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STAR

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National Aeronautics and
Space Administration
Langley Research Center

**Scientific and Technical
Information Program Office**

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- Translations in report form;
- NASA-owned patents and patent applications
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Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

Abstracts in *STAR* are categorized by 10 major subject divisions that are divided further into 76 specific subject categories. The subject divisions and categories are listed in the Table of Contents together with a note for each that defines its scope and provides any cross-references.

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Subject Divisions

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F. Life Sciences
G. Mathematical and Computer Sciences
H. Physics
I. Social and Information Sciences
J. Space Sciences
K. General

Indexes

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

Subject Term Index
Personal Author Index

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Subject Categories of the Division A. Aeronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

01 Aeronautics (General) 1

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

02 Aerodynamics 1

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 Heat Transfer.*

03 Air Transportation and Safety 4

Includes passenger and cargo air transport operations; aircraft 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*.

04 Aircraft Communications and Navigation 8

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.*

05 Aircraft Design, Testing and Performance 10

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*.

06 Avionics and Aircraft Instrumentation 13

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For relatead information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.*

07 Aircraft Propulsion and Power 14

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; 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*.

08 Aircraft Stability and Control 14

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*.

09 Research and Support Facilities (Air) 15

Includes airports, runways, hangers, 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 operation see *03 Air Transportation and Safety.* For astronautical facilities see *14 Ground Support Systems and Facilities (Space).*

Subject Categories of the Division B. Astronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

16 Space Transportation and Safety 17

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also *03 Air Transportation and Safety* and *15 Launch Vehicles and Launch Vehicles,* and *18 Spacecraft Design, Testing and Performance*. For space suits, see *54 Man/System Technology and Life Support*.

18 Spacecraft Design, Testing and Performance 17

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.*

19 Spacecraft Instrumentation and Astrionics 18

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 Aircraft Instrumentation and Avionics;* For spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy, Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy.*

20 Spacecraft Propulsion and Power 18

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*.

Subject Categories of the Division C. Chemistry and Materials

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

23 Chemistry and Materials (General) 20

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 24 through 29*. For astrochemistry see category *90 Astrophysics*.

24 Composite Materials 23

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

25 Inorganic, Organic, and Physical Chemistry 24

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

26 Metals and Metallic Materials 26

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

27 Nonmetallic Materials 27

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials.*

28 Propellants and Fuels 30

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*.

29 Space Processing 30

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

Subject Categories of the Division D. Engineering

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

32 Communications and Radar 31

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.*

33 Electronics and Electrical Engineering 35

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.*

34 Fluid Mechanics and Thermodynamics 36

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.*

35 Instrumentation and Photography 38

Includes remote sensors; measuring instruments and gauges; 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*.

36 Lasers and Masers 39

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*.

37 Mechanical Engineering 40

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*.

39 Structural Mechanics 41

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

Subject Categories of the Division E. Geosciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

42 Geosciences (General) 43

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

43 Earth Resources and Remote Sensing 44

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see *35 Instrumentation and Photography.*

44 Energy Production and Conversion 45

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*.

45 Environment Pollution 46

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

46 Geophysics 48

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*.

47 Meteorology and Climatology 49

Includes weather observation forecasting and modification.

48 Oceanography 50

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*.

Subject Categories of the Division F. Life Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

51 Life Sciences (General) 51

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*.

52 Aerospace Medicine 104

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*.

53 Behavioral Sciences 110

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 Man/System Technology and Life Support 111

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

Subject Categories of the Division G. Mathematical and Computer Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

60 Computer Operations and Hardware 112

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*.

61 Computer Programming and Software 113

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.

62 Computer Systems 119

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.

63 Cybernetics, Artificial Intelligence and Robotics 120

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support.*

64 Numerical Analysis 125

Includes iteration, differential and difference equations, and numerical approximation.

65 Statistics and Probability 126

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

66 Systems Analysis and Operations Research 126

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

Subject Categories of the Division H. Physics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

71 Acoustics 127

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution.* For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion Propulsion and Power.*

72 Atomic and Molecular Physics 129

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

73 Nuclear Physics 131

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*.

74 Optics 132

Includes light phenomena and the theory of optical devices. For lasers see *36 Lasers and Masers*.

75 Plasma Physics 133

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics*.

76 Solid-State Physics 135

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 Physics of Elementary Particles and Fields 137

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.*

Subject Categories of the Division I. Social and Information Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

80 Social and Information Sciences (General) 138

Includes general research topics related to sociology; educational programs and curricula.

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Includes management planning and research.

82 Documentation and Information Science 140

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software*.

83 Economics and Cost Analysis 141

Includes cost effectiveness studies.

Subject Categories of the Division J. Space Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

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Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

89 Astronomy 143

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x–ray, ultraviolet, and infrared astronomy; and astrometry.

90 Astrophysics 143

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

91 Lunar and Planetary Science and Exploration 144

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*.

Subject Categories of the Division K. General

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99 General 178

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.

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❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

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01
AERONAUTICS (GENERAL)

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

20010041369 Air Force Scientific Advisory Board, Washington, DC USA
Why and Whither Hypersonics Research in the US Air Force ***Final Report, Jan. - Nov. 2000***
Fuchs, Ronald P.; Chaput, Armand J.; Frost, David E.; McMahan, Tom; Vesely, David L.; December 2000; 209p; In English
Report No.(s): AD-A387782; SAB-TR-00-03; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

This report summarizes the deliberations and conclusions of the 2000 Air Force Scientific Advisory Board (SAB) study on Why and Whither Hypersonics Research in the US Air Force. In this study the committee describes the operational requirements of a hypersonic system and presents a research program for air breathing hypersonics to meet the operational requirements. We define a program resulting in an operational air breathing hypersonic space launch system in about 2025. This program includes several exit ramps and potential options. The exit ramps would lead to either an operational rocket-based reusable launch system or continuation of the expendable course the Air Force is currently on. A Red Team Panel was part of the study team and provides alternatives to the air breathing hypersonic systems to meet the operational requirements. The study results represent an outstanding collaboration between the scientific and operational communities and among government, industry, and academia. DTIC

Air Breathing Engines; Hypersonics; Breathing Apparatus; Navy; Military Technology

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 Heat Transfer.

20010040884 Massachusetts Inst. of Tech., Dept. of Mechanical Engineering, Cambridge, MA USA
Propeller Blade Design Thickness and Blockage Issues Due to Source-Induced Factors
Hunt, David S.; Feb. 2001; 67p; In English
Report No.(s): AD-A387655; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A propeller lifting-surface design and analysis program is improved upon by implementing enhancements in the source distribution calculation to represent the blade thickness. It is recognized that the present method of setting the source line distribution representing blade thickness (currently based on linearized slender-body theory for an isolated foil section) may introduce significant errors. This is the case for propulsors with a combination of a large thickness/chord ratio (blockage effect) and numerous blades (cascade effect). A source panel (area) method was developed to more accurately model these effects. This method uses the lattice structure of the current PBD-14 code from which to compute the source-induced velocity factors between the blades, hub, and duct, if present. Using the method of images allows the hub and duct to be modeled as panel images from the blade panels. The source-induced effects of the whole propulsor are accounted for by using a panel method to obtain a source distribution along the mean camber surface of the blade. Invoking the kinematic boundary condition on the true blade suction and pressure surfaces solves this system of linear equations, which represent the blade thickness distribution. This robust formulation

assigns source strengths more accurately over a much larger range of thickness/chord ratios and increasing numbers of blades, as evidenced by a more accurate velocity streamline trace representation of the actual pressure and suction side surfaces of the blade. Experimental validation is demonstrated for open and ducted flow stators.
DTIC
Airfoils; Panel Method (Fluid Dynamics); Propeller Blades; Propellers; Slender Bodies; Air Flow; Lifting Bodies; Ducted Flow

20010041077 Lockheed Martin Engineering and Sciences Co., Hampton, VA USA
Summary Report of the Orbital X-34 Wing Static Aeroelastic Study
Prabhn, Ramadas K., Lockheed Martin Engineering and Sciences Co., USA; April 2001; 20p; In English
Contract(s)/Grant(s): NAS1-96014; RTOP 242-80-01-01
Report No.(s): NASA/CR-2001-210850; NAS 1.26:210850; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report documents the results of a computational study conducted on the Orbital Sciences X-34 vehicle to compute its inviscid aerodynamic characteristics taking into account the wing structural flexibility. This was a joint exercise between LaRC and SDRC of California. SDRC modeled the structural details of the wing, and provided the structural deformation for a given pressure distribution on its surfaces. This study was done for a Mach number of 1.35 and an angle of attack of 9 deg.; the freestream dynamic pressure was assumed to be 607 lb/sq ft. Only the wing and the body were simulated in the CFD computations. Two wing configurations were examined. The first had the elevons in the undeflected position and the second had the elevons deflected 20 deg. up. The results indicated that with elevon undeflected, the wing twists by about 1.5 deg. resulting in a reduction in the angle of attack at the wing tip to by 1.5 deg. The maximum vertical deflection of the wing is about 3.71 inches at the wing tip. For the wing with the undeflected elevons, the effect of this wing deformation is to reduce the normal force coefficient (C(sub N)) by 0.012 and introduce a noise up pitching moment coefficient (C(sub m)) of 0.042.
Author
X-34 Reusable Launch Vehicle; Aerodynamic Characteristics; Aeroelasticity; Inviscid Flow; Computational Fluid Dynamics; Free Flow; Flexibility; Dynamic Pressure

20010041335 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Blast Initiation Detector Proof-Of-Concept Wind Tunnel Testing of Optical/Aeroshell Interface
Gauthier, Leo R., Jr., Johns Hopkins Univ., USA; Mattes, Louis A., Johns Hopkins Univ., USA; Eddins, Christopher L., Johns Hopkins Univ., USA; Nov. 09, 2000; 14p; In English; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): N00024-98-D-8124
Report No.(s): AD-A386552; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Interceptors with fragmenting warheads that detonate in proximity to target vehicles are being used in missile defense tests. As part of this effort, it is necessary to be able to measure the performance of an interceptor during the endgame and it is preferable that the measurements be recorded independently from the interceptor telemetry. Target-based instrumentation and telemetry are used to provide this independent performance measurement. A Blast initiation Detector (BID) was developed for use onboard target vehicles to detect the initiation of the blast from the fragmenting warhead. The blast detection provides a target-centric temporal baseline for the final sequence of events during the intercept. The BID uses a circumferential array of six individual optical fibers attached to the surface of the target re-entry vehicle. The distal tip of each optical fiber protrudes beyond the surface of the aeroshell to provide the required optical field-of-view. Testing was used to address concerns of possible optical tip damage that could be induced by aerothermal loads. The optical fiber/aeroshell interface design of the BID was proven out by performing wind tunnel testing in a simulated aerothermal environment at the Avery Advanced Technology Development Laboratory by using two toggling laser beams at differing angles of incidence to simulate the blasts. The exposed distal tip of the optical fiber reached 1200 deg F during the worst aerothermal heating. The measured optical signals from the fibers indicated no significant degradation of performance and provided a proof-of-concept for the design of the optical/aeroshell interface of the BID.
DTIC
Fiber Optics; Wind Tunnel Tests; Attack Aircraft; Performance Prediction; Aerodynamic Heating; Aerothermodynamics; Detonation

20010041343 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France

In-Flight Flow Visualization Results of The F-106B With a Vortex Flap

Brandon, Jay M., NASA Langley Research Center, USA; Hallissy, James B., NASA Langley Research Center, USA; Brown, Philip W., NASA Langley Research Center, USA; Lamar, John E., NASA Langley Research Center, USA; [2001]; 36p; In English; Symposium on Advanced Flow Management. Part A: Vortex Flow and High Angle of Attack, 7-11 May 2001, Loen, Norway; Original contains color illustrations

Report No.(s): RTO-MP-69-P-43; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Surface and off-surface flow visualization techniques were used to visualize the three-dimensional vortex flows on the F-106 aircraft with vortex flaps installed. Results at angles of attack between 9 deg to 18 deg and Mach numbers from 0.3 to 0.9 are presented. A smoke flow vapor screen technique was used to document leading-edge vortex paths and sizes, while an oil flow technique was employed to provide detailed information on reattachment and separation line locations and other flow details. Results were obtained for two vortex flap deflection angles, 30 deg and 40 deg. Flow visualization revealed the existence of a multiple vortex system that had not previously been seen in subscale tests or predicted for this configuration. The vortex flap generated a leading-edge vortex system that reattached near the flap hinge over a wide angle of attack range. In addition to the primary vortex, flow visualization revealed the presence of several distinct vortices which traced a path from the vortex flap and then over the wing.

