nm (violet to orange) was similar (82.8% 4.6%) for both windscreen materials, while from 625 to 775 nm (orange to red), the difference in average transmittance increased from 9.1% to 40.0%, respectively, with plastic transmitting longer wavelengths more efficiently.

DTIC

Optical Properties; Radiation Protection; Radiation Spectra; Transmittance; Vision; Windshields

20070038445 Air Force Research Lab., Edwards AFB, CA USA

Kinetic Modeling of Laser Induced Fusion

Messmer, Peter; Paul, Kevin; Stoltz, Peter; Cambier, Jean-Luc; Jul 2007; 22 pp.; In English

Contract(s)/Grant(s): RP060281; Proj-2301

Report No.(s): AD-A471750; AFRL-PR-ED-TP-2007-371; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471750>

Thermal neutrons are of considerable interest to the Department of Defense and for commercial applications. Unlike high-energy photons, neutrons easily penetrate high density targets, but get effectively absorbed by low density materials like paraffin, nylon or explosives. This makes them attractive complements to X-rays for radiographic applications, e.g. for the detection or inspection of explosives inside steel casings. The key challenge is to develop a compact generator for thermal neutrons with large enough flux. The limited availability of radio-isotopes, combined with the relatively short half-life, safety constraints and regulatory requirements make them unattractive for wide-spread use. An alternative design exploits the Deuterium-Tritium (D-T) fusion, which generates Alpha particles and fast neutrons. In these sources, Deuterium ions are accelerated to about 130 keV and hit a Tritium target. The acceleration of Deuterium ions is usually accomplished in a diode configuration. Recently, considerable success has been achieved in the acceleration of ions via laser-matter interaction. In this project we investigated whether laser-accelerated ions could undergo nuclear fusion in an adequately designed target and could be used for neutron sources. We therefore enhanced our proprietary plasma simulation code VORPAL with a model for fusion reactions and investigated the generation of neutrons in shaped D-T targets.

DTIC

Laser Fusion; Models; Thermal Neutrons

20070038446 Library of Congress, Washington, DC USA

Nuclear Power Plants: Vulnerability to Terrorist Attack

Holt, Mark; Andrews, Anthony; Aug 8, 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471755; CRS-RS21131; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471755>

Protection of nuclear power plants from land-based assaults, deliberate aircraft crashes, and other terrorist acts has been a heightened national priority since the attacks of September 11, 2001. The Nuclear Regulatory Commission (NRC) has strengthened its regulations on nuclear reactor security, but critics contend that implementation by the industry has been too slow and that further measures are needed. Several provisions to increase nuclear reactor security were included in the Energy Policy Act of 2005, signed August 8, 2005. The law requires NRC to conduct force-on-force security exercises at nuclear

power plants at least once every three years and to revise the design-basis threat that nuclear plant security forces must be able to meet, among other measures. This report will be updated as events warrant.

DTIC

Nuclear Power Plants; Nuclear Vulnerability

20070038458 Massachusetts Inst. of Tech., Cambridge, MA USA

Maintenance Practices for Emergency Diesel Generator Engines Onboard USA Navy Los Angeles Class Nuclear Submarines

Hawks, Matthew A; Jun 2006; 42 pp.; In English

Contract(s)/Grant(s): N62271-97-G-0026

Report No.(s): AD-A471788; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471788>

The USA Navy has recognized the rising age of its nuclear reactors. With this increasing age comes increasing importance of backup generators. In addition to the need for decay heat removal common to all (naval and commercial) nuclear reactors, naval vessels with nuclear reactors also require a backup means of propulsion. All underway Navy nuclear reactors are operated with diesel generators as a backup power system, able to provide emergency electric power for reactor decay heat removal as well as enough electric power to supply an emergency propulsion mechanism. While all commercial nuclear reactors are required to incorporate multiple backup generators, naval submarine nuclear plants feature a single backup generator. The increasing age of naval nuclear reactors, coupled with the dual requirements of a submarine's solitary backup generator, makes the study of submarine backup generators vital.

DTIC

Diesel Engines; Emergencies; Maintenance; Navy; Nuclear Reactors; Procedures; Submarines; United States

20070038652 Library of Congress, Washington, DC USA

U.S.-China Nuclear Cooperation Agreement

Kan, Shirley; Holt, Mark; Sep 6, 2007; 27 pp.; In English

Report No.(s): AD-A471989; CRS-RL33192; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This CRS Report, updated as warranted, discusses the U.S. agreement on civilian nuclear cooperation with the People's Republic of China (PRC) by focusing on congressional roles in crafting and carrying out the agreement. Almost 13 years passed between the time that President Reagan submitted the agreement to Congress in July 1985 and its implementation in March 1998 under the Clinton Administration. Key developments in the U.S.-China nuclear cooperation agreement were timed for diplomatic summits between U.S. Presidents and PRC leaders. On April 30, 1984, President Reagan witnessed the initialing of the agreement. Secretary of Energy John Herrington signed the agreement on July 23, 1985. On July 24, 1985, President Reagan submitted to Congress the 'Agreement Between the USA and the People's Republic of China Concerning Peaceful Uses of Nuclear Energy.' Consideration of whether a Presidential certification would be the centerpiece of a summit in 1997 advanced the agreement's implementation. President Clinton, on January 12, 1998, signed certifications (as required by P.L. 99-183) on China's nuclear nonproliferation policy and practices to implement the agreement. Clinton also issued a certification and waived a sanction imposed after the 1989 Tiananmen Crackdown (as required by P.L. 101-246). Congressional review ended on March 18, 1998, and the agreement has since been implemented. Congress played an important role in determining implementation of the agreement, including holding hearings, crafting legislation, and requiring and reviewing Presidential certifications. Some Members have been concerned about U.S. nuclear cooperation with China in the context of China's practices related to the proliferation of nuclear weapons. Members also have been interested in how Congress reviewed the agreement with China as well as how this experience might apply to other similar agreements, such as that with India.

DTIC

Agreements; China; United States

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*.

20070036797 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Recent New Ideas and Directions for Space-Based Nulling Interferometry

Serabyn, Eugene (Gene); October 12, 2004; 8 pp.; In English; Terrestrial Planet Finder (TPF) Science Working Group (SWG), 12-14 Oct. 2004, Washington, DC, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: <http://hdl.handle.net/2014/40482>

This document is composed of two viewgraph presentations. The first is entitled 'Recent New Ideas and Directions for Space-Based Nulling Interferometry.' It reviews our understanding of interferometry compared to a year or so ago: (1) Simpler options identified, (2) A degree of flexibility is possible, allowing switching (or degradation) between some options, (3) Not necessary to define every component to the exclusion of all other possibilities and (4) MIR fibers are becoming a reality. The second, entitled 'The Fiber Nuller,' reviews the idea of Combining beams in a fiber instead of at a beamsplitter.

CASI

Imaging Techniques; Astronomical Interferometry

20070037527 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling, Germany

Scene Understanding for High Resolution SAR

Datcu, Mihai; May 1, 2005; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A471156; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA471156>

No abstract available

High Resolution; Target Recognition

20070037731 University of Southern California, Los Angeles, CA USA

Two-Dimensional Photonic Crystal Mach-Zehnder Interferometers

Shih, M H; Kim, W J; Kuang, Wan; Cao, J R; Yukawa, H; Choi, S J; O'Brien, J D; Dapkus, P D; Marshall, W K; Jun 1, 2005; 4 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0403; 96428CDVOS

Report No.(s): AD-A471276; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Mach-Zehnder interferometers were fabricated from suspended membrane photonic crystal waveguides. Transmission spectra were measured and device operation was shown to be in agreement with theoretical predictions.

DTIC

Crystals; Interferometers; Mach Number; Mach-Zehnder Interferometers; Optical Waveguides

20070037737 University of Southern California, Los Angeles, CA USA

Experimental Characterization of the Reflectance of 60 Waveguide Bends in Photonic Crystal Waveguides

Shih, M H; Kiim, Woo J; Kuang, Wan; Cao, J R; Choi, Sang-Jun; O'Brien, John D; Dapkus, P D; May 3, 2005; 4 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0403

Report No.(s): AD-A471294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Photonic crystal waveguides with two 60 bends were fabricated in an InGaAsP/InP suspended membrane geometry. The transmission spectrum was measured and the reflectance of the 60 bend was evaluated from Fabry Perot oscillations using Fourier analysis. It is shown that the reflectance agrees well with the results of a finite element method simulation.

DTIC

Crystals; Reflectance; Waveguides

20070037738 University of Southern California, Los Angeles, CA USA

Reducing the Out-of-Plane Radiation Loss of Photonic Crystal Waveguides on High-Index Substrates

Kuang, Wan; O'Brien, John D; Jun 1, 2005; 4 pp.; In English

Contract(s)/Grant(s): 10191574; F49620-02-1-0403

Report No.(s): AD-A471295; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Two-dimensional photonic crystal linear defect waveguides on semiconductor substrates are studied. It is predicted that

the out-of-plane radiation loss can be reduced by shifting one side of the photonic crystal cladding by one-half period with respect to the other along the propagation direction.

DTIC

Crystals; Losses; Substrates; Waveguides

20070037831 University of Southern California, Los Angeles, CA USA

Quality Factors in Single-Defect Photonic-Crystal Lasers with Asymmetric Cladding Layers

Kim, Cheolwoo; Kim, Woo J; Stapleton, Andrew; Cao, Jiang-Rong; O'Brien, John D; Dapkus, P D; Jun 1, 2005; 6 pp.; In English

Contract(s)/Grant(s): MDA972-00-1-0019; N00014-00-C-8079

Report No.(s): AD-A471481; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present quality factors of single-defect photonic-crystal resonant cavities with asymmetric cladding layers. The resonators studied here are dielectric slabs patterned with two-dimensional photonic crystals on a sapphire substrate. Three-dimensional finite-element and finite-difference time-domain routines were used to analyze the electromagnetic properties of these cavities. We observe that high quality factors (~800) can be obtained in these cavities for reasonable structures with thick enough dielectric slabs. This work was motivated by the need to place photonic-crystal resonators on a substrate to improve heat dissipation in photonic-crystal lasers.

DTIC

Asymmetry; Cladding; Crystals; Defects; Lasers; Q Factors; Single Crystals

20070038269 Universities Space Research Association, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

Mounting and Alignment of Full-Shell Replicated X-Ray Optics

Gubarev, Mikhail; Arnold, William; Kester, Thomas; Ramsey, Brian; Smithers, Martin; August 26, 2007; 1 pp.; In English; SPIE Optics and Photonics 2007, 26-30 Aug. 2007, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

We are developing grazing-incidence x-ray optics for astronomy. The optics are full-cylinder mirror shells fabricated using electroformed-nickel replication off super-polished mandrels. For space-based applications where weight is at a premium, very-thin-walled, light-weight mirrors are required. Such shells have been fabricated at MSFC with greater than 15 arcsec resolution. The challenge, however, is to preserve this resolution during mounting and assembly. We present here a status report on a mounting and alignment system currently under development at Marshall Space Flight Center to meet this challenge.

Author

X Ray Optics; Electroforming; Nickel; Mirrors

20070038385 California Univ., San Diego, La Jolla, CA USA

Separation of Radiation and Absorption Losses in Two-Dimensional Photonic Crystal Single Defect Cavities

Alvarado-Rodriguez, I; Yablonovitch, E; Jun 1, 2005; 5 pp.; In English

Contract(s)/Grant(s): MDA972-00-1-0019

Report No.(s): AD-A471616; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471616>

We have characterized the optical modes present in a two-dimensional photonic crystal single defect cavity fabricated in an InP/In_{0.53}Ga_{0.47}As/InP double heterostructure thin film on a glass slide. The cavity resonance was tuned to different frequencies in the 1.55 μm spectral region. Radiation losses and material absorption influence the measured value of cavity quality factor Q. We separated these two loss mechanisms by performing a curve fit of the loss rate 1/Q versus the wavelength-dependent absorption coefficient of In_{0.53}Ga_{0.47}As. By extrapolating this curve to zero absorption, the radiation loss rate 1/Q_{rad} is obtained.

DTIC

Cavities; Crystal Defects; Crystals; Indium Phosphides; Optical Properties; Radiation Absorption

20070038589 Air Force Research Lab., Kirkland AFB, NM USA

Evaluation of Phase-Shifting Techniques for a Self-Referencing Interferometer Wavefront Sensor (Postprint)

Corley, Melissa S; Rhoadarmer, Troy A; Jul 29, 2005; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-JT00

Report No.(s): AD-A471859; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force Research Laboratory is developing a Self-Referencing Interferometer (SRI) wavefront sensor (WFS) for applications requiring laser propagation in strong scintillation. This paper compares several phase-shifting techniques that can be used to capture interference patterns and examines their effects on SRI WFS performance. These techniques included temporal, spatial, spatial-temporal phase shifting. Temporal phase shifting allows for straightforward setup, alignment, and calibration, though its performance is degraded by changes in the atmosphere between measurements. Spatial phase shifting effectively 'freezes' the atmosphere, but required more rigorous camera calibration and alignment. Spatial-temporal phase shifting balances the benefits and challenges of both methods. This paper includes discussion of the tradeoffs involved in selecting an appropriate phase-shifting approach for a given application. Laboratory results demonstrate the advantages and disadvantages of each technique in evaluation of SRI WFS performance.