Author

Flow Visualization; Three Dimensional Flow; Vortex Flaps; Vortices; Wind Tunnel Tests

20010041358 Old Dominion Univ., Norfolk, VA USA

Experimental Development and Physical Analysis of Jet and Vortex Actuators ***Final Report***

Kandil, Osama A., Old Dominion Univ., USA; Yang, Zhi, Old Dominion Univ., USA; Lachowicz, Jason T., Old Dominion Univ., USA; [2000]; 10p; In English

Contract(s)/Grant(s): NCC1-322; AFSOR-ISSA-98-0021; ISBN 0-7803-5846; Copyright; Avail: Issuing Activity

The Vortex generator consists of a cavity with a lightweight actuator plate. The actuator plate acts like a piston pumping air out of the cavity on the down-stroke and sucking air into the cavity on the upstroke. The actuator is placed asymmetrically over the cavity opening, forming narrow and wide slots when viewed from the top. The actuator depending on amplitude, frequency, and slot spacing produces several flow fields (free jet, wall jet, vortex flow). Computational simulation of the actuator-generated flows have been developed and applied to several actuator flow modes. The objectives of this paper are to study the physics of the actuator-induced flow and to develop computational simulations of the actuatorgenerated flows. This work should provide an impetus for designing similar active flow control systems suitable for aircraft applications. The computational simulation uses a time-accurate full Navier-Stokes (NS) solver known as FTNS3D (a full NS version of CFL3D solver). A Multi-block moving grid has been developed and used for the computational study of the flow fields produced by the vortex generator. For three-dimensional computations, ten multi-block grids are used and for two-dimensional computations, six multiblock grids are used. The grid blocks adjacent to the actuator plate move with the plate motion, and second-order interpolation is used along the block interfaces. Periodic response of the flow has been observed to develop after three cycles of the plate sinusoidal motion.

Author

Active Control; Boundary Layer Control; Actuators; Flow Distribution; Free Jets; Jet Flow; Vortex Generators; Simulation; Jet Control; Computational Grids; Multiblock Grids; Navier-Stokes Equation

20010043660 NASA Langley Research Center, Hampton, VA USA

Simultaneous Aerodynamic and Structural Design Optimization (SASDO) for a 3-D Wing

Gumbert, Clyde R., NASA Langley Research Center, USA; Hou, Gene J.-W., Old Dominion Univ., USA; Newman, Perry A., NASA Langley Research Center, USA; [2001]; 16p; In English; 15th AIAA Computational Fluid Dynamics, 11-14 Jun. 2001, Anaheim, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Financial sponsored in part by Old Dominion Univ. Research Foundation

Contract(s)/Grant(s): NAS1-19858; L-9291

Report No.(s): AIAA Paper 2001-2527; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The formulation and implementation of an optimization method called Simultaneous Aerodynamic and Structural Design Optimization (SASDO) is shown as an extension of the Simultaneous Aerodynamic Analysis and Design Optimization (SAADO) method. It is extended by the inclusion of structure element sizing parameters as design variables and Finite Element Method (FEM) analysis responses as constraints. The method aims to reduce the computational expense. incurred in performing shape and sizing optimization using state-of-the-art Computational Fluid Dynamics (CFD) flow analysis, FEM structural analysis and sensitivity analysis tools. SASDO is applied to a simple. isolated, 3-D wing in inviscid flow. Results show that the method finds

the saine local optimum as a conventional optimization method with some reduction in the computational cost and without significant modifications; to the analysis tools.
Author
Aerodynamic Characteristics; Structural Design; Design Optimization; Design Analysis

20010043661 NASA Langley Research Center, Hampton, VA USA
Development of Unsteady Aerodynamic State-Space Models from CFD-Based Pulse Responses
Silva, Walter A., NASA Langley Research Center, USA; Raveh, Daniella E., Georgia Inst. of Tech., USA; [2001]; 9p; In English
Report No.(s): AIAA Paper 2001-1213; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

A method for computing discrete-time state-space models of linearized unsteady aerodynamic behavior directly from aeroelastic CFD codes is presented. The method involves the treatment of CFD-based pulse responses as Markov parameters for use in a system identification /realization algorithm. Results are presented for the AGARD 445.6 Aeroelastic Wing with four aeroelastic modes at a Mach number of 0.96 using the EZNSS Euler/Navier-Stokes flow solver with aeroelastic capability. The System/Observer/Controller Identification Toolbox (SOCIT) algorithm, based on the Ho-Kalman realization algorithm, is used to generate 15th- and 32nd-order discrete-time state-space models of the unsteady aerodynamic response of the wing over the entire frequency range of interest.
Author
Unsteady Aerodynamics; Aeroelasticity; Aerodynamic Characteristics; Mathematical Models; Computational Fluid Dynamics; Stokes Flow

20010043665 NASA Langley Research Center, Hampton, VA USA
Prediction of Business Jet Airloads Using The Overflow Navier-Stokes Code
Bounajem, Elias, Cessna Aircraft Co., USA; Buning, Pieter G., NASA Langley Research Center, USA; 2001; 10p; In English
Report No.(s): AIAA Paper 2001-1004; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of this work is to evaluate the application of Navier-Stokes computational fluid dynamics technology, for the purpose of predicting off-design condition airloads on a business jet configuration in the transonic regime. The NASA Navier-Stokes flow solver OVERFLOW with Chimera overset grid capability, availability of several numerical schemes and convergence acceleration techniques was selected for this work. A set of scripts which have been compiled to reduce the time required for the grid generation process are described. Several turbulence models are evaluated in the presence of separated flow regions on the wing. Computed results are compared to available wind tunnel data for two Mach numbers and a range of angles-of-attack. Comparisons of wing surface pressure from numerical simulation and wind tunnel measurements show good agreement up to fairly high angles-of-attack.
Author
Computational Fluid Dynamics; Computational Grids; Grid Generation (Mathematics); Navier-Stokes Equation; Separated Flow; Wings; Aerodynamics; Air Flow

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft 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.

20010040762 NASA Marshall Space Flight Center, Huntsville, AL USA
The THOR Project-Reducing the Impact of Thunderstorms on Aviation and the General Public Through a Multi-Agency Effect
Smith, Stephan B., National Weather Service, USA; Pace, David; Goodman, Steven J.; Burgess, Donald W.; Smarsh, David; Roberts, Rita D.; Wolfson, Marilyn M.; [2001]; 1p; In English; 18th Conference on Weather Analysis and Forecasting, 30 Jul. - 2 Aug. 2001, Silver Spring, MD, Silver Spring, MD, USA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Thunderstorms are high impact weather phenomena. They also pose an extremely challenging forecast problem. The National Oceanic and Atmospheric Administration (NOAA), the Federal Aviation Administration (FAA), the National Aeronautic and Space Administration (NASA), and the Air Force Weather Agency (AFWA), have decided to pool technology and scientific expertise into an unprecedented effort to better observe, diagnose, and forecast thunderstorms. This paper describes

plans for an operational field test called the THunderstorm Operational Research (THOR) Project beginning in 2002, the primary goals of which are to: 1) Reduce the number of Thunderstorm-related Air Traffic Delays with in the National Airspace System (NAS) and, 2) Improve severe thunderstorm, tornado and airport thunderstorm warning accuracy and lead time. Aviation field operations will be focused on the prime air traffic bottleneck in the NAS, the airspace bounded roughly by Chicago, New York City and Washington D.C., sometimes called the Northeast Corridor. A variety of new automated thunderstorm forecasting applications will be tested here that, when implemented into FAA-NWS operations, will allow for better tactical decision making and NAS management during thunderstorm days. Severe thunderstorm operations will be centered on Northern Alabama. NWS meteorologists from the forecast office in Birmingham will test the utility of experimental lightning, radar, and profiler data from a mesoscale observing network being established by NASA's Marshall Space Flight Center. In addition, new tornado detection and thunderstorm nowcasting algorithms will be examined for their potential for improving warning accuracy. The Alabama THOR site will also serve as a test bed for new gridded, digital thunderstorm and flash flood warning products.
Author
Thunderstorms; Algorithms; Decision Making; Field Tests; Forecasting; Lightning; Nowcasting; Weather

20010040823 Army Safety Center, Fort Rucker, AL USA
Flightfax: Army Aviation Risk-Management Information. Volume 29, Number 3, March 2001
Mar. 2001; 12p; In English
Report No.(s): AD-A387939; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Flightfax is published by the U.S. Army Safety Center, Fort Rucker, AL 36362-5363. Information is for accident-prevention purposes only and is specifically prohibited for use for punitive purposes or matters of liability, litigation, or competition. This issue contains topics such as shipboard landings, safety professionals, accidents, and army aviation research.
DTIC
Accident Prevention; Liabilities; Risk; Safety; Aerospace Safety; Flight Safety; Aircraft Safety; Safety Management

20010040856 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA
Aviation and the Environment: Airport Operations and Future Growth Present Environmental Challenges
Aug. 2000; 108p; In English; Original contains color illustrations
Report No.(s): PB2001-104191; GAO/RCED-00-153; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy
The Ranking Democratic Member of the House Transportation and Infrastructure Committee asked GAO to review (1) the key concerns and challenges associated with airports current operations and future growth particularly concerns about aircraft noise, water quality, and air pollutant emissions and the actions being taken by the nations busiest airports to balance environmental concerns with such operations and growth and (2) the actions taken by FAA and other federal agencies to address environmental concerns associated with airports current operations and future growth.
NTIS
Airports; Environmental Quality; Environment Effects; Aeronautics

20010040857 General Accounting Office, Washington, DC USA
Aviation Competition: Regional Jet Service Yet to Reach Many Small Communities
Feb. 2000; 62p; In English
Report No.(s): PB2001-104407; GAO/01/344; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
Many aviation experts view U.S. airlines growing use of small regional jets1 as a revolutionary development that is significantly changing the aviation marketplace. Because jets are generally faster, quieter, smoother, and perceived to be safer than turboprop aircraft, the public tends to prefer travel by jet. Additionally, because regional jets (typically seating between 32 and 70 passengers) tend to have lower operating costs than larger mainline jets (e.g., the Boeing 737, which may seat 110 passengers or more), expectations rose that air carriers would provide regional jet service to smaller communities that could not profitably support mainline service. The report focusses on three questions: What is the status of regional jet deployment in the USA, and how has this service evolved. What factors have affected the airlines decisions in deploying regional jets. What effects have regional jets had on air traffic and airport congestion, according to published studies and experts in the field.
NTIS
Air Transportation; Competition; Support Systems; Cost Reduction

20010041044 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
Integrated Icing Diagnostic Algorithm (IIDA) Assessment Report
Sims, Danny; Carty, Thomas; Fidalgo, Cynthia; Sep. 2000; 65p; In English; Original contains color plates
Report No.(s): AD-A387889; DOT/FAA/CT-TN00/16; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes the Assessment of the Integrated Icing Diagnostic Algorithm (IIDA) conducted by ACT-320 at the Aviation Weather Center (AWC) from March through May 1998. The IIDA, developed by scientists at the National Center for Atmospheric Research (NCAR), combines a number of in-flight icing detection techniques into an integrated algorithm that makes use of the strengths of each technique. IIDA output is a graphical depiction of the potential for encountering in-flight icing. The purpose of the assessment was to collect feedback from AWC forecasters on the utility of IIDA and to guide NCAR in making improvements to the algorithm. Results of the assessment indicated there was value to integrating various icing detection techniques. The IIDA Icing Potential product appeared to provide the most benefit. In addition, several suggestions for IIDA enhancements were provided.
DTIC
Algorithms; Weather Forecasting; Systems Integration; Civil Aviation; Aircraft Icing

20010041073 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA
Aircraft Cargo Compartment Smoke Detector Alarm Incidents on U.S.-Registered Aircraft, 1974-1999
Blake, David, Federal Aviation Administration, USA; Jun. 2000; 22p; In English
Report No.(s): PB2000-108246; DOT/FAA/AR-TN00/29; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This technical note documents the number of incidents of cargo compartment smoke detector alarms on U.S.-registered aircraft operating under Federal Aviation Regulations (FAR) Part 121 and Part 135 for the years 1974 through 1999. The source for the data includes the Federal Aviation Administration (FAA) Service Difficulty Report System, the FAA Accident/Incident Reports, and National Transportation Safety Board (NTSB) accident information. The incidents are tabulated by year, precautionary action taken, cause, aircraft type, and phase of flight.
NTIS
Aircraft Compartments; Air Cargo; Smoke Detectors; Warning Systems; USA