DTIC

Adaptive Optics; Detectors; Interferometers; Phase Shift; Wave Fronts

20070038653 Air Force Research Lab., Kirkland AFB, NM USA

Primary and Secondary Superresolution by Data Inversion (preprint)

Matson, Charles L; Tyler, David W; Jun 6, 2005; 20 pp.; In English

Contract(s)/Grant(s): F29601-01-D-0083; Proj-2304

Report No.(s): AD-A471990; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Superresolution by data inversion is the extrapolation of measured Fourier data to regions outside the measurement bandwidth using postprocessing techniques. Here we characterize superresolution by data inversion for objects with finite support using the twin concepts of primary and secondary superresolution, where primary superresolution is the essentially unbiased portion of the superresolution data and secondary superresolution is the remainder. We show that this partition of superresolution into primary and secondary components can be used to explain why some researchers believe that meaningful superresolution is achievable with realistic signal-to-noise ratios, and other researchers do not.

DTIC

Data Processing; High Resolution; Inversions

75

PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20070037510 Air Force Research Lab., Edwards AFB, CA USA

An Inversion Method for Reconstructing Hall Thruster Plume Parameters from the Line Integrated Measurements (Preprint)

Matlock, Taylor S; Larson, C W; Hargus, William A; Nakles, Michael R; Jun 5, 2007; 20 pp.; In English

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

Report No.(s): AD-A471123; AFRL-PR-ED-TP-2007-330; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471123>

Utilizing symmetry and extensive datasets, it is possible to extract three-dimensional distributions from two dimensional data. Numerically, these inversions are unstable and prone to magnify noise. However, noise amplification can be controlled by careful addition of artificial smoothing within the numerical inversion algorithm. The precept of Tikhonov regularization is that a unique, stable solution to a deconvolution may be achieved by minimizing a constrained smoothing function. Fundamentally, this will generate a stable, single valued solution only so long as the uncertainty of the iterated solution does not exceed the uncertainty (noise) of the original data. Within these constraints, the algorithm is relatively insensitive to noise. Using Tikhonov deconvolution, it is possible to determine radial profiles from line integrated measurements. A preliminary evaluation of the deconvolution scheme was made with a biased tungsten wire acting as a Faraday probe. After the deconvolution method was assessed, it was applied to a spectroscopic survey of relative xenon neutral line intensities in the

near infrared. The radially resolved emission ratios provide a three-dimensional estimate of the plume electron temperature using a published xenon collisional radiative model.

DTIC

Hall Thrusters; Inversions; Near Fields; Plumes

20070038368 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Central Role of Tether-Cutting Reconnection in the Production of CMEs

Moore, Ron; Sterling, Alphonse; Suess, Steve; July 30, 2007; 16 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038368>

This viewgraph presentation describes tether-cutting reconnection in the production of Coronal Mass Ejections (CMEs). The topics include: 1) Birth and Release of the CME Plasmoid; 2) Resulting CME in Outer Corona; 3) Governing Role of Surrounding Field; 4) Testable Prediction of the Standard Scenario Magnetic Bubble CME Model; 5) Lateral Pressure in Outer Corona; 6) Measured Angular Widths of 3 CMEs; 7) LASCO Image of each CME at Final Width; 8) Source of the CME of 2002 May 20; 9) Source of the CME of 1999 Feb 9; 10) Source of the CME of 2003 Nov 4; and 11) Test Results.

CASI

Coronal Mass Ejection; Tethering; Magnetic Field Reconnection; Plasmas (Physics)

20070038685 Nevada Univ., Reno, NV USA

Measurement of Atmospheric Pressure Air Plasma via Pulsed Electron Beam and Sustaining Electric Field

Vidmar, Robert J; Stalder, Kenneth R; Aug 29, 2007; 26 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0015

Report No.(s): AD-A472040; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An apparatus to study the generation of plasma in air was designed, fabricated, and assembled. A 400-liter test cell was developed to study plasma in air which has a pressure that can be varied from standard atmospheric pressure at sea level to 1 mTorr at 300,000 ft. Plasma is generated by impact ionization of air due to bombardment by a 100-keV electron beam. Microwave diagnostics quantify electron number density and optical diagnostics quantify ozone production. A particle in cell plasma code (MAGIC) and an air-chemistry code are used to quantify beam propagation through an electron-beam transmission window into air and the volumetric ionization rate within the test cell. Sensors were developed to monitor beam current incident on a transmission window and the resulting plasma formed in air on the transmission side of the window. Diagnostics from multiple sensors are acquired simultaneously for studies of power required to generate and maintain plasma in air on the timescale of 1 ms.

DTIC

Air; Atmospheric Pressure; Electric Fields; Electron Beams; Plasmas (Physics); Pressure Measurement

20070038701 Old Dominion Univ., Norfolk, VA USA

Large Volume Non-Equilibrium Air Plasma at Atmospheric Pressure: A Novel Method with Low Power Requirements

Laroussi, Mounir; Feb 28, 2007; 36 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0325

Report No.(s): AD-A472062; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document is the final technical report on the research activities carried out under AFOSR Grant F49620-03-1-0325. Here we present our research results, which took place in the last three years and a half. Particularly, during the later period of performance the focus of our activities was on carrying out diagnostics on plasma devices based on new approaches that use high voltage narrow pulses to ignite the plasma. These novel approaches allow for the generation of non-thermal high-pressure discharges that can be used as radiation sources and for biomedical applications.

DTIC

Atmospheric Pressure; Nonequilibrium Flow; Plasmas (Physics)

20070039003 NASA Marshall Space Flight Center, Huntsville, AL, USA

2-D Drift Velocities from the IMAGE EUV Plasmaspheric Imager

Gallagher, D.; Adrian, M.; September 19, 2007; 17 pp.; In English; Workshop on the Plasmasphere: The Earth's Plasmasphere; a Cluster, IMAGE and Modelling Perspective, 19-21 Sep. 2007, Brussels, Belgium; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070039003>

The IMAGE Mission extreme ultraviolet imager (EUY) observes He⁺ plasmaspheric ions throughout the inner

magnetosphere. Limited by ionizing radiation and viewing close to the Sun, images of the He⁺ distribution are available every 10 minutes for many hours as the spacecraft passes through apogee in its highly elliptical orbit. As a consistent constituent at about 15%, He⁺ is an excellent surrogate for monitoring all of the processes that control the dynamics of plasmaspheric plasma. In particular, the motion of He⁺ transverse to the ambient magnetic field is a direct indication of convective electric fields. The analysis of boundary motions has already achieved new insights into the electrodynamic coupling processes taking place between energetic magnetospheric plasmas and the ionosphere. Yet to be fulfilled, however, is the original promise that global EUY images of the plasmasphere might yield two-dimensional pictures of meso-scale to macro-scale electric fields in the inner magnetosphere. This work details the technique and initial application of an IMAGE EUY analysis that appears capable of following thermal plasma motion on a global basis.

Author

Plasmas (Physics); Space Plasmas; Extreme Ultraviolet Radiation; Image Analysis

20070039070 NASA Marshall Space Flight Center, Huntsville, AL, USA

Polarization Measurements on SUMI's TVLS Gratings

Kobayashi, K.; West, E. A.; Davis, J. M.; Gary, G. A.; August 26, 2007; 1 pp.; In English; SPIE Optics and Photonics 2007, 26-30 Aug. 2007, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

We present measurements of toroidal variable-line-space (TVLS) gratings for the Solar Ultraviolet Magnetograph Investigation (SUMI), currently being developed at the National Space Science and Technology Center (NSSTC). SUMI is a spectro-polarimeter designed to measure magnetic fields in the solar chromosphere by observing two UV emission lines sensitive to magnetic fields, the C-IV line at 155nm and the Mg-II line at 280nm. The instrument uses a pair of TVLS gratings, to observe both linear polarizations simultaneously. Efficiency measurements were done on bare aluminum gratings and MgF₂ coated gratings, at both linear polarizations.

Author

Magnetometers; Solar Instruments; Ultraviolet Radiation; Toroidal Plasmas; Linear Polarization; Gratings (Spectra)

76

SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20070037732 California Inst. of Tech., Pasadena, CA USA

Methods for Controlling Positions of Guided Modes of Photonic-Crystal Waveguides

Loncar, Marko; Vuckovic, Jelena; Scherer, Axel; Jun 1, 2005; 8 pp.; In English

Contract(s)/Grant(s): F49620-98-1-0447

Report No.(s): AD-A471278; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We analyze different methods for controlling positions of guided modes of planar photonic-crystal waveguides. Methods based both on rearrangements of holes in the photonic-crystal lattice and on changes of hole sizes are presented. The ability to tune frequencies of guided modes within a frequency bandgap is necessary to achieve efficient guiding of light within a waveguide, as well as to match frequencies of eigenmodes of different photonic-crystal-based devices for the purpose of good coupling between them. We observe and explain the appearance of acceptor-type modes in donor-type waveguides.

DTIC

Crystal Lattices; Crystals; Optical Waveguides; Waveguides

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*.

20070037480 Air Force Research Lab., Edwards AFB, CA USA

Thermographic Characterization and Comparison of 200W and 600W Hall Thrusters (Preprint)

Matlock, Taylor S; Hargus, William A; Larson, C W; May 23, 2007; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-23080535

Report No.(s): AD-A471080; AFRL-PR-ED-TP-2007-291; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471080>

Thermal analysis of Hall thrusters is necessary for both performance optimization and spacecraft integration. The thermal characteristics of the thruster influence the lifetime, energy losses, and spacecraft integration. The lifetime of most Hall thrusters is limited by the erosion of the insulating materials within the discharge chamber, which may vary with temperature. Thruster thermal data are also indicative of thruster energy losses as well as the heating characteristics of spacecraft interface surfaces. The results of the thermographic imaging of two laboratory Hall thrusters, a 200W (BusekBHT-200-X3) and 600W (BusekBHT-600), are presented. Surface temperature profiles were obtained using an infrared camera (7-13 micrometres), independently verified by thermocouples. Infrared imagery of thruster start-up, steady-state, and shut-down was recorded and used to approximate the transient heating behavior of each thruster. Variation of the nominal mass flow rate (resulting in proportional variation of the anode current and power level) between 85% to 115% resulted in proportional changes to the thruster surface temperatures.

DTIC

Hall Thrusters; Infrared Imagery; Thermal Analysis; Thermography

ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20070038143 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Bird's Eye View: Is the Common Remotely Operated Weapons Station an Improvement over a Traditionally Manned Weapon

Hoffman, Krista M; Jun 15, 2007; 82 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471376; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis compares a traditional M2 machine gun with an M2 mounted on the Common Remotely Operated Weapon Station (CROWS). CROWS is a remotely operated weapons platform primarily mounted on the Army's M1114 Up-Armored High Mobility Multipurpose Wheeled Vehicle (HMMWV). The problem is whether this state of the art weapon system is an improvement over a traditionally manned weapon in combat. To address the problem the thesis analyzed the benefits of CROWS over an M2, any systemic issues associated with the system, what users thought, and what additional and unique resources CROWS requires. This thesis also analyzed the system's limitations in terms of doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF). The combination of document research and primary source information provide justification that, despite some increased capabilities, CROWS is not an improvement over a traditionally manned weapon in combat at the current time.

DTIC

Birds; Eye (Anatomy); Remote Control; Robotics; Weapon Systems

20070038305 NASA, Washington, DC, USA

William H. Pickering: America's Deep Space Pioneer

Mudgway, Douglas J.; Pickering, William H., Personal Name; 2007; 268 pp.; In English; Original contains black and white illustrations

Report No.(s): NASA/SP-2007-4113; Copyright; Avail.: CASI: [EA5](#), Hardcopy

William Pickering first came to the attention of the world in January 1958 when the media triumphantly announced the successful launch of Explorer 1, the American response to the Soviet deployment a few months earlier of the first

Earth-orbiting satellite Sputnik. Along with Wernher von Braun and James Van Allen, William Pickering shared the limelight and the accolades. In that instant of time the Space Age was born and with it the professional reputation of William H. Pickering. Under Pickering's leadership, JPL designed, built, and dispatched NASA's first Ranger spacecraft to take close-up pictures of the surface of the Moon. Building on its Ranger experience, JPL sent the first spacecraft to Venus and, as technology improved, to Mars. The scientific data returns from each successive mission greatly increased our understanding of the composition and dynamics of the solar system and its planets. When he retired as Director in 1976, Pickering had presided over NASA-JPL's missions to the Moon, Venus, and Mars and laid the basis for the fabulous Voyager Grand Tour of all the planets that would sound the praises of NASA-JPL for the next 25 years. Not all of the missions were successful, but Pickering accepted the responsibility that devolved from his position as Director, regardless of the outcome.

Derived from text

Biography; Histories; NASA Space Programs; Scientists; Research Management; NASA Programs

20070038323 NASA Marshall Space Flight Center, Huntsville, AL, USA

UID...Now That's Gonna Leave A Mark

Schramm, Harry F., Jr.; September 11, 2007; 10 pp.; In English; Department of Defense for Unique Identification Defense and eBusiness Forum, 11-13 Sep. 2007, Atlanta, GA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038323>

Since 1975 bar codes on products at the retail counter have been accepted as the standard for entering product identity for price determination. Since the beginning of the 21st century, the Data Matrix symbol has become accepted as the bar code format that is marked directly on a part, assembly or product that is durable enough to identify that item for its lifetime. NASA began the studies for direct part marking Data Matrix symbols on parts during the Return to Flight activities after the Challenger Accident. Over the 20 year period that has elapsed since Challenger, a mountain of studies, analyses and focused problem solutions developed by and for NASA have brought about world changing results. NASA Technical Standard 6002 and NASA Handbook 6003 for Direct Part Marking Data Matrix Symbols on Aerospace Parts have formed the basis for most other standards on part marking internationally. NASA and its commercial partners have developed numerous products and methods that addressed the difficulties of collecting part identification in aerospace operations. These products enabled the marking of Data Matrix symbols in virtually every situation and the reading of symbols at great distances, severe angles, under paint and in the dark without a light. Even unmarkable delicate parts now have a process to apply a chemical mixture, recently trademarked as Nanocodes, that can be converted to Data Matrix information through software. The accompanying intellectual property is protected by ten patents, several of which are licensed. Direct marking Data Matrix on NASA parts dramatically decreases data entry errors and the number of parts that go through their life cycle unmarked, two major threats to sound configuration management and flight safety. NASA is said to only have people and stuff with information connecting them. Data Matrix is one of the most significant improvements since Challenger to the safety and reliability of that connection.

Author

Intellectual Property; Electronic Commerce; Industrial Management; Identifying

20070038975 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Personalizing Knowledge Delivery Services for Emerging Knowledge Processes (EKPs): A Conceptual Framework

Majchrzak, Ann; Chellappa, Ramnath K.; Cooper, Lynne P.; Hars, Alexander; March 14, 2003; 31 pp.; In English; Minnesota Symposium on Knowledge Management, 14-15 Mar. 2003, Minneapolis, MN, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40423>

The contents include: 1) What do most KMS in use today assume?; 2) Assumptions are violated when KMS is used by EKP workers - Why?; 3) Current State of KMS for EKPs are inadequate; 4) What would an 'adequate' KMS for EKPs look like?; 5) 'User-as-Consumer' Analogue: Ecommerce/Eem ployee Services; 6) Why is an ideal KMS for EKPs hard to achieve?; 7) So, what type of KMS design would work?; 8) Human-Based KMS for EKP - Proposal Call Managers at R&DLAB; 9) Proposal Call Managers (PCMs); 10) Specific PCM tasks; 11) Why is a R&DLAB PCM a human metaphor for a KMS for EKP?; 12) Data Collection; 13) Finding #1; 14) Finding #2; 15) Finding #3; 16) Factors affecting How/when; 17) Finding #4; 18) Finding #5; 19) Implication#1 for a KMS for EKP: From System to Service; 20) Implication #2: From technology or human-centric to Mixed Mode; 21) Implication #3: From Simple User Profiles to Dynamic Delivery Profiles; 22) Implication #4: Maintaining a trustworthy environment; 23) Implication #5: Constructing a dynamic delivery profile; 24)

Implications for Research: Model; and 25) Example Research Qs on KMS Support for EKPs.
CASI
Knowledge Representation; Project Management; Human Relations; Management Planning

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*.

20070037548 Oregon State Univ., Corvallis, OR USA

Browsing for Information on the Web and in the File System

Seifert, Ethan; Stumpf, Simone; Herlocker, Jonathan; Wynn, Eleanor; Feb 23, 2007; 6 pp.; In English

Contract(s)/Grant(s): HR0011-04-1-0005; NBCHDO-3-0010

Report No.(s): AD-A471204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471204>

Browsing is one of the methods used for finding and refinding information on the web or in the file local system and there are opportunities to avoid this, particularly if that information is revisited frequently. We present empirical results from a field study contrasting patterns of browsing to local and web information and we qualify the cost that this navigation method incurs. In addition, we provide an improved method for defining revisit behavior and report on the level of revisits during our study. Our findings have implications for solution development that reduce user effort for finding and refinding information.

DTIC

Information Retrieval; Internets

20070037551 Army Research Lab., Aberdeen Proving Ground, MD USA

Theoretical Considerations for Battlespace Information Mediation

Kaste, Richard C; Jul 2007; 44 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471216; ARL-TN-282; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471216>

The purpose of this note is to generate discussions about information fusion modeling for research and hypothesis testing. A modest start on back-of-the-envelope analyses of battlespace digitization and fusion problems is intended to encourage network scientists and analysts of tactical information concerns. We consider several elementary concepts, including amount and value of information, processor level and rate, process rules, and information decay. Given certain theoretical premises about information in a real-time system, the overall problem is one of determining types and connections of processors at various levels to maximize utilizable information. The note utilizes differential equations as a modeling technique; however, other approaches are alluded to. Areas for theoretical investigation are set forth, and several problems are associated with development of information structures and processing techniques. Research merging information theory with control theory may yield opportunities for commercial systems as well as for battle command over the tactical internet.

DTIC

Data Processing; Data Systems; Networks; Real Time Operation

20070037553 Massachusetts Inst. of Tech., Cambridge, MA USA

An Interpolation Method for the Reconstruction and Recognition of Face Images

Nguyen, N C; Peraire, J; Mar 2007; 9 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0114; F49620-03-1-0439

Report No.(s): AD-A471235; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471235>

An interpolation method is presented for the reconstruction and recognition of human face images. Basic ingredients include an optimal basis set defining a low-dimensional face space and a set of 'best interpolation pixels' capturing the most relevant characteristics of known faces. The best interpolation pixels are chosen as points of the pixel grid so as to best interpolate the set of known face images. These pixels are then used in a least-squares interpolation procedure to determine interpolant components of a face image very inexpensively, thereby providing efficient reconstruction of faces. In addition, the method allows a fully automatic computer system to be developed for the real-time recognition of faces. Two significant advantages of this method are: '1' the computational cost of recognizing a new face is independent of the size of the pixel

grid; and '2' it allows for the reconstruction and recognition of incomplete images.

DTIC

Character Recognition; Interpolation

20070037566 Oregon State Univ., Corvallis, OR USA

Getting to the Information you Already have

Rajaram, Vidya; Stumpf, Simone; Burnett, Margaret; Dragunov, Anton; Wick, Evelyn; Lynn, Juliana; Johnsrude, Kevin; Herlocker, Jonathan; Oct 5, 2005; 25 pp.; In English

Contract(s)/Grant(s): HR0011-04-1-0005; NBCHD-03-0010

Report No.(s): AD-A471260; CS05-10-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471260>

Knowledge workers need to find information but even when it is stored on their local computer systems, finding it can be costly. There are many researchers working on solutions to reduce these costs, but there has been little research into exactly what these costs are, and what the ties are between these costs and users' choices between ways to access their local information. This paper provides a methodology for investigating such issues, and reports empirical results on ways of accessing local, task-relevant resources 'e.g. document files', their associated costs, and users' sensitivities to certain kinds of costs. Our results fill in gaps in what has been known about the problem, thereby helping to inform research on solutions to the problem.

DTIC

Cost Analysis; Data Management; Information Retrieval

20070037730 Oregon State Univ., Corvallis, OR USA

Getting to Local Information: The Role of Different Costs

Rajaram, Vidya; Sep 22, 2006; 84 pp.; In English

Contract(s)/Grant(s): HR0011-04-1-0005; NBCHD030010

Report No.(s): AD-A471275; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Finding information can cost a significant amount of time, even when the information is already stored on the user's local computer system. There is significant research aimed at reducing these time costs, but little research into exactly what these costs are or how they impact people's use of tools and technologies to access local information. This thesis presents a methodology for investigating such issues, and uses the methodology to report empirical results on ways people access local information and how these ways tie to different types of costs. Our results fill in gaps in what is known about the problem of accessing local information, thereby helping to inform technological solutions to the problem.

DTIC

Computer Storage Devices; Costs; Human-Computer Interface; Information Retrieval

20070037752 Army War Coll., Carlisle Barracks, PA USA

Jointness: A Selected Bibliography

Shope, Virginia C; Aug 2007; 27 pp.; In English

Report No.(s): AD-A471335; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This selected bibliography lists references for readings on Jointness, an enduring theme of the U.S. Army War College. A revised and updated version of the library's earlier bibliographies on jointness, it focuses on aspects of the USA Armed Forces such as joint operations, joint logistics, interservice cooperation, interservice rivalry, joint communications, joint training, and the Goldwater-Nichols Act. With the exception of some important older titles, most of the books, documents, journal articles, and online resources cited are dated 2004 to the present. All items are available in the U.S. Army War College Library. For users' convenience, at the end of the citations, the author added Library call numbers, Internet addresses, or database links. Web sites were accessed during July 2007.

DTIC

Bibliographies; Education; Military Operations

20070037753 Library of Congress, Washington, DC USA

Internet Search Engines: Copyright's 'Fair Use' in Reproduction and Public Display Rights

Jeweler, Robin; Jul 12, 2007; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471337; CRS-RL33810; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Terms that describe Internet functionality pose interpretative challenges for the courts as they determine how these

activities relate to a copyright holder's traditional right to control reproduction, display, and distribution of protected works. At issue is whether basic operation of the Internet, in some cases, constitutes or facilitates copyright infringement. If so, is the activity a 'fair use' protected by the Copyright Act? These issues frequently implicate search engines, which scan the web to allow users to find content for uses, both legitimate and illegitimate. In 2003, the Ninth Circuit Court of Appeals decided *Kelly v. Arriba Soft Corp.*, holding that a search engine's online display of 'thumbnail' images was a fair use of copyright protected work. More recently, a U.S. district court considered an Internet search engine's caching, linking, and the display of thumbnails in a context other than that approved in *Kelly*. In *Field v. Google*, the district court found that Google's system of displaying cached images did not infringe the content owner's copyright. And in *Perfect 10 v. Amazon.com Inc.*, the Ninth Circuit revisited and expanded upon its holding in *Kelly*, finding that a search engine's use of thumbnail images and practice of in-line linking, framing, and caching were not infringing. But it left open the question of possible secondary liability for contributory copyright infringement and possible immunity under the Digital Millennium Copyright Act. Taken together, these cases indicate a willingness by the courts to acknowledge the social utility of online indexing, and factor it into fair use analysis; to adapt copyright law to the core functionality and purpose of the Internet, even when that means requiring content owners to affirmatively act, such as by the use of meta-tags; and to consider and balance conflicts between useful functions, such as online indexing and caching, against emerging, viable new markets for content owners.

DTIC

Copyrights; Images; Information Retrieval; Internets; Law (Jurisprudence)

20070037809 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Are Army Public Affairs Officers Trained and Educated to Meet the Challenges of the Contemporary Information Environment?

Seiber, Patrick R; Jun 15, 2007; 114 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471440; No Copyright; Avail.: Defense Technical Information Center (DTIC)

From the Crimean War through the ongoing conflicts in Afghanistan and Iraq, the military and the media have had a dynamic relationship that has changed throughout history. Many of the changes in this relationship have been based on technology, while other parts of the relationship have changed based on cultures within the military, the public, and the media establishment. In order to answer the primary research question, this thesis begins with a brief historical review of military and media relationships from 1854 (Crimean War) to present day operations (Operations Iraqi Freedom and Enduring Freedom) in order to capture lessons learned from history. Contemporary concerns, such as strategic communications, proposed doctrinal relationships between Information Operations and Public Affairs, and Army officer 'Pentathlete' development challenges, are also addressed, as Army Public Affairs Officers have requirements to support each of these areas. Research will show whether or not the current Army Public Affairs Officer training and development model listed in DA Pam 600-3 (December 1995) prepares FA 46 officers for the ongoing challenges in the contemporary information environment (CIE).

DTIC

Education; News Media; Public Relations; Requirements

20070037818 Carnegie-Mellon Univ., Pittsburgh, PA USA

T-Cube: A Data Structure for Fast Extraction of Time Series from Large Datasets

Sabhnani, Maheshkumar; Moore, Andrew W; Dubrawski, Artur W; Apr 2007; 22 pp.; In English

Contract(s)/Grant(s): FA8650-05-C-7264

Report No.(s): AD-A471457; CMU-ML-07-114; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report introduces a data structure called T-Cube designed to dramatically improve response time to ad-hoc time series queries against large datasets. We have tested T-Cube on both synthetic and real world data 'emergency room patient visits, pharmacy sales' containing millions of records. The results indicate that T-Cube responds to complex queries 1,000 times faster when compared to the state-of-the-art commercial time series extraction tools. This speedup has two main benefits: 1. It enables massive scale statistical mining of large collections of time series data, and 2. It allows its users to perform many complex ad-hoc queries without inconvenient delays. These benefits have been already found useful in applications related to practice of monitoring safety of food and agriculture, in detection of emerging patterns of failures in maintenance and supply management systems, as well as in the original application domain: bio-surveillance.

DTIC

Data Structures; Extraction; Information Retrieval; Time Series Analysis

20070037823 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Using Innovative Knowledge Management Tools for Information Technology Development, Acquisition, and Integration in the USA Army

Williams, Daniel S; Jun 15, 2007; 161 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471465; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this thesis is to determine whether or not the Army is effectively and adequately employing innovative (IP-based) knowledge management (KM) tools to manage the knowledge of information technology (IT) development, acquisition, and integration. A world of unmanaged IT information is available to the military from various commercial and government sources that could improve its IT requirements analysis, efficiency of acquisition, and stewardship of taxpayer dollars in this age of rapidly changing technologies. This important issue is a leadership challenge for all officers to effectively and adequately employ KM to exploit synergies, gain efficiencies, and economies of scale that ultimately save taxpayer dollars and lives. This study is an investigation into the tacit and explicit knowledge of IT that the Army offers for IT development, acquisition, and integration. Case studies of the two current innovative Army KM systems and two potential non-DoD KM models were conducted. These KM systems are: the Battle Command Knowledge System (BCKS), the Center for Army Lessons Learned (CALL), Amazon.com, and BaseOps.net. In addition to these four formal case, seven more Army and Department of Defense (DoD) IT acquisition and KM organizations are investigated for their role and responsibility in tax stewardship, requirements development, and acquisition efficiencies.