20010041307 General Accounting Office, Washington, DC USA
AVIATION COMPETITION: Regional Jet Service Yet to Reach Many Small Communities
Feb. 2001; 58p; In English
Report No.(s): AD-A387948; GAO-01-344; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Many aviation experts view U.S. airlines growing use of small regional jets as a revolutionary development that is significantly changing the aviation market place. Because jets are generally faster, quieter, smoother, and perceived to be safer than turboprop aircraft, the public tends to prefer travel by jet. Additionally, because regional jets (typically seating between 32 and 70 passengers) tend to have lower operating costs than larger mainline jets (e.g., the Boeing 737, which may seat 110 passengers or more), expectations rose that air carriers would provide regional jet service to smaller communities that could not profitably support mainline service. and because regional jets can fly farther than turboprop aircraft, their use holds the potential for small communities to obtain new service on longer routes to more distant airports thereby perhaps offering new service options to those small communities. The Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21) further fueled small communities expectations of improved air service through specific provisions that eased certain restrictions at New York's LaGuardia Airport to encourage air carriers to serve smaller communities with regional jets.
DTIC
Airline Operations; Air Transportation; Civil Aviation; Aircraft Industry; Jet Aircraft; Boeing 737 Aircraft

20010041314 Civil Aeromedical Inst., Civil Aeromedical Inst., Oklahoma City, OK USA
A Human Error Analysis of Commercial Aviation Accidents Using the Human Factors Analysis and Classification System (HFACS) ***Final Report***
Wiegmann, Douglas A., Illinois Univ. at Urbana-Champaign, USA; Shappell, Scott A., Civil Aeromedical Inst., USA; February 2001; 17p; In English; Prepared in collaboration with Illinois Univ., Urbana-Champaign, Institute of Aviation, Savoy
Report No.(s): AD-A387808; DOT/FAA/AM-01/3; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Human Factors Analysis and Classification System (HFACS) is a general human error framework originally developed and tested within the U.S. military as a tool for investigating and analyzing the human causes of aviation accidents. Based upon Reason's (1990) model of latent and active failures, HFACS addresses human error at all levels of the system, including the condition of aircrew and organizational factors. The purpose of the present study was to assess the utility of the HFACS framework

as an error analysis and classification tool outside the military. Specifically, HFACS was applied to commercial aviation accident records maintained by the National Transportation Safety Board (NTSB). Using accidents that occurred between January 1990 and December 1996, it was demonstrated that HFACS reliably accommodated all human causal factors associated with the commercial accidents examined. In addition, the classification of data using HFACS highlighted several critical safety issues in need of intervention research. These results demonstrate that the HFACS framework can be a viable tool for use within the civil aviation arena.
DTIC
Aircraft Accident Investigation; Commercial Aircraft; Error Analysis; Human Factors Engineering; Human Performance

20010042203 General Accounting Office, Washington, DC USA
Aviation Competition: Challenges in Enhancing Competition in Dominated Markets
Hecker, Jayetta Z., General Accounting Office, USA; Mar. 13, 2001; 25p; In English; Testimony before the Senate Committee on Commerce, Science, and Transportation.
Report No.(s): AD-A387720; GAO/01-518T; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We appreciate the opportunity to testify on some of the vexing issues of competition in the commercial aviation industry. Extensive research and the experience of millions of Americans underscore the benefits that have flowed to most consumers from the 1978 deregulation of the airline industry, including dramatic reductions in fares and expansion of service. These benefits are largely attributable to increased competition--by the entry of both new airlines into the industry and established airlines into new markets. At the same time, however, airline deregulation has not benefited everyone; some communities particularly small and medium-sized communities in the East and upper Midwest--have suffered from relatively high airfares and a loss of service due in part to a lack of competition.
DTIC
Airline Operations; Commercial Aircraft; Competition; Aircraft Industry

20010043369 Federal Aviation Administration, Washington, DC USA
Notices to Airmen, Domestic/International, March 22, 2001
Mar. 22, 2001; 296p; In English
Report No.(s): PB2001-104571; ATA-10; Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
Contents: Airway Notams; Airports, Facilities, and Procedural Notams; General FDC Notams; Part 95 Revisions to Minimum En Route IFR Altitudes and Changeover Points; International Notices to Airmen; Graphic Notices.
NTIS
Airports; National Airspace System; Air Navigation

20010043650 Army Safety Center, Fort Rucker, AL USA
FLIGHTFAX: Army Aviation Risk-Management Information, Volume 28
Apr. 04, 2001; 18p; In English
Report No.(s): AD-A387099; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
The Army's process to identify, assess, and control risks is called Risk Management. Risk management provides a formalized, systematic tool to help commanders identify hazards and controls necessary to reduce or eliminate risks during operations planning and execution.
DTIC
Risk; Management; Command and Control; Management Methods

20010043692 Illinois Univ. at Urbana-Champaign, Inst. of Aviation, Savoy, IL USA
Human Error Analysis of Commercial Aviation Accidents Using the Human Factors Analysis and Classification System (HFACS) ***Final Report***
Wiegmann, D. A.; Shappell, S. A.; Feb. 2001; 24p; In English
Report No.(s): PB2001-104656; DOT/FAA/AM-01/3; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
The Human Factors Analysis and Classification System (HFACS) is a general human error framework originally developed and tested within the U.S. military as a tool for investigating and analyzing the human causes of aviation accidents. Based upon Reasons (1990) model of latent and active failures, HFACS addresses human error at all levels of the system, including the condition of aircrew and organizational factors. The purpose of the present study was to assess the utility of the HFACS framework as an error analysis and classification tool outside the military. Specifically, HFACS was applied to commercial aviation accident records maintained by the National Transportation Safety Board (NTSB). Using accidents that occurred between January 1990

and December 1996, it was demonstrated that HFACS reliably accommodated all human causal factors associated with the commercial accidents examined. In addition, the classification of data using HFACS highlighted several critical safety issues in need of intervention research. These results demonstrate that the HFACS framework can be a viable tool for use within the civil aviation arena.
NTIS
Aircraft Accident Investigation; Safety Management; Human Factors Engineering; Error Analysis

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.

20010041023 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
Display System Replacement Baseline Research Report
Allendoerfer, Kenneth R.; Galushka, Joseph; Mogford, Richard H.; Dec. 2000; 112p; In English
Report No.(s): AD-A388039; DOT/FAA/CT-TN00/31; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report provides baseline measurements on the Display System Replacement (DSR). These measurements followed six constructs: safety, capacity, performance, workload, usability, and simulation fidelity. to collect these measurements, human factors researchers conducted an air traffic control simulation using four sectors of Washington Air Route Traffic Control Center (ARTCC) airspace with a traffic volume representing a 90th percentile day. Ten controllers from Washington ARTCC served as participants in the study. Recordings and questionnaires provided objective and subjective measurements such as the number of aircraft controlled and controller workload. This report provides statistics at several levels of specificity: aggregated across all sectors and positions, by individual sectors and positions, and by 12-minute intervals. We intend that data from the study will provide a meaningful representation of the DSR controller position. In addition, this report compares these data to equivalent data collected on the Plan View Display, the equipment that the DSR replaces. We discuss several differences between the systems and provide recommendations for improvements to the baseline process.
DTIC
Display Devices; Human Factors Engineering; Ground Support Equipment; Performance Tests

20010041040 Federal Aviation Administration, Airport and Aircraft Safety Research and Development, Atlantic City, NJ USA
Simulation of the North Atlantic Air Traffic and Separation Scenarios - Communication Effects
Gerhardt-Falk, Christine M.; Elsayed, E. A.; Livingston, Dale; Colamosca, Brian; Aug. 2000; 37p; In English
Report No.(s): AD-A387877; DOT/FAA/CT-TN00/17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents a comprehensive study of the air traffic over the North Atlantic (NAT) Ocean. The main purpose of the study is to assess the fuel savings benefit under reduced separation standards and improved communication systems in the NAT Minimum Navigation Performance Specification (MNPS) airspace. The report describes, in detail, the purpose of the study, various separation standard scenarios, simulation assumptions, analyses of the results, and conclusions. Using the separation standards from the 1996 NAT system as the baseline, this study presents analyses of four different separation scenarios with assigned communication environments: Reduced Vertical Separation Minima (RVSM), Reduced Vertical and Longitudinal Separation Minima (RVLSM), Reduced Vertical and Horizontal Separation Minima (RVHSM), and Free Flight. A fast-time simulation model is used to investigate the effect of the separation scenarios and communication environment on fuel consumption. The original study was completed in cooperation with the NAT Implementation Management Group (IMG) Cost Effectiveness (NICE) Task Force. The results presented in this report represent an extension of the initial findings of the NICE-USA Task Group.
DTIC
Air Traffic; Telecommunication; Fuel Consumption; Air Traffic Control; Computerized Simulation

20010041108 Stottler Henke Associates, Inc., San Mateo, CA USA

Artificial Intelligence Technique for Pilot Approach Decision Aid Logic (PADAL) System ***Final Report, Phase 2***

Richards, Robert; Chrenka, Jason; Thordsen, Marvin; Mar. 23, 2001; 106p; In English; Prepared in cooperation with Klein Associates, Inc., Fairborn, OH.

Contract(s)/Grant(s): N68335-98-C-0027

Report No.(s): AD-A388045; 214; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In this project the objective was to improve Landing Signal Officer (LSO) decision making by using Artificial Intelligence (Al) and other techniques to develop pilot trending, ship oscillation and other decision support aids. During the pursuit and satisfaction of the primary objective, several sub-objectives were met. The project developed pilot trending and ship oscillation recognition techniques and software by investigating the use of Fourier, wavelet, neural networks, fuzzy logic and other transform techniques in conjunction with the application of decision-centered design methodologies from cognitive psychology; the research determined that a combination of neural networks and fuzzy logic applied under a decision-centered design approach proved most useful and was developed. We determined the significant aircraft approach parameters and similarity measures and important pilot considerations and similarity measures. We also developed pilot trending techniques and software using case-based reasoning and combinations of other AI techniques. In addition, in conjunction with many LSOs, we determined the best display options and most appropriate display logic for the information produced by the pilot trending module, and designed and implemented the resulting LSO interface. Then the design concepts were implemented and tested, in an iterative fashion. The decision aid prototypes were evaluated and critiqued by active LSOs with enhancements based on feedback from the LSOs.

DTIC

Software Engineering; Decision Support Systems; Artificial Intelligence; Navigation Aids

20010041119 Coast Guard, Marine Fire and Safety Research Staff, Groton, CT USA

Model Basis for the Navigation Aid Analysis Tool ***Final Report, Apr. 1998 - Oct. 1999***

Morris, Peter B., Coast Guard, USA; McGaffigan, Daniel P., Coast Guard, USA; October 1999; 67p; In English

Contract(s)/Grant(s): DTCG-23-94-TNJ0129; Proj. 2420

Report No.(s): AD-A387494; USCG-MFSRS-R&DC-262-00; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report describes the development of models used in the Navigation Aid Analysis Tool (NAAT), a self-contained software product that computes the probability of being in a given system state, most commonly, the incident state, for a user-constructed scenario of surface marine navigation in harbor entrance and approach navigation areas. The report describes error models of visual navigation systems, constructed so as to place them on an equal footing with other commonly used radio navigation systems. The report also traces the methods used to create a dynamic Markov state space model, necessary for determining incident rates for arbitrary input of user navigation systems, navigation areas, and vessel characteristics. For a given scenario, the computed incident rate may be compared to the target level of safety to determine if navigation requirements are met.

DTIC

Error Analysis; Navigation Aids; Radio Navigation; Software Engineering; Surface Navigation

20010041557 NASA Ames Research Center, Moffett Field, CA USA

Model Based Vision for Aircraft Position Determination

Sridhar, Banavar, NASA Ames Research Center, USA; Chatterji, Gano B., NASA Ames Research Center, USA; Soni, Tarun, NASA Ames Research Center, USA; [1994]; 1p; In English; Automatic Control in Aerospace, 12-16 Sep. 1994, Palo Alto, CA, USA; Sponsored by International Federation of Automatic Control, Germany

Contract(s)/Grant(s): RTOP 505-64-36; No Copyright; Avail: Issuing Activity; Abstract Only

This paper investigates the use of imaging sensors to estimate the position of an aircraft with respect to the runway during landing. Passive vision techniques to estimate aircraft position during landing rely on the known runway model, images acquired by onboard imaging sensor, orientation information provided by the inertial navigation system and the position estimate provided by devices such as the global positioning system. Point features in the runway model are compared with the onboard sensor images of the features and the difference between the two is used to correct the aircraft position and orientation. In this paper the sensitivity of point features is examined as a means of determining the accuracy of such position estimation techniques. Expressions are derived for the sensitivity of image point to errors in the position and orientation of the sensor. Using these, the sensitivity of the image to aircraft position and orientation errors along a typical landing glide path is studied. A least squares technique based on this sensitivity analysis is described for the correction of position and orientation estimates. The final version of the paper will include results from the application of this analysis to real image sequences collected in flight.

Author

Imaging Techniques; Aircraft Landing; Position (Location); Sensitivity Analysis

20010041558 NASA Ames Research Center, Moffett Field, CA USA

A Modular, Portable Model of Image Fidelity

Watson, Andrew B., NASA Ames Research Center, USA; Ahumada, Albert J., Jr., NASA Ames Research Center, USA; [1994]; 1p; In English; 17th; Visual Perception, 4-8 Sep. 1994, Eindhoven, Netherlands

Contract(s)/Grant(s): RTOP 505-64-53; No Copyright; Avail: Issuing Activity; Abstract Only

There is a persistent need for a trustworthy model of perceptual image fidelity, especially in applications such as image compression and display design. A fidelity model provides a measure of the visual discriminability of two images. Ahumada has previously shown that the existing fidelity models may be categorized according to their inclusion of various canonical properties, such as a contrast sensitivity function, spatial frequency channels, etc. This suggests that research would be aided by the availability of a modular model, in which these components could be easily inserted or removed. A further impediment to research in this area has been that most models are written in low-level languages and are consequently large, non-portable, and difficult to understand, modify, and maintain. We therefore believe research would also be aided by models written in high-level languages. to serve both of these purposes, and to honor our conference host for his lifetime dedication to the problem of image quality. Global brightness and its effect on perceptual image quality. We offer a modular model written in the high-level language Mathematica. We will demonstrate this model and show how it may be modified.

Author

Image Analysis; Computer Programs

20010043695 Corps of Engineers, Washington, DC USA

NAVSTAR Global Positioning System Surveying (Engineering and Design). CECW-EP Engineer Manual 1110-1-1003

Aug. 01, 1996; 332p; In English

Report No.(s): PB2001-104692; EM-1110-1-1003; No Copyright; Avail: CASI; A03, Microfiche; A15, Hardcopy

This manual provides technical specifications and procedural guidance for surveying with the NAVSTAR Global Positioning System (GPS). It is intended for use by engineering, topographic, or construction surveyors performing surveys for civil works and military construction projects. Procedural and quality control standards are defined to establish Corps-wide uniformity in GPS survey performance and GPS Architect-Engineer (A-E) contracts.

NTIS

Global Positioning System; Navstar Satellites; Systems Engineering

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.

20010040814 Wichita State Univ., Wichita, KS USA

Impact Damage Characterization and Damage Tolerance of Composite Sandwich Airframe Structures ***Final Report***

Tomblin, John S.; Raju, K. S.; Liew, J.; Smith, B. L.; Jan. 2001; 181p; In English

Report No.(s): AD-A388041; DOT/FAA/AR-00/44; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The use of composite sandwich construction is rapidly increasing in current and future airframe designs. Typically, these sandwich constructions use thin gage composite facesheets (0.020” to 0.045”) which are co-cured to honeycomb and foam cores. Due to the nature of these structures, damage tolerance is more complex than conventional laminated structures. Besides typical damage concerns such as through penetration and delamination, additional modes including core crushing and facesheet debonding must also be addressed. This complicates the certification process by introducing undefined Allowable Damage Limits (ADL) and Critical Damage Thresholds (CDT) as related to the ultimate and limit load carrying capability of the structure. In this report, the preliminary results of the damage resistance and tolerance experiments on sandwich panels are presented. The testing capabilities developed at the Wichita State University to support this program are presented in detail. The effect of impactor size on the impact resistance and residual strength properties was investigated. The effectiveness of traditional nondestructive inspection (NDI) methods in detecting and quantifying the damage distribution in the sandwich panels was studied and the salient results were presented. The damage metrics used for quantifying the damage distributions are planar damage area and residual indentation depth. The use of residual indentation in conjunction with a typical visual inspection protocol for preliminary damage detection was appraised. The characteristic damage states due to different impactor sizes were identified using destructive

inspection and further correlated with the NDI damage metrics. The effects of different damage states were quantified by conducting uniaxial edgewise-compressive tests on the impacted specimens. The failure mechanisms governing the sandwich panels with different damage modes were identified and reported.
DTIC
Impact Tests; Composite Structures; Airframes

20010040861 Naval Postgraduate School, Dept. of Electrical and Computer engineering, Monterey, CA USA
Performance Evaluation of Antennas Installed on a Joint Standoff Weapon (JSOW) Captive Air Training Missile (CATM)
Jenn, D. C.; Mar. 10, 1998; 47p; In English
Report No.(s): AD-A343484; NPS-EC-98-008; No Copyright; Avail: Issuing Activity

The captive air training missile (CATM) is a version of the joint standoff weapon (JSOW) that is to be used for training purposes. The CATM will be mounted on the wing of an F-18, yet its response to a control aircraft command must mimic that of the JSOW in free flight. The objective of this work is to determine the effect of the F-18 carriage aircraft on the performance of the CATM data link. Gain data was computed using APATCH for various CATM configurations and locations. The results indicate that there is significant degradation in the data link for mode 1 when - 90 deg less than or equal AZ less than or equal 0 deg, 0 deg less than or equal EL less than or equal 90 deg and for mode 2 when - 90 deg less than or equal AZ less than or equal 0 deg, all elevation angles. The performance is best when the CATM is located at the outer mount point on the wing.
DTIC
Antennas; Performance Tests; Missiles; F-18 Aircraft; Free Flight

20010040896 Naval Academy, Annapolis, MD USA
USNA Trident Scholar Project Report Number 274 (2000)
Filbey, Joshua R.; May 08, 2000; 75p; In English; Accepted by the U.S. Trident Scholar Committee. The original document contains color images.
Report No.(s): AD-A387614; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This project studied the flow field characteristics responsible for lateral instabilities observed on the F/A-18E/F in the Power Approach (PA) configuration. Discovered during the aircraft's initial testing, these instabilities were observed when the aircraft exceeded twelve degrees angle of attack, a behavior that came to be known as PA wing drop. The problem was corrected by the closure of a vent on the aircraft body. However, neither the cause of the problem nor the mechanics of the solution was understood. This project used computational fluid dynamics to solve for the airflow properties over the aircraft with both the vent open and closed. Elements of the study included: 1) construction of a detailed computer model of the aircraft in both configurations; 2) generation of a computational grid encompassing the aircraft model and its surroundings; 3) computation of the airflow properties over the aircraft at different angles of attack; and 4) qualitative and quantitative analysis of the results. The project was performed in league with members of the Naval Air Systems Team, at Patuxent River, MD, and the NASA Langley Research Center.
DTIC
Fighter Aircraft; Aircraft Structures; Aircraft Models; Air Flow; Computational Fluid Dynamics; Computational Grids

20010041018 Air Force Academy, CO USA
USAFA Discovery: Jul. - Sep. 2000. Research Activity in Support of Unmanned Aerial Vehicles (UAV) at the Aeronautics Research Center
Sep. 2000; 8p; In English
Report No.(s): AD-A388025; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The future of air warfare is undergoing a fundamental transformation with the move toward the increased use of Unmanned Aerial Vehicles (UAV's). UAV's are capable of performing a number of missions in high-threat environments while minimizing the risk of human life. An example of an important mission particularly well suited for a UAV is the provision of information superiority for in-theater commanders. Information superiority is defined in Joint Vision 2010, the official vision statement of the Joint Chiefs of Staff as "the ability to collect, process, and disseminate an uninterrupted flow of information while denying the enemy's ability to do the same". The USAF is currently operating the Predator, a medium-altitude, medium-range, high-endurance (20 hours) UAV that was used in Kosovo to provide near- real-time reconnaissance, target acquisition, and battle-damage assessment. The sensors allowed for effective operation during the day and night and in bad weather conditions. The USAF is currently developing the Global Hawk, a high-altitude, aerial reconnaissance UAV. The Global Hawk will have a maximum

operating altitude of 65,000 feet and endurance of 24 hours. It will be able to provide imagery with one-meter resolution over an area of 40,000 square nautical miles, an area roughly the size of the state of Illinois, in one day.
DTIC
Pilotless Aircraft; Wind Tunnel Tests

20010041047 Naval Command, Control and Ocean Surveillance Center, Research, Development, Technology and Evaluation Div., San Diego, CA USA
UAV-Related Capabilities of San Diego Area Companies. A Survey Conducted by the Naval Command, Control and Ocean Surveillance Center RDT and E Division (NRaD)
Campbell, Ken; May 1997; 75p; In English
Report No.(s): AD-A387895; NCCOSC/RDT/E-SD,038; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

During 6-8 May 1997, the Naval Command, Control and Ocean Surveillance Center RDT&E Division, commonly referred to as NRaD, hosted a meeting of the Unmanned Aerial Vehicle (UAV) Joint Technology Steering Committee (JTSC). The JTSC, which is chartered by the UAV Joint Program Office (JPO), is charged to ”coordinate ongoing and proposed technology programs, identify opportunities for leveraging relevant technologies, and aid in optimizing the investment strategy for new UAV research and development initiatives.” to assist the JTSC in responding to these broad objectives, NRaD has compiled this document which describes the UAV-relevant capabilities of San Diego area companies.
DTIC
Navy; Pilotless Aircraft; Research and Development; Command and Control; Surveys; Surveillance

20010041078 NASA Dryden Flight Research Center, Edwards, CA USA
Developing Uncertainty Models for Robust Flutter Analysis Using Ground Vibration Test Data
Potter, Starr, NASA Dryden Flight Research Center, USA; Lind, Rick, NASA Dryden Flight Research Center, USA; April 2001; 21p; In English; 42nd Structures, Structural Dynamics, and Materials Conference, 16-19 Apr. 20011, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 274-00-00
Report No.(s): NASA/TM-2001-210392; NAS 1.15:210392; H-2452; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A ground vibration test can be used to obtain information about structural dynamics that is important for flutter analysis. Traditionally, this information#such as natural frequencies of modes#is used to update analytical models used to predict flutter speeds. The ground vibration test can also be used to obtain uncertainty models, such as natural frequencies and their associated variations, that can update analytical models for the purpose of predicting robust flutter speeds. Analyzing test data using the -norm, rather than the traditional 2-norm, is shown to lead to a minimum-size uncertainty description and, consequently, a least-conservative robust flutter speed. This approach is demonstrated using ground vibration test data for the Aerostructures Test Wing. Different norms are used to formulate uncertainty models and their associated robust flutter speeds to evaluate which norm is least conservative.
Author
Flutter Analysis; Ground Tests; Dynamic Structural Analysis; Dynamic Response; Mathematical Models

20010041304 Virginia Polytechnic Inst. and State Univ., Dept. of Aerospace and Ocean Engineering, Blacksburg, VA USA
Wing Structural Design by Genetic Algorithms and Homotopy Methods ***Final Report, 1 Apr. 1996 - 31 Dec. 1998***
Gurdal, Zafer; Haftka, Raphael T.; Watson, Layne T.; Mar. 26, 1999; 28p; In English
Contract(s)/Grant(s): F49620-96-1-0104
Report No.(s): AD-A387965; AFRL-SR-BL-TR-01-0175; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One objective of this project was to develop a global-local algorithm for wing structure design based on parallel genetic algorithms for the lower (local) level and homotopy algorithms for the upper (global) level. A second goal is to develop a similar procedure for aerodynamic wing design for a micro aerial vehicle. The upper level optimization will use a response surface approximation quality of the response surface. In support of this main objective, new genetic algorithms and homotopy algorithm concepts will be explored.
DTIC
Wings; Aircraft Design; Genetic Algorithms; Aeronautical Engineering; Structural Design

20010041373 General Accounting Office, Washington, DC USA
TACTICAL AIRCRAFT: F-22 Development and Testing Delays Indicate Need for Limit on Low-Rate Production
Mar. 2001; 38p; In English
Report No.(s): AD-A387753; GAO-01-310; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

As you know, the Air Force is developing the F-22 aircraft which is designed with advanced features to allow it to be less detectable to adversaries, capable of high speeds for long ranges, and able to provide the pilot with substantially improved awareness of the surrounding situation through the use of integrated aviation electronics (avionics). These features are expected to permit the F-22 to penetrate adversary airspace, operate with limited interference, and destroy targets in the air as well as on the ground. In view of past increases in cost estimates to complete development, the National Defense Authorization Act for Fiscal Year 1998 limited the cost of F-22 development to $20.443 billion, as adjusted under the act's provisions. The act requires us to annually assess whether the Air Force s engineering and manufacturing development program for the F-22 aircraft is meeting key goals. The act also requires us to assess whether we had access to sufficient information to make informed judgments on matters covered by our report.
DTIC
F-22 Aircraft; Product Development; Manufacturing

20010043365 Federal Aviation Administration, Washington, DC USA
Repair Assessment for Pressurized Fuselages. Docket No. 29104. Amendment Nos. 91-264, 121-275, 125-33, and 129-28 *Final Report*
2000; 76p; In English
Report No.(s): PB2001-104737; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This action requires operators of certain transport category airplanes to incorporate repair assessment guidelines for the fuselage pressure boundary into their FAA-approved maintenance or inspection program. This action is the result of concern for the continued operational safety of airplanes that are approaching or have exceeded their design service goal. The purpose of the repair assessment guidelines is to establish a damage-tolerance based supplemental inspection program for repairs to detect damage, which may develop in a repaired area, before that damage degrades the load carrying capability of the structure below the levels required by the applicable airworthiness standards.
NTIS
Fuselages; Aircraft Maintenance

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

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.