DTIC

Acquisition; Information Management; Information Systems; Management Information Systems; United States

20070037863 Northrop Grumman Information Technology, Inc., Fairborn, OH USA

Engineering Data Compendium: Human Perception and Performance Conversion to HTML

Clark, Patrick K; Nov 2006; 18 pp.; In English

Contract(s)/Grant(s): FA8650-05-D-6633; Proj-7184

Report No.(s): AD-A471538; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this task was to convert the three volume Engineering Data Compendium: Human Perception and Performance to HTML so it could be accessed via the World Wide Web. This document provides an extraordinary body of knowledge that can be of use to researchers and practitioners in the fields concerning Human System Integration (HSI).

DTIC

Document Markup Languages; Human Performance; Hypertext

20070037866 Carnegie-Mellon Univ., Pittsburgh, PA USA

Introducing the CERT (Trademark) Resiliency Engineering Framework: Improving the Security and Sustainability Processes

Caralli, Richard A; Stevens, James F; Wallen, Charles M; White, David W; Wilson, William R; Young, Lisa R; May 2007; 142 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A471548; CMU/SEI-2007-TR-009; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As security issues dominate news headlines and affect our daily lives, organizations need to improve their ability to protect and sustain their business-critical assets -- people, information, technology, and facilities -- using human and financial resources efficiently and effectively. Traditional activities such as security and business continuity must not only be effective at achieving these goals, but also must offer the organization increased capabilities for managing and controlling operational resiliency. Unfortunately, organizations often manage these activities in a reactive posture fraught with stove-piped organizational structures and poorly defined and measured goals. The result: potentially less-than-adequate operational resiliency to support business objectives. But organizations can vastly improve operational resiliency by viewing it as an engineering-based process that can be defined, managed, measured, and improved. This view ensures collaboration between security and business continuity activities toward common goals and considers the role of supporting activities such as governance, asset and risk management, and financial control. This report introduces the CERT Resiliency Engineering Framework as a foundational model that describes the essential processes for managing operational resiliency, provides a structure from which an organization can begin process improvement of its security and business continuity efforts, and catalyzes the formation of a community from which further definition of this emerging discipline can evolve.

DTIC

Commerce; Computer Programming; Management Planning; Organizations; Resilience; Security; Software Engineering

20070038079

NASA Video Catalog

November 2007; 86 pp.; In English

Report No.(s): NASA/SP-2007-7109/SUPPL17; No Copyright; Avail.: CASI: [A05](#), Hardcopy

This issue of the NASA Video Catalog cites video productions listed in the NASA STI database. The videos listed have been developed by the NASA centers, covering Shuttle mission press conferences; fly-bys of planets; aircraft design, testing and performance; environmental pollution; lunar and planetary exploration; and many other categories related to manned and unmanned space exploration. Each entry in the publication consists of a standard bibliographic citation accompanied by an abstract. The Table of Contents shows how the entries are arranged by divisions and categories according to the NASA Scope and Subject Category Guide. For users with specific information, a Title Index is available. A Subject Term Index, based on the NASA Thesaurus, is also included. Guidelines for usage of NASA audio/visual material, ordering information, and order forms are also available.

Author

Audio Visual Material; Bibliographies; Catalogs (Publications); Indexes (Documentation); Space Exploration; Space Shuttle Missions

20070038083 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

NASA Taxonomy 2.0 Project Overview

Dutra, Jayne; Busch, Joseph; November 16, 2004; 22 pp.; In English; American Society for Information Science and Technology, Annual Meeting, 12-17 Nov. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40450>

This viewgraph presentation reviews the project to develop a Taxonomy for NASA. The benefits of this project are: Make it easy for various audiences to find relevant information from NASA programs quickly, specifically (1) Provide easy access for NASA Web resources (2) Information integration for unified queries and management reporting ve search results targeted to user interests the ability to move content through the enterprise to where it is needed most (3) Facilitate Records Management and Retention Requirements. In addition the project will assist NASA in complying with E-Government Act of 2002 and prepare NASA to participate in federal projects.

CASI

Information Management; Resources Management; Taxonomy; Classifications; Indexing (Information Science); Terminology; Information Retrieval

20070038140 Library of Congress, Washington, DC USA

Information Security and Data Breach Notification Safeguards

Stevens, Gina M; Jul 31, 2007; 26 pp.; In English

Report No.(s): AD-A471179; CRS-RL34120; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471179>

Information security and breach notification requirements are imposed on some entities that own, possess, or license sensitive personal information. Information security standards are designed to protect personally identifiable information from compromise, unauthorized disclosure, unauthorized acquisition, unauthorized access, or other situations where unauthorized persons have access or potential access to personally identifiable information for unauthorized purposes. Data breach notification requirements obligate covered entities to provide notice to affected persons (e.g., cardholders, customers) about the occurrence of a data security breach involving personally identifiable information. The first data breach notification law was enacted in 2002-- S.B. 1386, the California Security Breach Notification Act. It requires any state agency, person, or business that owns or licenses computerized personal information to disclose any breach of a resident's personal information. S.B. 1386 was the model for subsequent data breach notification laws enacted by many states and Congress. California's law and other similar federal and state laws require the disclosure of security breaches of personal information. Major data security breaches have been disclosed by the nation's largest information brokerage firms, retailers, companies, universities, and government agencies. From February 2005 to December 2006, 100 million personal records were reportedly lost or exposed. Massive data security breaches in 2005, 2006, and 2007 have heightened interest in the security of personal information; in the business and regulation of data brokers; in the liability of retailers, credit card issuers, payment processors, banks, and furnishers of credit reports for third party companies costs arising from data breaches; and in remedies available to individuals whose personal information was accessed without authorization.

DTIC

Security; Information Management

20070038192 NASA Marshall Space Flight Center, Huntsville, AL, USA

Lessons Learned from Deploying an Analytical Task Management Database

O'Neil, Daniel A.; Welch, Clara; Arceneaux, Joshua; Bulgatz, Dennis; Hunt, Mitch; Young, Stephen; September 26, 2007; 20 pp.; In English; 58th International Astronautical Congress, 24-28 Sep. 2007, Hyderabad, India; Original contains black and white illustrations

Report No.(s): IAC-07-D3.4./D3.5/E5.5.08; Copyright; Avail.: CASI: [A03](#), Hardcopy

Defining requirements, missions, technologies, and concepts for space exploration involves multiple levels of organizations, teams of people with complementary skills, and analytical models and simulations. Analytical activities range from filling a To-Be-Determined (TBD) in a requirement to creating animations and simulations of exploration missions. In a program as large as returning to the Moon, there are hundreds of simultaneous analysis activities. A way to manage and integrate efforts of this magnitude is to deploy a centralized database that provides the capability to define tasks, identify resources, describe products, schedule deliveries, and generate a variety of reports. This paper describes a web-accessible task management system and explains the lessons learned during the development and deployment of the database. Through the database, managers and team leaders can define tasks, establish review schedules, assign teams, link tasks to specific requirements, identify products, and link the task data records to external repositories that contain the products. Data filters and spreadsheet export utilities provide a powerful capability to create custom reports. Import utilities provide a means to populate the database from previously filled form files. Within a four month period, a small team analyzed requirements, developed a prototype, conducted multiple system demonstrations, and deployed a working system supporting hundreds of users across the aeros pace community. Open-source technologies and agile software development techniques, applied by a skilled team enabled this impressive achievement. Topics in the paper cover the web application technologies, agile software development, an overview of the system's functions and features, dealing with increasing scope, and deploying new versions of the system.

Author

Space Exploration; Organizations; Software Engineering; Data Bases; Computer Programming; Mathematical Models; Schedules

20070038270 NASA Marshall Space Flight Center, Huntsville, AL, USA

Science and Exploration Research Office Publications and Presentations, January 1-December 31, 2006

Summers, F. G., Compiler; July 2007; 48 pp.; In English

Report No.(s): NASA/TM-2007-215018; M-1195; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038270>

This Technical Memorandum (TM) lists the significant publications and presentations of the Science and Exploration Research Office during the period January 1-December 31, 2006. Entries in the main part of the document are categorized according to NASA Reports (arranged by report number), Open Literature and Presentations (arranged alphabetically by title). Most of the articles listed under Open Literature have appeared in refereed professional journals, books, monographs, or conference proceedings. Although many published abstracts are eventually expanded into full papers for publication in scientific and technical journals, they are often sufficiently comprehensive to include the significant results of the research reported. Therefore, published abstracts are listed separately in a subsection under Open Literature.

Author

Aerospace Sciences; Astrophysics; Biophysics; Weightlessness; Earth Sciences; Bibliographies

20070038394 Defence Science and Technology Organisation, Edinburgh, Australia

Scenario Development for Information Operations (IO) Experimentation

Allwright, Alan; Jul 10, 2003; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471642; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471642>

Defence Operations Research Symposium held in Sydney, Australia on 8-10 July 2003.

DTIC

Information Systems; IO

20070038402 Defence Science and Technology Organization, Australia

Knowledge Superiority Parameter - a Metric for Network Centric Warfare (NCW)

Beck, Justin; Moon, Terry; van Antwerpen, Coen; Reynolds, Hayley; Forsyth, Adam; Oct 1, 2003; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471658; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471658>

Problem: NCW concepts include the primacy of information and its exploitation using technology. Evaluating the military worth of knowledge derived from information is, however, a major challenge for the international OR community.

DTIC

Warfare

20070038442 Army Engineer Research and Development Center, Vicksburg, MS USA

A Wetland Restoration Spatial Decision Support System for the Mississippi Gulf Coast

Lin, Jeff P; Kleiss, Barbara A; Aug 2007; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471738; ERDC/EL-TR-07-12; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471738>

The Engineer Research and Development Center, Environmental Laboratory, has created a Wetlands Restoration Spatial Decision Support System (SDSS) based on Geographic Information System (GIS) tools. SDSS will be used to identify and prioritize potential wetland restoration areas along the Mississippi Gulf Coast as part of the non-structural solutions planned for that area following Hurricane Katrina. Advantages of the SDSS approach include relatively rapid identification and assessment of a large number of restoration sites across a wide area. Potential sites can also be evaluated and restored in a watershed or landscape context, maximizing the benefits of wetland restoration.

DTIC

Coasts; Decision Support Systems; Gulf of Mexico; Gulfs; Reclamation; Restoration; Wetlands

20070038460 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Finding Weakness in Jihadist Propaganda

King, Timothy R; May 2007; 63 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471796; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471796>

The Global War on Terror is an ideological war being fought in an environment indicative of Fourth Generation Warfare. Propaganda bypasses traditional defenses and strikes right at the center of gravity: popular support. In the modern war of ideologies, communication is decisive; propaganda is cleverly designed and influential communication that compels associated populations to support the cause or leave the battlefield. The Jihadists seek social revolution and rely on propaganda to communicate their cause. Propaganda is especially effective because of the nature of globalized communications -- a picture, a video, or a statement quickly consumes the attention of the world media and is spread instantaneously. Communist China successfully completed a social revolution during the 20th Century. Their revolution has striking similarities to the current Jihadist social revolution, although China had a significant capability the Jihadists do not: the Chinese government could control nearly all aspects of information within their country. Despite the advantages of globalized communications, the Jihadists do not 'own' the battlefield. They are effectively using the battleground (i.e., television, internet, satellite TV), but they pale in comparison to America's potential for using it. Today, America does little to compete with the Jihadists in the realm of information operations. But should it ever decide to compete, America can win the war of ideology on the information battlefield. The appendices present posters conveying different kinds of propaganda from World War I, World War II, Mao's Communist China, and today's Jihadists. The older posters were intended to spur fundraising, recruitment, racial/religious hatred, productivity, and unity. The Jihadist posters rely on hate against America to agitate the Islamic population and to promote recruitment and suicide bombings.

DTIC

China; Terrorism; Vulnerability; Warfare

20070038594 National Commission on Libraries and Information Science, Washington, DC USA

Preliminary Assessment of the Proposed Closure of the National Technical Information Service (NTIS): A Report to the President and the Congress

Mar 2000; 73 pp.; In English

Report No.(s): AD-A471868; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA National Commission on Libraries and Information Science (NCLIS) is an independent agency charged by

Section 5 of PL 91-345 to take a leadership position on matters pertaining to the library and information needs of the nation. Specifically, Section 1504(a)(1) of Title 20 says that the Commission shall 'advise the President and the Congress on the implementation of national policy by such statements, presentations, and reports as it deems appropriate.' In fulfillment of that statutory mandate, the Commission has been carefully studying the proposal made in August 1999 by the Department of Commerce to close the National Technical Information Service (NTIS) and shift its paper, microfiche, digital archives, and bibliographic database to the Library of Congress. Soon after Secretary Daley's announcement, the Commission met with senior Departmental officials, as well as staff members of both the Senate and House committees holding jurisdiction over science and technology issues. All recognized the value of an independent examination of the Commerce proposal, and all participated in the Commission's public and working meetings, and other fact and opinion gathering activities during the September 1999 - February 2000 period. I am attaching our report, which documents results of the Commission's research, interviews, public meetings, government meetings, and other fact and opinion gathering efforts, and spells out fully our specific findings, conclusions, and recommendations. It is called a 'preliminary assessment' because we plan to undertake an in-depth study of all alternatives later.

DTIC

Closures; Organizations; Presidential Reports

20070038687 Defence Science Technology Lab., Farnborough, UK

Quantifying the Benefits of NEC

Court, Georgia; Sharp, Lynda C; Apr 2005; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472042; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Command and Control; Information Management

20070038708 Library of Congress, Washington, DC USA

Protection of Classified Information by Congress: Practices and Proposals

Kaiser, Frederick M; Sep 5, 2007; 7 pp.; In English

Report No.(s): AD-A472070; CRS-RS20748; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The protection of classified national security and other controlled information is of concern not only to the executive branch -- which determines what information is to be safeguarded, for the most part -- but also to Congress, which uses the information to fulfill its constitutional responsibilities. It has established mechanisms to safeguard controlled information in its custody, although these arrangements have varied over time between the two chambers and among panels in each. Both chambers, for instance, have created offices of security to consolidate relevant responsibilities, although these were established two decades apart. Other differences exist at the committee level. Proposals for change, some of which are controversial, usually seek to set uniform standards or heighten requirements for access. This report will be updated as conditions require.

DTIC

Procedures; Protection; Regulations

20070038735 Gracar Corp., Dayton, OH USA

Smart Systems for Logistics Command and Control (SSLC2) Spiral Two

Matthews, Elizabeth; Cagle, Ron; Gruenke-Saunders, Jessica; Gallimore, Jennie J; Feb 2006; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-04-C-6404; Proj-2830

Report No.(s): AD-A472113; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Virtual Space Logistics Readiness Center (VSLRC) Living Laboratory was developed to provide Air Force Space Command (AFSPC) users with a consistent understanding of space system operational, equipment, communication, and logistics status. VSLRC also provides the ability to post required critical briefing materials such as Quarterly Sustainment Reviews, weekly Production Meetings, and daily Situation Reports and provide users with the most updated information that would assist in data analysis and status reporting. The purpose of this Spiral Two research was to obtain user feedback on the effectiveness of VSLRC. Users were given a questionnaire to provide feedback after they had one month to become familiar with the VSLRC software. Thirteen items of criteria were established and measured through the questionnaire. The questionnaire results support the overall success of the VSLRC project, as it met its measured criteria in twelve out of thirteen of the study's research categories including: the effectiveness of VSLRC visualizations, support for decision making, providing situation awareness, perceived satisfaction, ease of learning, ease of use, improvement in timeliness, effective and

clearly presented information, usefulness, understanding of reporting functions and overall usability. Time log data were also collected which provided a benchmark for the time it takes to update weapon system status data and transfer that data into VSRLC. It can be expected that significant time savings will result when VSRLC is automatically updated and when all AFSPC personnel use VSLRC as a standard tool. Feedback related to user ideas for incorporation of real time sensing technologies were solicited and users indicated several areas where sensors would be useful.

DTIC

Command and Control; Decision Making; Logistics; Software Development Tools; Space Logistics; User Requirements

20070038874 Department of Defense, Washington, DC USA

Information Management (IM) Strategic Plan. Version 2.0

Oct 1999; 43 pp.; In English

Report No.(s): AD-A471966; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We must exploit the RMA and RBA to meet the challenges of an uncertain future and ensure we maintain information superiority over our adversaries. Information superiority is not only the foundation of new military concepts -- it is the key to reinventing the defense infrastructure. To meet this responsibility, the Department must have a strategic plan that addresses the management and use of IM capabilities. Thus this DoD IM Strategic Plan provides overall direction and guidance for managing the Department's information resources. It establishes the DoD vision for IM, top goals and objectives, and strategies to accomplish the goals.

DTIC

Defense Program; Information Management; Management Planning; Organizations

20070038876 Office of the Deputy Inspector General for Auditing, Arlington, VA USA

Information Technology Management: DoD Organization Information Assurance Management of Information Technology Goods and Services Acquired Through Interagency Agreements

Ugone, Mary L; Jolliffe, Richard B; Wiccarver, Jacqueline; Davis, Sean; Kince, Therese; Beal, Deirdre; Holliman, Benita; Lesly, Kelly; Marr, Mandie; Hart, Marcia; Cleveland, Karma; Price, Matt; Feb 23, 2006; 36 pp.; In English

Report No.(s): AD-A471955; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Chief information officers within DoD and individuals responsible for DoD Component information assurance should read this report because it contains information on properly securing information technology goods and services purchased through interagency agreements. Many Federal agencies, including DoD, are now making greater use of interagency agreements to improve the Government's aggregate buying power and simplify the procurement process. The information technology goods and services purchased through these agreements do not stand alone, but instead are part of the seamless web of communications networks, computers, software, databases, applications, security services, and other capabilities used by DoD. As a result, information assurance is an important aspect of any DoD information system, no matter how the system components or services are acquired, whether through traditional acquisitions or interagency agreements. DoD Components are required to implement and maintain adequate security programs that include the minimum information assurance controls outlined in DoD Instruction 8500.2, Information Assurance (IA) Implementation, February 6, 2003, for all DoD information systems. Army, Navy, and Air Force chief information officers rely on subordinate command chief information officers to follow this guidance for all information systems, including those acquired through interagency agreements. Additionally, the National Institute of Standards and Technology Special Publication 800-12, An Introduction to Computer Security, October 1995, recommends monitoring procedures for tracking user activity on DoD systems and networks.

DTIC

Acquisition; Agreements; Information Management; Information Systems; Management Information Systems; Procurement

20070038909 Westat Research, Inc., Rockville, MD USA

Assessment of Electronic Government Information Products

Glover, Denise; Bennett-Harper, Sarah; Alexander, Debbie; Sanniez, Ethel; Mar 30, 1999; 197 pp.; In English

Contract(s)/Grant(s): RN-97007001

Report No.(s): AD-A471622; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471622>

The Federal Depository Library Program (FDLP) has served and continues to serve the American public by ensuring localized access to Federal Government information. The mission continues to be as important today to the fundamental success of our democracy as it was when the FDLP was created. The FDLP's original mandate, to assist Americans regardless

of economic, education, or geographic considerations, is one that must not be lost as we strategically and thoughtfully use the tools of the electronic age to enhance that mandate. The purpose of this study was to assess electronic medium and format standards for the creation and dissemination of electronic information products. The Superintendent of Documents will use the study to continue to plan and implement the transition to a more electronic FDLP.

DTIC

Electronic Publishing; Information Dissemination; Governments; Information Retrieval

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SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20070037453 NASA Marshall Space Flight Center, Huntsville, AL, USA

Radiation Hardened Electronics for Space Environments (RHESE)

Keys, Andrew S.; Adams, James H.; Frazier, Donald O.; Patrick, Marshall C.; Watson, Michael D.; Johnson, Michael A.; Cressler, John D.; Kolawa, Elizabeth A.; September 20, 2007; 23 pp.; In English; AIAA Space 2007: Avionics, Surface and Mission Operations Logistics Session, 18-20 Sep. 2007, Long Beach, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Radiation Environmental Modeling is crucial to proper predictive modeling and electronic response to the radiation environment. When compared to on-orbit data, CREME96 has been shown to be inaccurate in predicting the radiation environment. The NEDD bases much of its radiation environment data on CREME96 output. Close coordination and partnership with DoD radiation-hardened efforts will result in leveraged - not duplicated or independently developed - technology capabilities of: a) Radiation-hardened, reconfigurable FPGA-based electronics; and b) High Performance Processors (NOT duplication or independent development).

Derived from text

Aerospace Environments; Radiation Hardening; Prediction Analysis Techniques; Environment Models

20070038193 NASA Marshall Space Flight Center, Huntsville, AL, USA

The MSFC Systems Engineering Guide: An Overview and Plan

Shelby, Jerry; Thomas, L. Dale; September 24, 2007; 12 pp.; In English; International Astronautical Federation, 24-28 Sep. 2007, Hyderabad, India; Original contains color illustrations

Report No.(s): IAC-07-D1.5.01; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038193>

This paper describes the guiding vision, progress to date and the plan forward for development of the Marshall Space Flight Center (MSFC) Systems Engineering Guide (SEG), a virtual systems engineering handbook and archive that describes the system engineering processes used by MSFC in the development of ongoing complex space systems such as the Ares launch vehicle and forthcoming ones as well. It is the intent of this website to be a 'One Stop Shop' for MSFC systems engineers that will provide tutorial information, an overview of processes and procedures and links to assist system engineering with guidance and references, and provide an archive of relevant systems engineering artifacts produced by the many NASA projects developed and managed by MSFC over the years.

Author

Systems Engineering; NASA Programs; Aerospace Systems; Complex Systems; Aeronautical Engineering

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ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20070036802 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

History of Stellar Interferometry

Lawson, Peter R.; November 18, 2004; 43 pp.; In English; 30 Years Ago : 12T First Fringes Celebration Workshop, 18-19 Nov. 2004, Nice, France; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40538>

This viewgraph presentation reviews the history of stellar interferometry from the suggestion of Fizeau that stellar

interferometry was possible, to the use of the Mark I, II and III for astrometry. Photographs, and parts of original articles are presented.

CASI

Stars; Astronomical Interferometry; Interferometers

20070037478 Naval Observatory, Washington, DC USA

The International Celestial Reference System, Maintenance and Future Realizations

Gaume, Ralph; McCarthy, Dennis; Souchay, Jean; Jul 22, 2003; 10 pp.; In English

Report No.(s): AD-A471078; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471078>

No abstract available

Astronomy; Celestial Mechanics; Celestial Reference Systems; Maintenance

20070038178 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Wavefront Aberrations Due to Alignment and Figure Compensation of the NASA James Webb Space Telescope

Howard, Joseph; August 26, 2007; 19 pp.; In English; SPIE Conference, 26-30 Aug. 2007, San Diego, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038178>

This viewgraph presentation describes wavefront aberrations due to the alignment and improper compensation of the NASA James Webb Space Telescope. The contents include: 1) James Webb Space Telescope (JWST); 2) Optical design of JWST; 3) Alignment Observables for JWST; 4) Low order Zernike Polynomials; 5) PM SM Ability to Target Low Order Aberrations; 6) Compensator definitions and Modes; 7) Field impact from compensation; 8) PM align error compensated by PM figure; 9) PM align error compensated by SM alignment; 10) SM align error compensated by PM figure; 11) SM figure error compensated by SM alignment; 12) Worst Case Pupil Maps; 13) Worst Case Pupil Maps at BEST FOCUS; 14) Field impact from compensation (+/- 1 arcmin FOV); and 15) Concluding Remarks.

CASI

Aberration; Alignment; James Webb Space Telescope; Wave Fronts; Compensators

20070038179 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Deep RGS Observations of Clusters

Smith, R.; Mushotzky, R.; Loewenstein, M.; June 04, 2007; 17 pp.; In English; XMM: The Next Decade, 4-6 Jun. 2007, Madrid, Spain; Original contains black and white illustrations

Contract(s)/Grant(s): NNG04GB78A; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038179>

This viewgraph presentation reviews the Reflection Grating Spectrometers (RGS) observations of clusters. It includes charts detailing the resolution difference between the European Photon Imaging Camera (EPIC) and the RGS and a partial review of existing observations, in graphic format, and as a table. Other sources show up in the ROSAT observations. The presentation reviews possible results that could be achieved in the event that 300 ks of time were allocated for the observations of clusters.

CASI

Star Clusters; XMM-Newton Telescope; X Ray Astronomy; Spectroscopic Analysis; X Ray Spectroscopy

20070038266 NASA Marshall Space Flight Center, Huntsville, AL, USA

A Hard-X-Ray Telescope Science Enhancement Package for the Constellation-X Mission

Ramsey, Brian; Gorenstein, Paul; August 26, 2007; 1 pp.; In English; SPIE Optics and Photonics 2007, 26-30 Aug. 2007, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

We present a science enhancement package (SEP) for NASA's planned Constellation-X mission submitted in response to a call for white papers. The call solicited proposals for either extending the bandwidth of Con-X to higher energies or enhancing the low-energy spectral resolution. The ground rules were that enhancement package should cost no more than \$100M and weigh no more than 100 kg. The nickel-replicated-optics team responded with a stand-alone hard-x-ray telescope SEP concept. This consisted of two mirror modules, each with approximately 70 multilayer and iridium-coated shells, and two corresponding cadmium-zinc-telluride-based focal plane detectors. Addition of this package permits measurement of the hard-x-ray continuum up to 30-40 keV, which is essential for a quantitative measurement of the spectrum of gravitationally

broadened iron lines that appear in the spectra of many black hole candidates. Full details of the instrument will be presented showing trades in energy bandwidth and effective area together with the full science justification for the enhancement package.

Author

Constellation-X; Mirrors; Spectral Resolution

20070038940 NASA Johnson Space Center, Houston, TX, USA

Optical Observations of GEO Debris with Two Telescopes

Seitzer, P.; Abercromby, K.; Rodriguez, H.; Barker, E.; *Orbital Debris Quarterly News*, Vol. 11, No. 3; July 12, 2007, pp. 6-7; In English; See also [20070038938](#); Original contains color illustrations; No Copyright; Avail.: CASI: [A01](#), Hardcopy ONLINE: <http://hdl.handle.net/2060/20070038940>

For several years, the Michigan Orbital DEbris Survey Telescope (MODEST), the University of Michigan's 0.6/0.9-m Schmidt telescope on Cerro Tololo Inter-American Observatory in Chile has been used to survey the debris population at GEO in the visible regime. Magnitudes, positions, and angular rates are determined for GEO objects as they move across the telescope's field-of-view (FOV) during a 5-minute window. This short window of time is not long enough to determine a full six-parameter orbit so usually a circular orbit is assumed. A longer arc of time is necessary to determine eccentricity and to look for changes in the orbit with time. MODEST can follow objects in real-time, but only at the price of stopping survey operations. A second telescope would allow for longer arcs of orbit to obtain the full six orbital parameters, as well as assess the changes over time. An additional benefit of having a second telescope is the capability of obtaining BVRI colors of the faint targets, aiding efforts to determine the material type of faint debris. For 14 nights in March 2007, two telescopes were used simultaneously to observe the GEO debris field. MODEST was used exclusively in survey mode. As objects were detected, they were handed off in near real-time to the Cerro Tololo 0.9-m telescope for follow-up observations. The goal was to determine orbits and colors for all objects fainter than $R = 15$ th magnitude (corresponds to 1 meter in size assuming a 0.2 albedo) detected by MODEST. The hand-off process was completely functional during the final eight nights and follow-ups for objects from night-to-night were possible. The cutoff magnitude level of 15th was selected on the basis of an abrupt change in the observed angular rate distribution in the MODEST surveys. Objects brighter than 15th magnitude tend to lie on a well defined locus in the angular rate plane (and have orbits in the catalog), while fainter objects fill the plane almost uniformly. We need to determine full six-parameter orbits to investigate what causes this change in observed angular rates. Are these faint objects either the same population of high area-to-mass (A/M) objects on eccentric orbits as discovered by the ESA Space Debris Telescope (Schildknecht, et al. 2004), or are they just normal debris from breakups in GEO?