20010041565 NASA Dryden Flight Research Center, Edwards, CA USA
Transport Aircraft Wing Camber Control: A Periodic Perturbation Approach
Espana, Martin, National Academy of Sciences - National Research Council, USA; Gilyard, Glenn, NASA Dryden Flight Research Center, USA; [1994]; 1p; In English; 13th; Automatic Control in Aerospace, 12-16 Sep. 1994, Palo Alto, CA, USA; Sponsored by International Federation of Automatic Control, Germany
Contract(s)/Grant(s): RTOP 505-69-10; No Copyright; Avail: Issuing Activity; Abstract Only

The possibilities of camber control are underscored by the relatively recent introduction of fly-by-wire technology in modem transport aircraft. To date, however, the issue of the algorithm for in-flight adaptive camber optimization has not been properly addressed. As such, the development of a robust and efficient algorithm to adjust, in flight, the aircraft control surfaces configuration is in order. This paper explores the applicability a periodic perturbation optimizing technique to this problem. The method is based on a direct measurement of the performance and, as such, it also includes the engines' contributions to the overall performance optimization. The actual performance improvement comes, thus, from the integrated effects of airframe and engine. The algorithm is demonstrated on a B720 flight simulator at NASA/Dryden Simulation Laboratory.
Author
Wing Camber; Adaptive Control; Variable Geometry Structures; Aircraft Performance; Control Systems Design; Optimization

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; 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.

20010040839 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA
Effects of Ballistic Impact Damage on Fatigue Crack Initiation in Ti-6Al-4V Simulated Engine Blades ***Final Report***
Martinez, Christine M.; Apr. 2000; 72p; In English; Thesis submitted to the School of Engineering University of Dayton. The original document contains color images.
Contract(s)/Grant(s): Proj-2302
Report No.(s): AD-A387870; AFRL-ML-WP-TR-2000-4097; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study characterizes damage caused by ballistically impacting spherical glass beads on leading edges of simulated engine blades and correlates it to their high cycle fatigue strength.
DTIC
Crack Initiation; Fatigue (Materials); Impact Damage; Terminal Ballistics; Turbine Blades; Fracture Mechanics; Computerized Simulation; Cracking (Fracturing); Cracks; Fatigue Tests

20010043651 Taitech, Inc., Beavercreek, OH USA
Active Combustion Instability Control During Scramjet Initiation Stage ***Final Report, 13 Apr. 2000 - 13 Jan. 2001***
Lin, Kuo-Cheng, Taitech, Inc., USA; Kennedy, Paul, Taitech, Inc., USA; Jan. 13, 2001; 39p; In English
Contract(s)/Grant(s): F33615-00-C02036
Report No.(s): AD-A38709; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Report developed under SBIR contract for topic AF00-204. This SBIR Phase I project incorporated experimental and modeling efforts to develop an advanced active control strategy and a robust instrumentation/actuation system for the suppression of combustion instability inside a scramjet during the initiation stage. The work carried out includes 1) development of micro-opto-mechanical (MOM) pressure sensors for the detection of instantaneous chamber pressure in harsh environment, 2) development of aerated-liquid actuators capable of enhancing spray atomization and controlling droplet evaporation rate, 3) characterization pf scramjet combustion instability, and 4) simulations of time-accurate combustion dynamics. It has been shown that the MOM pressure sensor exhibits a nearly linear response over pressure, with good sensitivity and dynamic response. The aerated-liquid actuator can achieve the desired mixing and, thus, heat release rate for the injected liquid as the liquid jet is aerated with a selected amount of gas. The low-frequency acoustic signatures inside a liquid-fueled scramjet combustor were shown to be manageable. Results from time-accurate calculations have closely mimicked the experimental conditions and operating procedure. This approach to the detection and control of combustion dynamics was proven to be feasible and can be applied to scramjets, as well as other liquid-fueled propulsion systems.
DTIC
Active Control; Combustion Stability; Fuel Combustion; Liquid Fuels; Supersonic Combustion Ramjet Engines

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.

20010040815 Colorado Univ., Dept. of Electrical and Computer Engineering, Boulder, CO USA
Robust Nonlinear Control of Piloted Tailless Fighters ***Final Report, 15 Apr. 1996 - 14 Apr. 1999***
Hauser, John; Apr. 14, 1999; 6p; In English
Contract(s)/Grant(s): F49620-96-1-0141
Report No.(s): AD-A388048; Rept-153-6909; AFRL-SR-BL-TR-01-0192; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The theme of this research has been to develop effective strategies for the design and analysis of flight control systems for tailless fighter aircraft. In our quest to understand the fundamental issues in the aggressive maneuvering of high performance fighter aircraft, we have developed tools and techniques, and the appropriate supporting theoretical results, for the study and analysis of high performance maneuvering systems. We have developed a simplified flight dynamics model, the coordinated flight

vehicle (CFV). Exploiting the geometric structure of the CFV, one may easily explore the space of aggressive flight maneuvers. We have developed an optimization based, trajectory morphing technique by which CFV maneuvers may be used to parametrize the achievable flight maneuvers (i.e., maneuvers that satisfy given high fidelity aircraft model dynamics). We have also developed theory and algorithms to allow these model based optimization techniques to used online, in a receding horizon fashion. As a theoretical bonus, we have obtained new results on the structure of the trajectory manifold of a nonlinear system.
DTIC
Nonlinear Systems; Fighter Aircraft; Tailless Aircraft; Flight Control; Maneuvers; Supersonic Aircraft; Aerodynamics

20010041305 Utah Univ., Dept. of Electrical Engineering, Salt Lake City, UT USA
Self-Designing Control Systems for Piloted and Uninhabited Aerial Vehicles ***Final Report, 1 Dec. 1997 - 30 Nov. 2000***
Bodson, Marc; Feb. 22, 2001; 69p; In English
Contract(s)/Grant(s): F49620-98-1-0013; AF Proj. 2304
Report No.(s): AD-A387960; AFRL-SR-BL-TR-01-0176; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The main advantage of self-designing flight control systems is their ability to optimize performance automatically, resulting in a substantial reduction of the cost and time needed for control law development. Self-designing control systems also reconfigure automatically after failures and damages, yielding greater chances of survival in dangerous conditions. A self-designing nonlinear autopilot was developed to interface with the high-level path planning of a UAV. The control algorithm is distinct from conventional autopilots in that it is not based on a known, linearized model of the aircraft. Instead, the algorithm compensates for nonlinear dynamic effects and adjusts its parameters automatically, exploiting the reconfiguration capabilities of an inner control loop designed using adaptive methods. A new control allocation algorithm was also developed, based on the direct allocation method of Durham. A special representation using spherical coordinates was used to speed-up the computations that must be performed at a high sampling rate. The direct allocation method was also extended to a class of systems that had previously been excluded, namely those for which some independent control surfaces produce linearly dependent moments. Finally, fast algorithms for optimal control allocation were developed based on linear programming techniques. It was observed that significant improvements in performance could be obtained at the cost of only modest increases in computations.
DTIC
Optimal Control; Flight Control; Systems Engineering; Adaptive Control

20010042796 Colorado Univ., Center for Space Structures and Controls, Boulder, CO USA
Real-Time Predictive Flutter Analysis and Continuous Parameter Identification of Accelerating Aircraft ***Final Report, 15 Nov. 1998 - 14 Oct. 2000***
Farhat, Charbel; Jan. 2001; 51p; In English
Contract(s)/Grant(s): F49620-99-1-0037
Report No.(s): AD-A387978; 153-0568; AFRL-SR-BL-TR-01-0701; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This is a four-part final report on the research supported by the Air Force Office of Scientific Research Center under Grant F49620-99-1-0037, entitled Real Time Predictive Flutter Analysis and Continuous Parameter Identification of Accelerating Aircraft.
DTIC
Real Time Operation; Flutter Analysis; Parameter Identification

09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

20010040859 Federal Aviation Administration, William J. Hughes Technical Center, Atlanta, GA USA
Evaluation of Wind-Loading on Airport Signs
Bagot, Keith, Federal Aviation Administration, USA; Jun. 2000; 28p; In English
Report No.(s): PB2000-108245; DOT/FAA/AR-TN00/32; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Airport signs at certain critical locations at O'Hare International Airport and other major U.S. airports are being sheared off their mounting legs at the frangible coupling from aircraft jet engine blast and/or wake turbulence forces. This damage to the sign

increases the chance of foreign object damage (FOD) as well as the loss of visual guidance for other aircraft. There is a need to better understand and more precisely determine the forces on the signs at these locations. The results of this testing indicated that the current frangibility design criteria is not adequate for airport signs installed on airports that service large transport aircraft. A modification to the frangibility requirements or a maximum setback distance would appear to be a satisfactory solution to mitigate sign breakage. The former is recommended since it would appear to have no impact on the operational characteristics of the aircraft movement area.
NTIS
Airports; Visual Aids; Design Analysis; Impact Damage

20010040877 Naval Research Lab., Washington, DC USA
Pushing the Horizon. Seventy-Five Years of High Stakes Science and Technology at the Naval Research Laboratory
Amato, Ivan; Jan. 01, 2001; 419p; In English
Report No.(s): AD-A387688; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche
Science writer Ivan Amato explores the origin development and accomplishments of NRL over the last 75 years. He analyzes the personalities institutional culture, and influences of what has become one of the preeminent research laboratories within the USA. Tracing the Laboratory from its small and often inauspicious origins of today's large, multi disciplinary research center, Amato sets in context many of the important research events and fronts of modern military science and technology.
DTIC
Technologies; Military Technology

20010041024 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
Human Error in Airway Facilities
Ahlstrom, Vicki; Hartman, Donald G.; January 2001; 23p; In English
Report No.(s): AD-A387811; DOT/FAA/CT-TN01/02; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
This report examines human errors in Airway Facilities (AF) with the intent of preventing these errors from being passed on to the new Operations Control Centers. to effectively manage errors, they first have to he identified. Human factors engineers researched human error literature, analyzed human errors recorded in AF databases, and conducted structured interviews with AF representatives. This study enabled them to categorize the types of human errors, identify potential causal factors, and recommend strategies for their mitigation. The results provide preventative measures that designers, developers, and users can take to reduce human error.
DTIC
Errors; Human Performance; Performance Tests; Military Air Facilities; Pilot Error

20010043370 Federal Aviation Administration, Airport Technology Research and Development Branch, Atlantic City, NJ USA
Airport Pavement Marking Evaluation for Reducing Runway Incursion
Cyrus, H. M.; Feb. 2001; 28p; In English
Report No.(s): PB2001-104557; DOT/FAA/AR-TN01/2; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This study was undertaken to evaluate the widening of airport pavement marking in order to enhance their recognition. Results of this evaluation are aimed at reducing the potential of runway incursions and incidents by making airport pavement markings more visible for pilots and vehicular operators. A series of airport pavement marking variations were evaluated at the Atlantic City International Airport (ACY). Subject pilots were given the opportunity to view these variations and to express their opinions. Results from the evaluation showed the pilots preferred the runway holding position marking incorporating the 12-inch stripes. Pilots also preferred the Instrument Landing System/Microwave Landing System (ILS/MLS) holding position marking incorporating 24-inch paint stripes with 48-inch spacing. The pilots preferred the nonmovement area boundary marking incorporating 12-inch stripes.
NTIS
Pavements; Microwave Landing Systems; Instrument Landing Systems; Runways; Marking; Air Traffic Control

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 and 15 Launch Vehicles and Launch Vehicles, and 18 Spacecraft Design, Testing and Performance. For space suits, see 54 Man/System Technology and Life Support.