Derived from text

Space Debris; Visual Observation; Schmidt Telescopes; Real Time Operation; Circular Orbits; Field of View; Eccentric Orbits; Angular Velocity; Magnitude

20070038941 NASA Johnson Space Center, Houston, TX, USA

Optical Measurement Center Status

Rodriguez, H.; Abercromby, K.; Mulrooney, M.; Barker, E.; *Orbital Debris Quarterly News*, Vol. 11, No. 3; July 12, 2007, pp. 7; In English; See also [20070038938](#); Original contains color illustrations; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070038941>

Beginning in 2005, an optical measurement center (OMC) was created to measure the photometric signatures of debris pieces. Initially, the OMC was equipped with a 300 W xenon arc lamp, a SBIG 512 x 512 ST8X MEI CCD camera with standard Johnson filters, and a Lynx 6 robotic arm with five degrees of freedom. As research progressed, modifications were made to the equipment. A customized rotary table was built to overcome the robot's limitation of 180 degree wrist rotation and provide complete 360 degree rotation with little human interaction. This change allowed an initial phase angle (source-object-camera angle) of roughly 5 degrees to be adjusted to 7, 10, 15, 18, 20, 25, or 28 degrees. Additionally, the Johnson R and I CCD filters were replaced with the standard astronomical filters suite (Bessell R,I). In an effort to reduce object saturation, the two generic aperture stops were replaced with neutral density filters. Initially data were taken with aluminum debris pieces from the European Space Operations Centre ESOC2 ground test and more recently with samples from a thermal multi-layered insulation (MLI) commonly used on rocket bodies and satellites. The ESOC2 data provided light curve analysis for one type of material but many different shapes, including flat, bent, curled, folded, and torn. The MLI samples are roughly the same size and shape, but have different surfaces that give rise to interesting photometric light curves. In addition, filter photometry was conducted on the MLI pieces, a process that also will be used on the ESOC2 samples. While obtaining light curve data an anomalous drop in intensity was observed when the table revolved through the second 180 degree rotation. Investigation revealed that the robot's wrist rotation is not reliable past 80 degrees, thus the object may be at slightly

different angles at the 180 degree transition. To limit this effect, the initial rotation position begins with the object's minimal surface area facing the camera.

Derived from text

Optical Measurement; Photometry; CCD Cameras; Charge Coupled Devices; Astronomy; Space Debris

90

ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20070037455 NASA Marshall Space Flight Center, Huntsville, AL, USA

Particle Acceleration, Magnetic Field Generation, and Associated Emission in Collisionless Relativistic Jets

Nishikawa, K.-I.; September 24, 2007; 1 pp.; In English; High Energy Phenomenon in Relativistic Outflows, 24 Sep. 2007, Dublin, Ireland; No Copyright; Avail.: Other Sources; Abstract Only

Nonthermal radiation observed from astrophysical systems containing relativistic jets and shocks, e.g., active galactic nuclei (AGNs), gamma-ray bursts (GRBs), and Galactic microquasar systems usually have power-law emission spectra. Recent PIC simulations using injected relativistic electron-ion (electro-positron) jets show that acceleration occurs within the downstream jet. Shock acceleration is a ubiquitous phenomenon in astrophysical plasmas. Plasma waves and their associated instabilities (e.g., the Buneman instability, other two-streaming instability, and the Weibel instability) created in the shocks are responsible for particle (electron, positron, and ion) acceleration. The simulation results show that the Weibel instability is responsible for generating and amplifying highly nonuniform, small-scale magnetic fields. These magnetic fields contribute to the electron's transverse deflection behind the jet head. The 'jitter' radiation from deflected electrons has different properties than synchrotron radiation which is calculated in a uniform magnetic field. This jitter radiation may be important to understanding the complex time evolution and/or spectral structure in gamma-ray bursts, relativistic jets, and supernova remnants.

Author

Magnetic Fields; Active Galactic Nuclei; Gamma Ray Bursts; Particle Acceleration; Nonuniform Magnetic Fields; Emission Spectra

20070037464 NASA Goddard Space Flight Center, Greenbelt, MD, USA; NASA Ames Research Center, Moffett Field, CA, USA

Consistency of Post-Newtonian Waveforms with Numerical Relativity

Baker, John G.; vanMeter, James R.; McWilliams, Sean T.; Cewntrella, Joan; Kelly, Bernard J.; 4 Dec. 2006; 5 pp.; In English; To appear in Physical Review Letter; Original contains black and white illustrations

Contract(s)/Grant(s): O5-BEFS-05-0044; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070037464>

General relativity predicts the gravitational radiation signatures of mergers of compact binaries, such as coalescing binary black hole systems. Derivations of waveform predictions for such systems are required for optimal scientific analysis of observational gravitational wave data, and have so far been achieved primarily with the aid of the post-Newtonian (PN) approximation. The quality of this treatment is unclear, however, for the important late inspiral portion. We derive late-inspiral waveforms via a complementary approach, direct numerical simulation of Einstein's equations, which has recently matured sufficiently for such applications. We compare waveform phasing from simulations covering the last approximately 14 cycles of gravitational radiation from an equal-mass binary system of nonspinning black holes with the corresponding 3PN and 3.5PN orbital phasing. We find agreement consistent with internal error estimates based on either approach at the level of one radian over approximately 10 cycles. The result suggests that PN waveforms for this system are effective roughly until the system reaches its last stable orbit just prior to the final merger/

Author

Gravitational Waves; Relativity; Waveforms; Binary Stars

20070037465 NASA Goddard Space Flight Center, Greenbelt, MD, USA; NASA Ames Research Center, Moffett Field, CA, USA

Binary Black Hole Late Inspiral: Simulations for Gravitational Wave Observations

Baker, John G.; vanMeter, James R.; Centrella, Joan; Choi, Dae-II; Kelly, Bernard J.; Koppitz, Michael; 19 Dec. 2006; 16 pp.; In English; Sponsored in part by the Leon A. Herreid Graduate Fellowship, The Korean Federation of Science and Technology Societies and by the Korean Government (MOEHRD, Basis Research Promotion Fund; Original contains black and white illustrations

Contract(s)/Grant(s): 05-BEFS-05-0044; Copyright; Avail.: CASI: [A03](#), Hardcopy

Coalescing binary black hole mergers are expected to be the strongest gravitational wave sources for ground-based interferometers, such as the LIGO, VIRGO, and GEO600, as well as the spacebased interferometer LISA. Until recently it has been impossible to reliably derive the predictions of General Relativity for the final merger stage, which takes place in the strong-field regime. Recent progress in numerical relativity simulations is, however, revolutionizing our understanding of these systems. We examine here the specific case of merging equal-mass Schwarzschild black holes in detail, presenting new simulations in which the black holes start in the late inspiral stage on orbits with very low eccentricity and evolve for approximately 1200M through approximately 7 orbits before merging. We study the accuracy and consistency of our simulations and the resulting gravitational waveforms, which encompass approximately 14 cycles before merger, and highlight the importance of using frequency (rather than time) to set the physical reference when comparing models. Matching our results to PN calculations for the earlier parts of the inspiral provides a combined waveform with less than half a cycle of accumulated phase error through the entire coalescence. Using this waveform, we calculate signal-to-noise ratios (SNRs) for iLIGO, adLIGO, and LISA, highlighting the contributions from the late-inspiral and merger-ringdown parts of the waveform which can now be simulated numerically. Contour plots of SNR as a function of z and M show that adLIGO can achieve SNR 2×10 for some IMBBHs out to z approximately equals 1, and that LISA can see MBBHs in the range $3 \times 10^{(exp 4)}$ approximately $< M/M_{\odot}$ approximately $< 10^{(exp 7)}$ at SNR > 100 out to the earliest epochs of structure formation at $z > 15$.

Author

Black Holes (Astronomy); Gravitational Waves; Signal to Noise Ratios; Waveforms; Astronomical Interferometry; Spaceborne Astronomy; Binary Stars

20070037819 Cornell Univ., Ithaca, NY USA

The Unusual Hydrocarbon Emission From the Early Carbon Star HD 100764: The Connection Between Aromatics and Aliphatics

Sloan, G C; Jura, M; Duley, W W; Kraemer, K E; Bernard-Salas, J; Forrest, W J; Sargent, B; Li, A; Barry, D J; Bohac, C J; Aug 2007; 11 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A471459; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have used the Infrared Spectrograph (IRS) on the Spitzer Space Telescope to obtain spectra of HD 100764, an apparently single carbon star with a circumstellar disk. The spectrum shows emission features from polycyclic aromatic hydrocarbons (PAHs) that are shifted to longer wavelengths than normally seen, a characteristic of 'class C' systems in the classification scheme of Peeters et al. All seven of the known class C PAH sources are illuminated by radiation fields that are cooler than those which typically excite PAH emission features. The observed wavelength shifts are consistent with hydrocarbon mixtures containing both aromatic and aliphatic bonds. We propose that the class C PAH spectra are distinctive because the carbonaceous material has not been subjected to a strong ultraviolet radiation field, allowing relatively fragile aliphatic materials to survive.

DTIC

Aliphatic Hydrocarbons; Carbon Stars; Early Stars; Hydrocarbons; Polycyclic Aromatic Hydrocarbons

20070037889 Air Force Research Lab., Hanscom AFB, MA USA

The 1859 Space Weather Event: Then and Now

Clover, E W; Jan 2006; 12 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A471584; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The 1859 space weather event, combining the first solar flare ever reported with arguably the largest geomagnetic storm ever observed, provided a dramatic opening to a new area of Sun-Earth studies. Here I describe solar science at the time of the discovery of the flare, recount the observation, and trace the developments that led to the correct interpretation of the 1859 solar-terrestrial event by Bartels in 1937. A 'fast forward' takes us to the present time when advances in modeling and

increasing concern with space weather have prompted renewed interest in a classic observation.

DTIC

Aerospace Environments; Space Weather; Weather

20070038196 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Comparison of the Variability of the Symbiotic X-ray Binaries GX 1+4, 4U 1954+31, and 4U 1700+24 from Swift/BAT and RXTE/ASM Observations

Corbet, R. H. D.; Sokoloski, J. L.; Mukai, K.; Markwardt, C. B.; Tueller, J.; [2007]; 33 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; SAO G06-7022AA; Copyright; Avail.: CASI: [A03](#), Hardcopy

We present an analysis of the X-ray variability of three symbiotic X-ray binaries, GX 1+4, 4U 1700+24, and 4U 1954+31, using observations made with the Swift Burst Alert Telescope (BAT) and the Rossi X-ray Timing Explorer (RXTE) All-Sky Monitor (ASM). Observations of 4U 1954+31 with the Swift BAT show modulation at a period near 5 hours. Models to explain this modulation are discussed including the presence of an exceptionally slow X-ray pulsar in the system and accretion instabilities. We conclude that the most likely interpretation is that 4U 1954+31 contains one of the slowest known X-ray pulsars. Unlike 4U 1954+31, neither GX 1+4 nor 4U 1700+24 show any evidence for modulation on a timescale of hours. An analysis of the RXTE ASM light curves of GX 1+4, 4U 1700+24, and 4U 1954+31 does not show the presence of periodic modulation in any source, although there is considerable variability on long timescales for all three sources. There is no modulation in GX 1+4 on either the optical 1161 day orbital period or a previously reported 304 day X-ray period. For 4U 1700+24 we do not confirm the 404 day period previously proposed for this source from a shorter duration ASM light curve.