20010041080 NASA Ames Research Center, Moffett Field, CA USA
A Two-Stage-to-Orbit Spaceplane Concept With Growth Potential
Mehta, Unmeel B., NASA Ames Research Center, USA; Bowles, Jeffrey V., NASA Ames Research Center, USA; February 2001; 28p; In English; 10 International Space Planes and Hypersonic Systems and Technologies Conference, 24-27 Apr. 2001, Kyoto, Japan; Sponsored by National Space Development Agency, Japan; Original contains color illustrations
Contract(s)/Grant(s): RTOP 713-74-00
Report No.(s): NASA/TM-2001-209620; NAS 1.15:209620; A-00V0029; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A two-stage-to-orbit (TSTO) spaceplane concept developed in 1993 is revisited, and new information is provided to assist in the development of the next-generation space transportation vehicles. The design philosophy, TSTO spaceplane concept, and the design method are briefly described. A trade study between cold and hot structures leads to the choice of cold structures with external thermal protection systems. The optimal Mach number for staging the second stage of the TSTO spaceplane (with air-breathing propulsion on the first stage) is 10, based on life-cycle cost analysis. The performance and specification of a prototype/experimental (P/X) TSTO spaceplane with a turbo/ram/scramjet propulsion system and built-in growth potential are presented and discussed. The internal rate of return on investment is the highest for the proposed TSTO spaceplane, vis-A-vis a single-stage-to-orbit (SSTO) rocket vehicle and a TSTO spaceplane without built-in growth. Additional growth potentials for the proposed spaceplane are suggested. This spaceplane can substantially decrease access-to-space cost and risk, and increase safety and reliability in the near term It can be a serious candidate for the next-generation space transportation system.
Author
Single Stage to Orbit Vehicles; Space Transportation System; Air Breathing Engines; Aerospace Planes; Design Analysis

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

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

20010040756 AZ Technology, Huntsville, AL USA
System Report for the Optical Properties Monitor (OPM) Experiment ***Final Report***
Hummer, Leigh, AZ Technology, USA; March 2001; 1p; In English
Contract(s)/Grant(s): NAS8-39237
Report No.(s): NASA/CR-2001-210882; NAS 1.26:210882; M-1008; Rept-91-1-118-164; No Copyright; Avail: Issuing Activity; Abstract Only

This systems report describes how the Optical Properties Monitor (OPM) experiment was developed. Pertinent design parameters are discussed, along with mission information and system requirements to successfully complete the mission. Environmental testing was performed on the OPM to certify it for spaceflight. This testing included vibration, thermal vacuum, electromagnetic interference and conductance, and toxicity tests. Instrument and monitor subsystem performances, including the reflectometer, vacuum ultraviolet, total integrated scatter, atomic oxygen monitor, irradiance monitor, and molecular contamination monitor during the mission are discussed. The OPM experiment was launched aboard the Space Shuttle on mission STS-81 in January 1997 and transferred to the Mir space station. An extravehicular activity (EVA) was performed in April 1997 to attach the OPM experiment to the outside of the Mir/Shuttle Docking Module for space environment exposure. The OPM conducted in situ measurements of a number of material samples. These data may be found in the OPM Science Report. OPM was retrieved during an EVA in January 1998 and was returned to Earth on board the Space Shuttle on mission STS-89.
Author
Design Analysis; Aerospace Environments; Irradiance; Optical Properties; Reflectometers; Performance Tests

20010042204 General Accounting Office, Washington, DC USA
DEFENSE ACQUISITIONS: Space-Based Infrared System-low at Risk of Missing Initial Deployment Date
Feb. 2001; 38p; In English
Report No.(s): AD-A387717; GAO-01-6; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Department of Defense (DOD) considers missile defense to counter attacks from ballistic missiles, both long-range strategic and shorter-range theater missiles, to be critical to our national security. The Air Force is developing a new satellite system, called Space-Based Infrared System-low (SBIRS)-low, to expand DODs current infrared satellite capabilities for supporting ballistic missile defense. The ability to detect missile launches, track missiles throughout their flights, and counter these threats is essential to ballistic missile defense. The primary mission of SBIRS-low is to detect launches and track missile flights. SBIRS-low accomplishes this by using infrared sensors to detect the heat missiles radiate. DOD plans to begin launching SBIRS-low satellites in fiscal year 2006 and estimates the life-cycle cost 1 through fiscal year 2022 to be $11.8 billion.
DTIC
Missile Defense; Infrared Detectors; Defense Program; Ballistic Missiles

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20010041563 NASA Ames Research Center, Moffett Field, CA USA
Distance Perception of Stereoscopically Presented Virtual Objects Optically Superimposed on Physical Objects by a Head-Mounted See-Through Display
Ellis, Stephen R., NASA Ames Research Center, USA; Bucher, Urs J., NASA Ames Research Center, USA; [1994]; 1p; In English; Human Factors and Ergonomics Society Meeting, 24-28 Oct. 1994, Nashville, TN, USA
Contract(s)/Grant(s): RTOP 199-06-30; No Copyright; Avail: Issuing Activity; Abstract Only

The influence of physically presented background stimuli on the perceived depth of optically overlaid, stereoscopic virtual images has been studied using headmounted stereoscopic, virtual image displays. These displays allow presentation of physically unrealizable stimulus combinations. Positioning of an opaque physical object either at the initial perceived depth of the virtual image or at a position substantially in front of the virtual image, causes the virtual image to perceptually move closer to the observer. In the case of objects positioned substantially in front of the virtual image, subjects often perceive the opaque object to become transparent. Evidence is presented that the apparent change of position caused by interposition of the physical object is not due to occlusion cues. According, it may have an alternative cause such as variation in the binocular vengeance position of the eyes caused by introduction of the physical object. This effect may complicate design of overlaid virtual image displays for near objects and appears to be related to the relative conspicuousness of the overlaid virtual image and the background. Consequently, it may be related to earlier analyses of John Foley which modeled open-loop pointing errors to stereoscopically presented points of light in terms of errors in determination of a reference point for interpretation of observed retinal disparities. Implications for the design of see-through displays for manufacturing will be discussed.
Author
Display Devices; Space Perception

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.

20010040831 TRW Space and Electronics Group, Redondo Beach, CA USA
30 KW Class Arcjet Advanced Technology Transition Development (ATTD) ***Final Report, Feb. 1990-Oct. 1999***
Kriebel, Mary M.; Jun. 2000; 145p; In English

Contract(s)/Grant(s): F04611-90-C-0005; AF Proj. 6340
Report No.(s): AD-A388006; 00.M230-024; AFRL-PR-ED-TR-1999-0034; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Arcjet Advanced Technology Transition Demonstration (ATTD) Program developed and demonstrated a flight qualified 30 kW arcjet propulsion flight unit. Once it successfully completed qualification testing, the flight unit was integrated as the Electric Propulsion Space Experiment (ESEX) flight experiment onto the Air Force Advanced Research and Global Observation Satellite (ARGOS). The objectives of the flight unit space test were to measure arcjet plume deposition, electromagnetic interference, thermal radiation, and performance in space. These measurements were chosen to address specific operational issues that are commonly raised for EP systems. There were a total of eight firings conducted over the course of the 60-day mission, for a total duration of 2,023 seconds. All of the demonstration aspects of the experiment were completed successfully and the arcjet, PCU, PFS and overall system operated very well. All of the data analyzed to date indicate the thruster operated nominally, and operated completely independently of the normal operations of the host spacecraft.
DTIC
Arc Jet Engines; Electric Propulsion; Flight Tests; Plumes; Satellite Observation; Thermal Radiation; Engine Tests

20010040918 Cornell Univ., Dept. of Mechanical and Aerospace Engineering, Ithaca, NY USA
Modeling Nonequilibrium Radiation in High Altitude Plumes ***Final Report, 1 Sep. 1996-30 Nov. 1999***
Boyd, Iain D.; Mar. 01, 2001; 37p; In English
Contract(s)/Grant(s): F49620-96-1-0091
Report No.(s): AD-A387925; AFRL-SR-BL-TR-01-0168; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is final report summarizes the research carried out on the development of numerical approaches for simulating the radiation emitted in high-altitude plumes of spacecraft and missiles. In Appendix I, we describe the development of ultra-violet radiation model for the hydroxyl radical that is implemented in a particle-based Monte Carlo approach for simulating the plumes. In Appendix II, we describe a plume radiation calculation for the plume of the ammonia arcjet flown on the USAF ESEX flight experiment. The research performed in this grant has led to significant advances in the capabilities for modeling these flows.
DTIC
High Altitude; Nonequilibrium Radiation; Mathematical Models; Rocket Exhaust

20010040954 Ohio State Univ., Dept. of Mechanical Engineering, Columbus, OH USA
Energy Transfer Processes in the Production of Excited States in Reacting Rocket Flows ***Final Report***
Rich, J. W., Ohio State Univ., USA; Adamovich, Igor, Ohio State Univ., USA; Subramaniam, Vish V., Ohio State Univ., USA; Feb. 26, 2001; 270p; In English
Contract(s)/Grant(s): F49620-96-1-0184
Report No.(s): AD-A388066; AFRL-SR-BL-TR-01-0198; No Copyright; Avail: CASI; A03, Microfiche; A12, Hardcopy

The present report incorporates the results of experimental and analytical research into kinetic mechanisms and rates of collisional and radiative energy transfer processes in nonequilibrium gas and plasma flows, such as exist in high-altitude rocket plumes, supersonic nozzles, and behind shock waves. The kinetic processes under consideration include vibrational relaxation and molecular dissociation of air species (N2 and 02), as well as of key combustion products (such as CO and NO), which are primarily responsible for persistent visible and ultraviolet radiation in low-density plumes. Associative ionization in collisions of vibrationally excited molecules, as well as strong coupling between plasma electrons and vibrationally excited species are also studied in detail. Finally, the report incorporates the results of kinetic modeling of nonequilibrium, reacting, ionized flows in supersonic nozzles, MHD channels, and behind the shock waves.
DTIC
Energy Transfer; Reacting Flow; Radiative Transfer; Nonequilibrium Flow

20010040957 Stanford Univ., Dept. of Mechanical Engineering, Stanford, CA USA
Characterization of Inert Gas Plasma Thrusters ***Annual Report, 1 Oct. 1997 - 30 Sep. 2000***
Cappelli, Mark; Mar. 07, 2001; 106p; In English; Original contains color plates
Contract(s)/Grant(s): F49620-98-1-0011
Report No.(s): AD-A388079; AFRL-SR-BL-TR-01-0200; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The efficiency of modern Hall thrusters is impacted by the ability to maintain a high ratio of the ion to electron current density, J(sub i)/J(sub e), at the exit of the acceleration channel. In principal, there is no limit to this ratio, since the electrons that are necessary to maintain the current balance at the anode can be generated within the ionization zone upstream of the channel exit. However, in practice, this metric of performance in a typical Hall thruster can range from 1 - 10. This is in part due to the loss

of electrons and ions through recombination reactions on the channel wall, and also due to the anomalous migration of electrons from the exit plane through the region of strong magnetic fields. It is believed that this poor confinement of electrons is in part due to turbulent fluctuations in plasma properties, which give rise Bohm-like electron transport in a direction orthogonal to the applied magnetic field. The Stanford Research was aimed at understanding this transport, and any affects that wall scattering may have on also enhancing electron current flow within the discharge channel. The broader long-term objective is to develop passive and/or active control strategies to enhance or suppress electron flow in regions of the channel where such actuation is desirable. Feedback-controlled actuation methods to reduce plasma fluctuations where only marginally successful back in the mid 70's in early versions of Hall thrusters 1,2. Using modern diagnostic and characterization strategies to obtain an improved understanding of the role that fluctuations and wall scattering plays in electron transport, it is anticipated that we can design more effective control and actuation strategies.
DTIC
Plasma Engines; Characterization; Hall Thrusters; Hall Effect; Electric Propulsion

20010041325 NASA Marshall Space Flight Center, Huntsville, AL USA
Development of Aluminum Composites for a Rocket Engine's Lightweight Thrust Cell
Lee, Jonathan A., NASA Marshall Space Flight Center, USA; Elam, Sandy, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 25th Annual Conference on Composites, Materials and Structures, 21-26 Jan. 2001, Cocoa Beach, FL, USA
Contract(s)/Grant(s): RTOP 713-23-53; No Copyright; Avail: Issuing Activity; Abstract Only

The Aerospike liquid fueled rocket engine for the X-33 aerospace vehicle consists of several thrust cells, which can comprise as much as 25% of the engine weight. The interior wall of the thrust cell chamber is exposed to high temperature combustion products and must be cooled by using liquid hydrogen. Ultimately, reducing engine weight would increase vehicle performance and allow heavier payload capabilities. Currently, the thrust cell's structural jacket and manifolds are made of stainless steel 347, which can potentially be replaced by a lighter material such as an Aluminum (Al) Metal Matrix Composites (MMC). Up to 50% weight reduction can be expected for each of the thrust cell chambers using particulate SiC reinforced Al MMC. Currently, several Al MMC thrust cell structural jackets have been produced, using cost-effective processes such as gravity casting and plasma spray deposition, to demonstrate MMC technology readiness for NASA's advanced propulsion systems.
Author
Aerospike Engines; Aluminum; Metal Matrix Composites; Thrust Chambers; Weight Reduction

20010043645 NASA Marshall Space Flight Center, Huntsville, AL USA
Some Interplanetary Missions Using IEC Fusion Propulsion
Hanson, John M., NASA Marshall Space Flight Center, USA; Mar. 22, 2001; 12p; In English; US-Japanese Exchange and IEC Workshop, 22 Mar. 2001, Huntsville, AL, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

IEC fusion offers the possibility of very efficient space propulsion with substantial thrust, examine human travel to the planets in order to determine the impact this technology could have reduced travel time and reduced fuel mass, travel via IEC propulsion is from earth orbit to another planetary orbit. Propulsion to a planet's or moon's surface assumed separate.
Derived from text
Fusion Propulsion; Propulsion; Space Missions

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CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see categories 24 through 29. For astrochemistry see category 90 Astrophysics.

20010040763 NASA Marshall Space Flight Center, Huntsville, AL USA
A New Direction for NASA Materials Science Research Using the International Space Station
Schlagheck, Ronald, NASA Marshall Space Flight Center, USA; Trach, Brian, Boeing Co., USA; [2001]; 1p; In English; 52nd International Astronautics Conference, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA recently created a fifth Strategic Enterprise, the Office of Biological and Physical Research (OBPR), to bring together physics, chemistry, biology, and engineering to foster interdisciplinary research. The Materials Science Program is one of five Microgravity Research disciplines within this new enterprise's Division of Physical Sciences Research. The Materials Science Program will participate within this new enterprise structure in order to facilitate effective use of ISS facilities, target scientific

and technology questions and transfer scientific and technology results for Earth benefits. The Materials Science research will use a low gravity environment for flight and ground-based research in crystallization, fundamental processing, properties characterization, and biomaterials in order to obtain fundamental understanding of various phenomena effects and relationships to the structures, processing, and properties of materials. Completion of the International Space Station's (ISS) first major assembly, during the past year, provides new opportunities for on-orbit research and scientific utilization. Accommodations will support a variety of Materials Science payload hardware both in the US and international partner modules with emphasis on early use of Express Rack and Glovebox facilities. This paper addresses the current scope of the flight investigator program. These investigators will use the various capabilities of the ISS to achieve their research objectives. The type of research and classification of materials being studied will be addressed. This includes the recent emphasis being placed on nanomaterials and biomaterials type research. Materials Science Program will pursue a new, interdisciplinary approach, which contributes, to Human Space Flight Exploration research. The Materials Science Research Facility (MSRF) and other related American and International experiment modules will serve as the foundation for this research. Discussion will be included to explain the changing concept for materials science research processing capabilities aboard the ISS along with the various ground facilities necessary to support the program. Finally, the paper will address the initial utilization schedule and strategy for the various materials science payloads including their corresponding hardware.
Author
Research Facilities; Technology Transfer; Modules; Microgravity; Crystallization

20010040994 Army Construction Engineering Research Lab., Champaign, IL USA
The Incorporation of Cyanobacteria into Starch Pellets and Determination of Escapability Rates For Use in Land Rehabilitation ***Final Report***
Howard, Gywn L., Army Construction Engineering Research Lab., USA; Warren, Steven D., Army Construction Engineering Research Lab., USA; April 1998; 26p; In English
Report No.(s): AD-A341151; USACERL-SR-98/56; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Many Army land managers find stabilization, rehabilitation, and revegetation of soil to be extremely difficult on fully denuded lands and/or those riddled with rills and gullies. Finding a suitable and affordable way to repair these disturbed lands can be a formidable challenge. For arid and semi-arid lands, a well-developed cryptogamic crust may, in many cases, be an appropriate foundational material. The objective of this study was to incorporate cyanobacteria into a pelletized starch matrix for use as a soil inoculant in arid land rehabilitation. Two common terrestrial cyanobacteria, Nostoc punctiforme and Microcoleus vaginatus, were pelletized and monitored over an 8-week period (July to August, 1996). Escapability and viability of the pelletized cyanobacteria were tested using both chlorophyll a extraction and epiflourescence microscopy. Direct counts of populations and mean levels of chlorophyll a in both species steadily declined during the 8-week period. Results were poor and indicated this approach would be ineffective in the field. Dessication of the organisms during the pelletizing process may have been a prime reason for lack of success in this study.
DTIC
Bacteria; Starches; Pellets; Soils; Cyanogen

20010041114 Geo-Centers, Inc., Newton, MA USA
Development of Materials for Naval Weapons ***Final Report, Aug. 1996-Nov. 2000***
Bailey, W.; Campbell, K.; Chung, R.; Dyka, C.; Greenwald, E.; Feb. 2001; 72p; In English
Contract(s)/Grant(s): N00014-96-C-2097
Report No.(s): AD-A387235; GC-3062; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
GEO-CENTERS, INC. programs in support of the Naval Research laboratory Materials Science and technology Division have addressed the development, characterization, and improvement of a variety of materials of interest to the Navy. The work accomplished encompassed a broad range of materials science and technology including basic research in the mathematical modeling of material properties, studies of marine corrosion and structural failure, and DT&E of novel materials and their applications. A major program was directed to application engineering for shipboard solid waste disposal and shipboard liquid waste concentration and disposal. GEO-CENTERS also provided research and documentation support to Navy environmental programs, in particular those related to ozone-depleting substances, the shipboard environmental information clearinghouse, and a program to develop environmentally sound ships or the 21st century.
DTIC
Navy; Weapons; Research and Development; Mechanical Properties; Materials Science

20010041118 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
IR Absorbance Measurement of Variable Composition Aqueous VOCs ***Final Report, Jul. 1993 - Feb. 1994***
Field, Paul E., Virginia Polytechnic Inst. and State Univ., USA; Combs, Roger J., Virginia Polytechnic Inst. and State Univ., USA; February 2001; 386p; In English
Contract(s)/Grant(s): DAAD05-93-W-0997
Report No.(s): AD-A387313; ECBC-TR-140; No Copyright; Avail: CASI; A04, Microfiche; A17, Hardcopy

Quantitative infrared (IR) absorbance spectra are compiled, which rely on the equilibrium-vapor cell method for generating controlled amounts of target analytes. The target analytes are the solutes of variable composition aqueous solutions of volatile organic compounds (VOCs). The VOCs investigated in this study are acetone, 2-butanone, ethanol. isopropanol, and methanol. The resulting vapor liquid equilibrium for the variable composition solutions provides analyte vapor concentrations in the Beer's law range of IR absorbance. Gravimetric solution preparation is documented with the actual solute and solvent weights for the VOC solutions necessary to generate the targeted vapor pressures and concentrations.
DTIC
Volatile Organic Compounds; Aqueous Solutions; Infrared Spectra

20010041168 Aerospace Corp., Lab. Operations, El Segundo, CA USA
Replacement Solvents for Nonvolatile Residue (NVR) Removal from Painted Space Hardware
Ternet, G. K.; Luey, K. T.; Panos, G. C.; Feb. 15, 2001; 18p; In English; Original contains color plates
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A387790; TR-2001(8565)-3; SMC-TR-01-66; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Hansen solubility parameters have been utilized to identify suitable solvents for the removal of organic contaminants and Nonvolatile Residues (NVRs). A laboratory effort was initiated to assess the feasibility of using Hansen parameters to predict the solubility behavior of multi-component systems. Specifically, we were interested in determining whether solubility parameters could be used to predict the solubility behavior of paints (a multi-component system) when NVR is removed from space hardware. Our examination revealed that although Hansen's three-dimensional model can be a useful guide for systems with single or "like type" components, it is not easily extended to multi-component paints. Caution should be used when utilizing solubility parameters as a predictive tool for applications in which NVR removal or cleaning is performed on painted space hardware.
DTIC
Cleaning; Paints; Solubility; Solvents; Paint Removal

20010042868 Department of the Navy, Washington, DC USA
Method for Making Metal Coated Powders
Kurihara, Lynn, Inventor; Jan. 19, 2001; 17p; In English
Patent Info.: Filed 19 Jan. 2001; US-Patent-Appl-SN-09,764,161
Report No.(s): AD-D019758; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Metal coated powders are produced by suspending a precursor metal salt and the powder to be coated in a glycol. This mixture is heated, and the metal salt is reduced and the metal precipitates as a coating onto the powder.
DTIC
Powder (Particles); Precipitates; Metal Coatings; Composite Materials

20010043364 Environmental Protection Agency, Office of Pollution, Prevention, and Toxics, Washington, DC USA
Data Analysis of Lead in Soil and Dust
Sep. 1993; 136p
Report No.(s): PB2001-104742; EPA/747/R-93/011; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The purpose of this study is to supplement the prior reports through additional data analyses focusing on the contribution of lead in exterior soil to the lead hazard in homes. The specific objectives of this study are two-fold: First, to conduct analyses of the statistical associations among the soil, dust, and paint data from the national survey. Many researchers believe that lead contamination in soil originates mainly from paint lead and automatic emissions. Similarly, interior dust lead is believed to come principally from paint lead and soil lead. The objective is to explore these hypotheses through a statistical analyses of the national survey data. Second, to present an analytical description of the soil and dust data, including sampling and measuring errors in the data, in order to evaluate the suitability of the soil and dust data for future data analyses.
NTIS
Lead (Metal); Contamination; Statistical Analysis; Soils; Dust; Hazards; Soil Pollution

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COMPOSITE MATERIALS

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

20010040852 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Nondestructive Characterization of Impact Damage in Metallic/Nonmetallic Composites Using X-ray Computed Tomography Imaging ***Final Report, Apr.-Sep. 1998***
Green, William H.; Wells, Joseph M.; Feb. 2001; 25p; In English
Report No.(s): AD-A387829; ARL-TR-2399; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Characterizing internal impact damage in composites can be difficult, especially in structurally complex composites or those consisting of many materials. Many methods for the nondestructive inspection/nondestructive testing (NDI/NDT) of materials have been known and used for many years, including x-ray film, real-time and digital radiographic techniques, and ultrasonic techniques. However, these techniques are generally not capable of mapping three-dimensional (3-D) complex damage patterns, which is necessary to visualize and understand damage cracking modes. X-ray computed tomography (CT) is broadly applicable to any material or test object through which a beam of penetrating radiation may be passed and detected, including metals, plastics, ceramics, metallic/nonmetallic composites, and assemblies. The principal advantage of CT is that it provides densitometric (e.g., radiological density and geometry) images of thin cross sections through an object. Because of the absence of structural superposition, the images are much easier to interpret than conventional radiological images. This report discusses current applications of advanced CT imaging to characterizing impact damage in metallic/nonmetallic composites. Examples, including encapsulated ceramics in metal matrix composites, will be presented.
DTIC
Impact; Composite Materials; Damage Assessment; Metal Matrix Composites; Nondestructive Tests; Real Time Operation

20010040891 California Univ., Berkeley, CA USA
The Compressive Behavior of Glass Fiber Reinforced Composites Subjected to Local Thermal Loading
Westover, Catherine M.; Jan. 2000; 95p; In English
Report No.(s): AD-A387645; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

An experimental study has been conducted to determine the effects of local thermal loading on the compressive behavior of glass fiber composites. The primary factors considered were the intensity of thermal loading and the applied compressive load. The material specimens tested were laminate plates composed of Micarta 010 FR4, a fire retardant glass/epoxy laminate. Two types of testing were conducted for heat fluxes of 85 kW/m(exp 2), 140 kW/m(exp 2), and 195 kW/m(exp 2). The first type involved the unloaded radiant thermal testing of the material and provided a baseline from which the effects of thermal loading on the physical properties of the composite specimen were determined. The second type was a combined loading test, which involved loading specimens in compression to a constant applied load and subjecting them to a local thermal load.
DTIC
Compressibility; Compression Loads; Epoxy Matrix Composites; Glass Fiber Reinforced Plastics; Laminates; Thermodynamic Properties