Author

X Ray Timing Explorer; Swift Observatory; Variability; X Ray Binaries; Symbiotic Stars

20070038302 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Novae as a Class of Transient X-ray Sources

Mukai, K.; Orio, M.; Valle, M. Della; [2007]; 13 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: CASI: [A03](#), Hardcopy

Motivated by the recently discovered class of faint ($10(\exp 34)$ - $10(\exp 35)$ ergs/s) X-ray transients in the Galactic Center region, we investigate the 2-10 keV properties of classical and recurrent novae. Existing data are consistent with the idea that all classical novae are transient X-ray sources with durations of months to years and peak luminosities in the $10(\exp 34)$ - $10(\exp 35)$ ergs/s range. This makes classical novae a viable candidate class for the faint Galactic Center transients. We estimate the rate of classical novae within a 15 arcmin radius region centered on the Galactic Center (roughly the field of view of XMM-Newton observations centered on Sgr A*) to be approx.0.1 per year. Therefore, it is plausible that some of the Galactic Center transients that have been announced to date are unrecognized classical novae. The continuing monitoring of the Galactic Center region carried out by Chandra and XMM-Newton may therefore provide a new method to detect classical novae in this crowded and obscured region, an

Author

Novae; X Ray Sources; Field of View; Luminosity

20070038314 NASA Marshall Space Flight Center, Huntsville, AL, USA

GRMHD and GRPIC Simulations

Nishikawa, K.-I.; Mizuno, Y.; Watson, M.; Fuerst, S.; Wu, K.; Hardee, P.; Fishman, G. J.; September 18, 2007; 1 pp.; In English; An Inter-disciplinary Workshop/Forum on Magnetospheric Activities in Moons, Planets, Stars and Black Holes, 18-20 Sep. 2007, London, UK; Copyright; Avail.: Other Sources; Abstract Only

We have developed a new three-dimensional general relativistic magnetohydrodynamic (GRMHD) code by using a conservative, high-resolution shock-capturing scheme. The numerical fluxes are calculated using the HLL approximate Riemann solver scheme. The flux-interpolated constrained transport scheme is used to maintain a divergence-free magnetic field. We have performed various 1-dimensional test problems in both special and general relativity by using several reconstruction methods and found that the new 3D GRMHD code shows substantial improvements over our previous code. The simulation results show the jet formations from a geometrically thin accretion disk near a nonrotating and a rotating black hole. We will discuss the jet properties depended on the rotation of a black hole and the magnetic field configuration including issues for future research. A General Relativistic Particle-in-Cell Code (GRPIC) has been developed using the Kerr-Schild metric. The code includes kinetic effects, and is in accordance with GRMHD code. Since the gravitational force acting on

particles is extreme near black holes, there are some difficulties in numerically describing these processes. The preliminary code consists of an accretion disk and free-falling corona. Results indicate that particles are ejected from the black hole. These results are consistent with other GRMHD simulations. The GRPIC simulation results will be presented, along with some remarks and future improvements. The emission is calculated from relativistic flows in black hole systems using a fully general relativistic radiative transfer formulation, with flow structures obtained by GRMHD simulations considering thermal free-free emission and thermal synchrotron emission. Bright filament-like features protrude (visually) from the accretion disk surface, which are enhancements of synchrotron emission where the magnetic field roughly aligns with the line-of-sight in the co-moving frame. The features move back and forth as the accretion flow evolves, but their visibility and morphology are robust. We would like to extend this research using GRPIC simulations and examine a possible new mechanism for certain X-ray quasi-periodic oscillations (QPOs) observed in blackhole X-ray binaries.

Author

Magnetohydrodynamics; Relativistic Particles; Black Holes (Astronomy); Coronas; Magnetic Field Configurations; Magnetic Fields; X Ray Binaries; Thermal Emission; Synchrotron Radiation

20070038388 Air Force Research Lab., Hanscom AFB, MA USA

Validating the Proton Prediction System (PPS)

Kahler, S W; Cliver, E W; Ling, A G; Dec 2006; 8 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A471620; AFRL-VS-HA-TR-2007-1083; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471620>

The proton prediction system (PPS) is a program developed at the Air Force Research Laboratory (AFRL) to predict solar energetic ($E > 5$ MeV) proton (SEP) intensities at 1 AU following solar flares. It is based on average observed SEP intensity-time profiles, peak intensities, and event durations. The input parameters are solar flare peak or time-integrated X-ray or radio fluxes and their times of onsets and maxima, and solar flare locations. We do a limited validation of the PPS using 78 GOES solar X-ray flares of peak intensity $\geq M5$ with well associated H alpha flare locations. Predicted peak proton intensities ($E > 10$ MeV) and event onset and rise times are compared with SEP events observed by GOES. We also select all GOES $E > 10$ MeV SEP events above 10 proton flux units (pfu) during the same time period to compare with those predicted by the PPS. With our MS X-ray flare threshold the PPS yields approximately equal numbers of correct predictions, false predictions, and missed 10-pfu SEP events.

DTIC

Forecasting; Prediction Analysis Techniques; Protons; Solar Flares; Space Weather

20070038984 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Space Interferometry Mission Science Overview

Unwin, Stephen C.; October 18, 2004; 17 pp.; In English; Astrometry in the Age of the Next Generation of Large Telescopes, 18-20 Oct. 2004, Flagstaff, AZ, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40523>

Conclusions: ESA is on track for a launch in 2010. Project 'Phase C' start in October 2005. ESA is a flexibly-pointed instrument Astrometric capability (wide angle) a) 4 pas parallax precision on targets down to $V = 20$ = Stellar and Galactic astrophysics; and b) 1 pas single measurement accuracy. Sensitive to terrestrial-mass planets around the nearest stars New proposal opportunities are: a) AO-2 for new (large) Key projects - 2005; and b) General Observer program, for smaller proposals - 2006.

Derived from text

Interferometry; Space Missions; Astrophysics; Astrometry; Parallax

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*.

20070037443 NASA Goddard Space Flight Center, Greenbelt, MD, USA

White Light Demonstration of One Hundred Parts per Billion Irradiance Suppression in Air by New Starshade Occulters

Levinton, Douglas B.; Cash, Webster C.; Gleason, Brian; Kaiser, Michael J.; Levine, Sara A.; Lo, Amy S.; Schindhelm, Eric; Shipley, Ann F.; [2007]; 9 pp.; In English; SPIE Conference, 26-30 Aug. 2007, San Diego, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: [A02](#), Hardcopy

A new mission concept for the direct imaging of exo-solar planets called the New Worlds Observer (NWO) has been proposed. The concept involves flying a meter-class space telescope in formation with a newly-conceived, specially-shaped, deployable star-occulting shade several meters across at a separation of some tens of thousands of kilometers. The telescope would make its observations from behind the starshade in a volume of high suppression of incident irradiance from the star around which planets orbit. The required level of irradiance suppression created by the starshade for an efficacious mission is of order 0.1 to 10 parts per billion in broadband light. This paper discusses the experimental setup developed to accurately measure the suppression ratio of irradiance produced at the null position behind candidate starshade forms to these levels. It also presents results of broadband measurements which demonstrated suppression levels of just under 100 parts per billion in air using the Sun as a light source. Analytical modeling of spatial irradiance distributions surrounding the null are presented and compared with photographs of irradiance captured in situ behind candidate starshades.

Author

Irradiance; Mathematical Models; Occultation; Light Sources; Air; Fabrication; Miniaturization; Extrasolar Planets

20070037451 NASA Marshall Space Flight Center, Huntsville, AL, USA

PISCES: A 'Stepping Stone' to International Space Exploration and Development

Howell, Joe T.; Henley, Mark W.; Schowengerdt, Frank; September 24, 2007; 15 pp.; In English; 58th International Astronautical Congress, 24-28 Sep. 2007, Hyderabad, India; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The Pacific International Space Center for Exploration Systems (PISCES) was initiated by the Japan/US Science, Technology and Space Application Programs (JUSTSAP) to advance research and education in space exploration technology and systems working closely with the State of Hawaii. Hawaii has a heritage with space exploration including the training of Apollo astronauts and testing of lunar rover systems in some of the most realistic terrestrial sites available. The high altitude dry environment with greater solar insolation, and the dry lunar regolith-like volcanic ash and cratered terrain make Hawaiian sites ideal to support, international space exploration technology development, demonstration, education and training. This paper will summarize development and roles of PISCES in lunar surface analogs, simulations, technology demonstrations, research and training for space exploration technology and systems.

Author

Space Exploration; Space Programs; Support Systems; Technology Utilization

20070038181 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Exploring the Possibilities: Earth and Space Science Missions in the Context of Exploration

Pfarr, Barbara; Calabrese, Michael; Kirkpatrick, James; Malay, Jonathan T.; [2006]; 7 pp.; In English; 2006 IEEE Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA; Original contains black and white illustrations
Report No.(s): IEEEAC Paper 1190; Copyright; Avail.: CASI: [A02](#), Hardcopy

According to Dr. Edward J. Weiler, Director of the Goddard Space Flight Center, 'Exploration without science is tourism'. At the American Astronautical Society's 43rd Annual Robert H. Goddard Memorial Symposium it was quite apparent to all that NASA's current Exploration Initiative is tightly coupled to multiple scientific initiatives: exploration will enable new science and science will enable exploration. NASA's Science Mission Directorate plans to develop priority science missions that deliver science that is vital, compelling and urgent. This paper will discuss the theme of the Goddard Memorial Symposium that science plays a key role in exploration. It will summarize the key scientific questions and some of the space and Earth science missions proposed to answer them, including the Mars and Lunar Exploration Programs, the Beyond Einstein and Navigator Programs, and the Earth-Sun System missions. It will also discuss some of the key technologies that will enable these missions, including the latest in instruments and sensors, large space optical system technologies and optical

communications, and briefly discuss developments and achievements since the Symposium. Throughout history, humans have made the biggest scientific discoveries by visiting unknown territories; by going to the Moon and other planets and by seeking out habitable worlds, NASA is continuing humanity's quest for scientific knowledge.

Author

Lunar Exploration; Mars Exploration; Space Missions; Science; NASA Programs

20070038190 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Radiolytic Gas-Driven Cryovolcanism in the Outer Solar System

Cooper, John F.; Cooper, Paul D.; Sittler, Edward C.; Sturmer, Steven J.; Rymer, Abigail M.; Hill, Matthew E.; August 06, 2007; 43 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Water ices in surface crusts of Europa, Enceladus, Saturn's main rings, and Kuiper Belt Objects can become heavily oxidized from radiolytic chemical alteration of near-surface water ice by space environment irradiation. Oxidant accumulations and gas production are manifested in part through observed H₂O₂ on Europa, tentatively also on Enceladus, and found elsewhere in gaseous or condensed phases at moons and rings of Jupiter and Saturn. On subsequent chemical contact in sub-surface environments with significant concentrations of primordially abundant reductants such as NH₃ and CH₄, oxidants of radiolytic origin can react exothermically to power gas-driven cryovolcanism. The gas-piston effect enormously amplifies the mass flow output in the case of gas formation at basal thermal margins of incompressible fluid reservoirs. Surface irradiation, H₂O₂ production, NH₃ oxidation, and resultant heat, gas, and gas-driven mass flow rates are computed in the fluid reservoir case for selected bodies. At Enceladus the oxidant power inputs are comparable to limits on nonthermal kinetic power for the south polar plumes. Total heat output and plume gas abundance may be accounted for at Enceladus if plume activity is cyclic in high and low 'Old Faithful' phases, so that oxidants can accumulate during low activity phases. Interior upwelling of primordially abundant NH₃ and CH₄ hydrates is assumed to resupply the reductant fuels. Much lower irradiation fluxes on Kuiper Belt Objects require correspondingly larger times for accumulation of oxidants to produce comparable resurfacing, but brightness and surface composition of some objects suggest that such activity may be ongoing.

Author

Solar System; Volcanoes; Cryogenics; Mathematical Models; Radiolysis; Gas Flow

20070038283 Universite des Sciences et Techniques de Lille Flandres Artois, Villeneuve D'Ascq, France; NASA Johnson Space Center, Houston, TX, USA

Transmission Electron Microscopy of Cometary Residues from Micron-Sized Craters in the Stardust Al-Foils

Leroux, Hugues; Stroud, Rhonda M.; Dai, Zu Rong; Graham, Giles A.; Troadec, David; Bradley, John P.; Teslich, Nick; Borg, Janet; Kearsley, Anton T.; Horz, Friedrich; [2008]; 43 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources; Abstract Only

We report Transmission Electron Microscopy (TEM) investigations of micro-craters that originated from hypervelocity impacts of comet 81P/Wild 2 dust particles on the aluminium foil of the Stardust collector. The craters were selected by Scanning Electron Microscopy (SEM) and then prepared by Focused Ion Beam (FIB) milling techniques in order to provide electron transparent cross-sections for TEM studies. The crater residues contain both amorphous and crystalline materials in varying proportions and compositions. The amorphous component is interpreted as resulting from shock melting during the impact and the crystalline phases as relict minerals. The latter show evidence for shock metamorphism. Based on the residue morphology and the compositional variation, the impacting particles are inferred to have been dominated by mixtures of submicron olivine, pyroxene and Fe-sulfide grains, in agreement with prior results of relatively coarse-grained mineral assemblages in the aerogel collector.

Author

Transmission Electron Microscopy; Stardust Mission; Wild 2 Comet; Cometary Collisions; Aluminum; Metal Foils; Hypervelocity Impact; Craters

20070038298 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Earth System Science Pathfinder Orbiting Carbon Observatory (OCO) Mission

Crisp, David; July 21, 2003; 23 pp.; In English; International Geoscience and Remote Sensing Symposium (IGARSS) 2003, 21-25 Jul. 2003, Toulouse, France; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: <http://hdl.handle.net/2014/40417>

A viewgraph presentation describing the Earth System Science Pathfinder Orbiting Carbon Observatory (OCO) Mission is shown. The contents include: 1) Why CO₂?; 2) What Processes Control CO₂ Sinks?; 3) OCO Science Team; 4)

Space-Based Measurements of CO₂; 5) Driving Requirement: Precise, Bias-Free Global Measurements; 6) Making Precise CO₂ Measurements from Space; 7) OCO Spatial Sampling Strategy; 8) OCO Observing Modes; 9) Implementation Approach; 10) The OCO Instrument; 11) The OCO Spacecraft; 12) OCO Will Fly in the A-Train; 13) Validation Program Ensures Accuracy and Minimizes Spatially Coherent Biases; 14) Can OCO Provide the Required Precision?; 15) O₂ Column Retrievals with Ground-based FTS; 16) X(sub CO₂) Retrieval Simulations; 17) Impact of Albedo and Aerosol Uncertainty on X(sub CO₂) Retrievals; 18) Carbon Cycle Modeling Studies: Seasonal Cycle; 19) Carbon Cycle Modeling Studies: The North-South Gradient in CO₂; 20) Carbon Cycle Modeling Studies: Effect of Diurnal Biases; 21) Project Status and Schedule; and 22) Summary.

CASI

Carbon Cycle; Earth Sciences; Remote Sensing; Observatories; Earth Orbits; Space Missions

20070038299 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

An Approach to Autonomous Operations for Remote Mobile Robotic Exploration

Chouinard, Caroline M.; Fisher, Forest W.; Gaines, Daniel M.; Estlin, Tara A.; Schaffer, Steve R.; March 12, 2003; 16 pp.; In English; IEEE Aerospace Conference, 8-15 Mar. 2003, Big Sky, MT, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40419>

This viewgraph presentation addresses the use of autonomy for remote mobile robotic exploration. The contents include: 1) Why Use Autonomy?; 2) What Are Some Options? JPL (Reasoning); 3) More Options.. . (Modeling); 4) The CLEaR Control System (Closed Loop Execution and Recovery); 5) Method of Response; 6) Overall Goal; 7) CLEaR in Action; 8) Initial Scenario; 9) Initial Scenario - Planned; 10) Unforeseen Events; and 11) Ongoing Research.

CASI

Autonomy; Robotics; Mobile Communication Systems; Mars Roving Vehicles; Space Exploration

20070038981 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Orbiting Carbon Observatory (OCO) Mission

Crisp, David; Miller, Charles; March 17, 2003; 20 pp.; In English; EOS Afternoon Constellation (A-Train) Mission Operations Working Group, 17 Mar. 2003, Greenbelt, MD, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40413>

This viewgraph presentation gives a general overview of The Orbiting Carbon Observatory (OCO) Mission. The contents include: 1) The Orbiting Carbon Observatory (OCO); 2) Why Measure CO₂?; 3) An Uncertain Future; 4) Monitoring CO₂ from Space; 5) Validation Program Ensures Accuracy and Minimizes Spatially Coherent Biases; 6) The OCO Instrument; 7) The OCO Spacecraft; 8) Mission Operations and Data Downlink; 9) OCO Data Products; 10) OCO Data Product Summary; 11) OCO in the A-Train; 12) Summary; and 13) Simulated Performance.

CASI

Carbon Dioxide; Observatories; Space Missions; General Overviews

20070038985 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Mars Exploration Rover Spirit Sol 18 Anomaly

Adler, Mark; September 29, 2004; 14 pp.; In English; AIAA Space Conference/ International Mars Conference, 29 Sep. 2004, San Diego, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40546>

The contents include: 1) Discovery; 2) Determination of Vehicle State; 3) Regaining Control of the Vehicle; 4) Diagnosis; 5) Repair and Restoration of Normal Operations; 6) Follow-up Mitigations; and 7) Lessons Learned

CASI

Anomalies; Mars Exploration; Mars Roving Vehicles; NASA Space Programs

20070039092 Cranfield Univ., Bedford, UK

PRIMA (Precursor Rendezvous for Impact Mitigation of Asteroids): Summary of the Group Design Project - 2006-2007

Hobbs, Stephen; September 2007; 50 pp.; In English; Original contains color illustrations

Report No.(s): COA Report No. 0703; Copyright; Avail.: Other Sources

Students of the MSc course in Astronautics and Space Engineering 2006/07 at Cranfield University took the Precursor

Rendezvous for Impact Mitigation of Asteroids (PRIMA) mission as one of their group projects. This report summarizes their findings. Asteroid impacts have shaped Earth's development in the past and they will continue to do so in the future. Large asteroid impacts are acts of nature beyond our ability to mitigate, but the much more frequent impacts with continental rather than global scale can now be prevented in many cases. Effective impact prevention depends on good knowledge of the asteroid threat: the PRIMA mission's goal is to obtain enough information about an asteroid's orbit and composition to enable impact prevention. This PRIMA study's objective is a feasible mission design. The asteroid Apophis was chosen as the prime target because it is representative of the most likely impact risk and it is also the highest current asteroid threat to Earth. To develop the baseline design the team initially identified a range of mission concepts and then chose the best of these using a trade-off based on the concepts' various attributes. The next phase was to develop outline designs for each sub-system, focussing on issues which could affect mission feasibility. The resulting baseline design consists of a 600 kg spacecraft with electric propulsion and a lander containing a tracking beacon which is placed on Apophis. Asteroid composition is measured by radar and seismometry. All results so far indicate that this concept is feasible, although further work is required especially in the areas of low-thrust trajectories for asteroid rendezvous, and technologies for the tracking transponder, measuring asteroid composition, and attaching equipment to an asteroid where gravity is weak and surface composition is uncertain.

Author

Spacecraft Configurations; Orbital Rendezvous; Asteroid Missions; Planetary Systems

92

SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20070037444 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Solar and Interplanetary Sources of Major Geomagnetic Storms (Dst less than or equal to -100 nT) During 1996 - 2005

Zhang, J.; Richardson, I.; Webb, D. F.; Gopalswamy, N.; Huttunen, E.; Kasper, J.; Nitta, N.; Poomvises, W.; Thompson, B. J.; Wu, C.-C.; Yashiro, S.; Zhukov, A.; [2007; ISSN 0148-0227; 24 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): AF19628-00-C-0073; FA8718-04-C-0050; NNG06EO90A; NNG04GN36G; NNG05GG19G; NSF ATM-04-54612; Copyright; Avail.: CASI: **A03**, Hardcopy

We present the results of an investigation of the sequence of events from the Sun to the Earth that ultimately led to the 88 major geomagnetic storms (defined by minimum Dst less than or equal to -100 nT) that occurred during 1996 - 2005. The results are achieved through cooperative efforts that originated at the Living with a Star (LWS) Coordinated Data- Analysis Workshop (CDAW) held at George Mason University in March 2005. Based on careful examination of the complete array of solar and in-situ solar wind observations, we have identified and characterized, for each major geomagnetic storm, the overall solar-interplanetary (solar-IP) source type, the time, velocity and angular width of the source coronal mass ejection (CME), the type and heliographic location of the solar source region, the structure of the transient solar wind flow with the storm-driving component specified, the arrival time of shock/disturbance, and the start and ending times of the corresponding IP CME (ICME). The storm-driving component, which possesses a prolonged and enhanced southward magnetic field ($B_{\text{sub s}}$) may be an ICME, the sheath of shocked plasma (SH) upstream of an ICME, a corotating interaction region (CIR), or a combination of these structures. We classify the Solar-IP sources into three broad types: (1) S-type, in which the storm is associated with a single ICME and a single CME at the Sun; (2) M-type, in which the storm is associated with a complex solar wind flow produced by multiple interacting ICMEs arising from multiple halo CMEs launched from the Sun in a short period; (3) C-type, in which the storm is associated with a CIR formed at the leading edge of a high speed stream originating from a solar coronal hole (CH). For the 88 major storms, the S-type, M-type and C-type events number 53 (60%): 24 (27%) and 11 (13%), respectively. For the 85 events for which the surface source regions could be investigated, 54 (63%) of the storms originated in solar active regions, 10 (12%) in quiet Sun regions associated with quiescent filaments or filament channels, and 11 (13%) were associated with coronal holes. Remarkably, 10 (12%) CME-driven events showed no sign of eruptive features on the surface (e.g., no flare, no coronal dimming, and no loop arcade, etc), even though all the available solar observation in a suitable time period were carefully examined. Thus, while it is generally true that a major geomagnetic storm is more likely to be driven by a front-side fast halo CME associated with a major flare, our study indicates a broad distribution of source properties. The implications of the results for space weather forecasting are briefly discussed.

Author

Coronal Mass Ejection; Magnetic Storms; Space Weather; Interplanetary Space; Solar Physics

20070038335 NASA Marshall Space Flight Center, Huntsville, AL, USA

Initiation of Solar Eruptions

Sterling, Alphonse C.; Moore, Ronald L.; April 07, 2007; 10 pp.; In English; National Solar Observatory, 7 Apr. 2007, Sun Spot, NM, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A02](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20070038335>

We consider processes occurring just prior to and at the start of the onset of flare- and CME-producing solar eruptions. Our recent work uses observations of filament motions around the time of eruption onset as a proxy for the evolution of the fields involved in the eruption. Frequently the filaments show a slow rise prior to fast eruption, indicative of a slow expansion of the field that is about to explode. Work by us and others suggests that reconnection involving emerging or canceling flux results in a lengthening of fields restraining the filament-carrying field, and the consequent upward expansion of the field in and around the filament produces the filament's slow rise: that is, the reconnection weakens the magnetic 'tethers' ('tether-weakening' reconnection), and results in the slow rise of the filament. It is still inconclusive, however, what mechanism is responsible for the switch from the slow rise to the fast eruption.

Author

Extreme Ultraviolet Radiation; Magnetic Field Configurations; Field Strength; Radial Velocity

20070038370 NASA Marshall Space Flight Center, Huntsville, AL, USA

Hinode Observations of the Onset Stage of a Solar Filament Eruption

Sterling, Alphonse C.; Moore, Ronald L.; August 19, 2007; 50 pp.; In English; Announcing First Results from Hinode, 20-25 Aug. 2007, Dublin, Ireland; No Copyright; Avail.: CASI: [A03](#), Hardcopy
ONLINE: <http://hdl.handle.net/2060/20070038370>

We use Hinode X-Ray Telescope (XRT) and Solar Optical Telescope (SOT) filtergraph (FG) Stokes-V magnetogram observations, to study the early onset of a solar eruption that includes an erupting filament that we observe in TRACE EUV images. The filament undergoes a slow rise for about 20 min prior to its fast eruption and strong soft X-ray flaring, and the new Hinode data elucidate the physical processes occurring during the slow-rise period. Magnetic flux cancellation occurs along the neutral line of the filament, beginning several hours before eruption. During the slow-rise phase, a soft X-ray (SXR) sigmoid forms from apparent reconnection low in the sheared core field traced by the filament, and there is a low-level intensity peak in both EUV and SXRs at the start of the slow rise.

Author

Solar Activity; Solar Prominences; Magnetic Flux; Solar Optical Telescope; X Ray Telescopes

20070038374 National Space Science and Technology Center, Huntsville, AL, USA

The Width of a CME and the Source of the Driving Magnetic Explosion

Moore, R. L.; Sterling, A. C.; Suess, S. T.; August 20, 2007; 15 pp.; In English; Announcing the First Results from Hinode, 20-25 Aug. 2007, Dublin, Ireland; Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

We show that the strength of the magnetic field in the area covered by the flare arcade following a CME-producing ejective solar eruption can be estimated from the final angular width of the CME in the outer corona and the final angular width of the flare arcade. We assume (1) the flux-rope plasmoid ejected from the flare site becomes the interior of the CME plasmoid, (2) in the outer corona the CME is roughly a 'spherical plasmoid with legs' shaped like a light bulb, and (3) beyond some height in or below the outer corona the CME plasmoid is in lateral pressure balance with the surrounding magnetic field. The strength of the nearly radial magnetic field in the outer corona is estimated from the radial component of the interplanetary magnetic field measured by Ulysses. We apply this model to three well-observed CMEs that exploded from flare regions of extremely different size and magnetic setting. In each event, the estimated source-region field strength is appropriate for the magnetic setting of the flare. This agreement indicates via the model that CMEs (1) are propelled by the magnetic field of the CME plasmoid pushing against the surrounding magnetic field, and (2) can explode from flare regions that are laterally far offset from the radial path of the CME in the outer corona.

Author

Coronal Mass Ejection; Solar Flares; Plasmas (Physics)

20070039075 NASA Marshall Space Flight Center, Huntsville, AL, USA

Polarization Measurements on SUMI's TVLS Gratings

Kobayashi, K.; West, E. A.; Davis, J. M.; Gary, G. A.; August 26, 2007; 12 pp.; In English; SPIE Optics and Photonics: Optical Engineering and Applications, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20070039075>

We present measurements of toroidal variable-line-space (TVLS) gratings for the Solar Ultraviolet Magnetograph Investigation (SUMI), currently being developed at the National Space Science and Technology Center (NSSTC). SUMI is a spectro-polarimeter designed to measure magnetic fields in the solar chromosphere by observing two UV emission lines sensitive to magnetic fields, the CIY line at 155nm and the MgII line at 280nm. The instrument uses a pair of TVLS gratings, to observe both linear polarizations simultaneously. Efficiency measurements were done on bare aluminum gratings and aluminum/MgF2 coated gratings, at both linear polarizations.

Author

Polarimeters; Solar Magnetic Field; Emission Spectra; Ultraviolet Radiation; Magnetometers

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20070038182 American Inst. of Aeronautics and Astronautics, Reston, VA, USA

The Case for Exploration Spacecraft

Caceres, Marco; Aerospace America; August 2007; ISSN 0740-722X; Volume 45, No. 8, pp. 22-25; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

This article poses the question 'Would more emphasis on scientific discovery rather than large-scale construction engineering have served NASA better, in terms of generating more public excitement and greater congressional support for its activities?' In doing so, it reviews some of the discoveries about our universe, the galaxy, the solar system, and the Earth made by unmanned scientific satellites. The International Space Station and the attendant costs of construction using the Space Shuttle, in the authors opinion, may have cost NASA some of the public attention and budget that could have been spent on other scientific missions. Ultimately the article questions the cost of construction of a moon base versus using the money to send more exploration satellites to further explore the cosmos.

CASI

Costs; Scientific Satellites; Astronomy; Astrophysics; Solar Physics; Cosmology

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