20010040893 Dayton Univ. Research Inst., Research Inst., OH USA
Intrinsically Survivable Structural Composite Materials ***Interim Report, 15 Sep. 1998-14 Sep. 1999***
Anderson, D. P.; Rice, B. P.; Apr. 2000; 28p; In English
Contract(s)/Grant(s): F33615-95-D-5029; AF Proj. 4347
Report No.(s): AD-A387629; UDR-TR-1999-00099; AFRL-ML-WP-TR-2000-4061; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Spherical nanoscale particles were incorporated into an aerospace epoxy resin. When properly dispersed with a combination of mechanical and ultrasonic mixing, the fracture toughness could be made twice that of the control resin. Spherical nanoparticles were added as a suspension which tended to agglomerate, dry fumed powders which were easiest to disperse and were formed in situ from silanes. The spherical particles had little effect on the flexural properties of the resin. Layered silicates were not observed to change the fracture toughness of the resin but did double the flexural properties in some formulations.
DTIC
Composite Materials; Composite Structures; Nanocomposites; Fracture Strength

20010041346 NASA Langley Research Center, Hampton, VA USA

An Assessment of the State-of-the-Art in the Design and Manufacturing of Large Composite Structures for Aerospace Vehicles

Harris, Charles E., NASA Langley Research Center, USA; Starnes, James H., Jr., NASA Langley Research Center, USA; Shuart, Mark J., NASA Langley Research Center, USA; April 2001; 48p; In English

Contract(s)/Grant(s): RTOP 706-85-20-01

Report No.(s): NASA/TM-2001-210844; L-18070; NAS 1.15:210844; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of an assessment of the state-of-the-art in the design and manufacturing of large composite structures are described. The focus of the assessment is on the use of polymeric matrix composite materials for large airframe structural components. such as those in commercial and military aircraft and space transportation vehicles. Applications of composite materials for large commercial transport aircraft, general aviation aircraft, rotorcraft, military aircraft. and unmanned rocket launch vehicles are reviewed. The results of the assessment of the state-of-the-art include a summary of lessons learned, examples of current practice, and an assessment of advanced technologies under development. The results of the assessment conclude with an evaluation of the future technology challenges associated with applications of composite materials to the primary structures of commercial transport aircraft and advanced space transportation vehicles.

Author

Design Analysis; Manufacturing; Structural Design; Polymer Matrix Composites; Composite Structures; Airframes

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20010040820 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

Transitioning Model Potentials to Real Systems

Bembenek, Scott D.; Rice, Betsy M.; Feb. 2001; 40p; In English

Report No.(s): AD-A387245; ARL-TR-2389; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The parameters of two pairs of potentials that describe argon over its entire liquid phase at a fixed pressure were optimized through a novel application of constant temperature and pressure molecular dynamics (NPT-MD) and Monte Carlo (NPT-MC) computer simulations. The forms of these potentials were those of a modified Lennard-Jones potential and a Lennard-Jones potential (Lennard-Jones, J. E. Physica, Vol. 4. p. 941, 1937). The optimized potential determined using NPT-MD simulations reproduced experimental densities, internal energies, and enthalpies with an error less than 1% over most of the liquid range and yielded self-diffusion coefficients that were in excellent agreement with the experiment. The results using the potential determined by NPT-MC simulations were in almost as good agreement with deviations from experiments of no more than 5.89% for temperatures up to vaporization. Additionally, molar volumes predicted using this potential at pressures in the 100-600 atm range and over temperatures in the 100-140 K range were within 0.83% of experimental values. These results show that when properly parameterized, Lennard-Jones-like potentials could describe a system well over a large temperature range. Further, the method introduced was easy to implement and was independent of the form of the interaction potential used.

DTIC

Molecular Dynamics; Argon; Liquid Phases; Mathematical Models; Lennard-Jones Potential

20010040958 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA

Predicting Heats of Formation of Energetic Materials Using Quantum Mechanical Calculations, *Jan. - Dec. 1998*

Rice, Betsy M.; Pai, Sharmila V.; Hare, Jennifer; Combuston and Flame; Feb. 2001; Volume 118, pp. 445-458; In English

Report No.(s): AD-A387156; ARL-RP-15; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Quantum mechanical calculations are used to predict gas, liquid, and solid heats of formation of energetic molecules. A simple atom-equivalent method converts quantum mechanical energies of molecules and their atomic constituents to gas-phase heats of formation of energetic materials. Functional relationships between heats of vaporization and sublimation and properties associated with quantum, mechanically determined electrostatic potentials of isolated molecules are established. These are used with the gas-phase heats of formation to predict condensed-phase heats of formation. The calculated gas-phase heats of formation have a root mean square (rms) deviation of 3.1 kca1/mol and a maximum deviation of 7.3 kca1/mol from 35 experimental values.

The rms and maximum deviation of predicted heats of vaporization from 27 experimental values are 1.7 and 6.1 kca1/mol, respectively. The rms and maximum deviations of predicted heats of sublimation from 36 experimental values are 3.6 and 12.4 kca1/mol, respectively. The rms and maximum deviations of predictions of liquid heats of formation from 41 measured values (corresponding to 24 molecules) are 3.3 and 9.3 kca1/mol, respectively. Similarly, the rms and maximum deviations of predictions of solid heats of formation from 75 measured values (corresponding to 44 molecules) are 9.0 and 35.4 kca1/mol, respectively.
DTIC
Quantum Chemistry; Quantum Theory; Potential Energy; Electrostatic Charge; Monatomic Gases

20010041116 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Fire Blankets for Munition Protection: Flame and Heat Blocking Properties of Advanced Materials ***Final Report, May 1999-May 2000***
Tewarson, Archibald, Army Research Lab., USA; Wu, Peter K., Factory Mutual Research Corp., USA; Chin, Wai K., Factory Mutual Research Corp., USA; Shuford, Richard, Army Research Lab., USA; Feb. 2001; 55p; In English; Prepared in cooperation with Factory Mutual Research Corp., Norwood, MA
Contract(s)/Grant(s): DAAL-01-97-Q-0276
Report No.(s): AD-A387272; ARL-TR-2398; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report examines the flame and heat penetration through layers of fabrics as blankets for thermally protecting stored munitions. Evaluated were 27 fabrics made of inorganic fibers (alumina, silica, and ceramic fibers) and organic fibers (Kevlar, Nomex, and carbon) varying in thickness from 3 to 25 mm. Two types of tests were performed. First, flame penetration tests were performed with an oxyacetylene flame. Visual observations and measured char depth into a wooden block at the back of the sample were used in the analysis. Second, heat penetration tests were performed in the heat penetration apparatus. A radiant heater was used for heat exposure. Temperatures were measured at the front and back surfaces of the inorganic fabrics and in each layer of the Kevlar fabric. The average steady-state temperatures were used for the analysis. Effective thermal diffusivity values for the sample ”blankets” were estimated from the measured temperatures, sample thickness, and exposure duration using a simple heat conduction relationship for thermally thick materials. A procedure was developed to obtain effective thermal diffusivity of the sample ”blankets” from the measured average steady-state temperatures at the front and back surfaces, thickness, and exposure time duration. This procedure, along with measurements in the heat penetration apparatus, can be used for routinely testing the various types and combinations of inorganic and organic fiber-based fabrics.
DTIC
Ammunition; Flammability; Protection; Thermal Resistance; Flames; Conductive Heat Transfer

20010041172 Pennsylvania State Univ., University Park, PA USA
Soot Formation in Turbulent Combusting Flows ***Final Report***
Santoro, Robert J.; Mar. 01, 2001; 31p; In English; Original contains color plates
Contract(s)/Grant(s): F49620-97-1-0094; AF Proj. 2308
Report No.(s): AD-A387771; AFRL-SR-BL-TR-01-0159; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This study investigated the effects of turbulence on the spatial distribution of the soot particle and OH fields in turbulent C2H4 air/jet diffusion flames. Measurements obtained using planar laser-induced incandescence (LII) for soot volume fraction and laser-induced fluorescence (LIF) for both OH, and polycyclic aromatic hydrocarbons (PAH) formed the basis for investigating soot formation and destruction processes in these flames. These laser-based techniques were applied to the flame independently as well as simultaneously. Extensive information on the structure of the soot and OH fields was obtained from two-dimensional imaging experiments. Imaging results for soot, OH and PAH indicated three distinct soot formation/oxidation regions; a rapid soot growth region, in which OH and soot particles lie in distinctly different radial locations; a mixing dominated region controlled by large-scale fluid motion; and, finally, a soot oxidation region in which the OH and soot fields overlap spatially, resulting in the rapid oxidation of soot particles. Detailed quantitative analyses including soot volume fraction, OH and soot zone thickness variations, and probabilities distributions for soot and OH were performed. The measurements of soot and OH zone thickness showed that the soot zone thickness varied nearly linearly in the formation region, while approximately a doubling of thickness of the OH zone was evident over the studied Reynolds number range (4000-23000). The probability density function results tor soot, OH, and PAH indicated that OH and PAH are spatially interrelated with respect to soot formation and oxidation processes
DTIC
Flames; Soot; Spatial Distribution; Turbulence; Turbulence Effects; Turbulent Flow

20010041323 City of Hope Medical Center, Duarte, CA USA

Electrochemical Treatment of Breast Cancer with Direct Current ***Annual Report, 1 Oct. 1996 - 30 Sep. 1997***

Clou, Chung-Kwang, City of Hope Medical Center, USA; March 1998; 23p; In English

Contract(s)/Grant(s): DAMD17-96-1-6184

Report No.(s): AD-A341307; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Electrochemical treatment (ECT) of cancer is a promising new method which delivers direct current (dc) into tumor tissue by inserting electrodes (anodes and/or cathodes) to induce tumor regression. The purpose of this study is to evaluate the effectiveness of ECT and tissue responses to anode and cathode. Methods: (1) Tumor tissue responses to ECT: 1 x 10 rat breast cancer cells (MTF-7) were injected subcutaneously into the right fat pad of the mammary gland of a Fisher 344 female rat. While the tumors were grown to 2 x 2 is greater than c 2 cm, 60 rats were divided into 6 groups and underwent ECT with doses of 0, 5, 10, 20, 30, and 40 coulombs (C), respectively (9) in each group except 12 in 5 and 10 C groups). Two platinum electrodes were inserted at a 1-cm spacing into the tumor. Three tumor samples in each group were removed at 0, 24, and /18 hrs post-treatment for light microscopy and at 0 hour for electron microscopy. (2) Normal muscle tissue response to ECT: 9 Fisher 3/14 female rats were divided into 3 groups: anode, cathode, and both% anode and cathode insertion in right thigh muscle (3 in each group) with 10 C applied. results: There are distinct changes to the cellular structure of the treated tumors. The changes ranged from blurred to completed loss of cellular outlines. An abrupt transition from treated tumor to viable tumor indicated that there is a definite effective treatment area, based upon the close applied. The area adjacent to the cathode exhibited minor swelling, while dehydration,as observed around the anode. Also, We observed disruption in the treated muscle tissue, either with cathode, anode, or both. Conclusions: (1) ECT is effective for cellular disruption of the acted tissue; (2) both anode and cathode can damage and destroy cell structures; (3) The effects of ECT are nonspecific.

DTIC

Cancer; Direct Current; Electrodes; Mammary Glands

20010043653 Army Research Lab., Adelphi, MD USA

Extinction, Absorption, Scattering, and Backscatter for Aerosolized Bacillus Subtilis Var. Niger Endospores from 3 to 13 Micron ***Final Report, 1 Aug. 1999 - 1 Aug. 2000***

Gurton, Kristan P., Army Research Lab., USA; Ligon, David, Army Research Lab., USA; Kvavilashvili, Ramaz, Army Research Lab., USA; Feb. 01, 2001; 23p; In English

Report No.(s): AD-A387014; ARL-TR-2343; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Spectral extinction was measured in situ for aerosolized Bacillus subtilis var. niger (BG) endospores with the use of Fourier-transform infrared (FTIR) spectroscopy from 3.0 to 13.0 micron. Corresponding aerosol-size distributions were measured with the use of a commercially available elastic light-scattering probe and verified by direct particle capture and subsequent counting via video microscopy. Aerosol mass density was monitored simultaneously with conventional dosimetry and used to mass-normalize the measured spectral extinction. Mie theory calculations based on measured distributions and available complex indices of refraction agreed well. Also present are resultant Mie calculations for the absorption, total scattering, and backscattering. Included are the real and imaginary components of the complex index of refraction for BG as measured by Milham and Quarry. Both calculated and measured cross sections suggest that for wavelengths longer than 6.0 micron, the total extinction is primarily due to absorption. Finally, to offer a comparison, we present measured spectral extinction for three additional aerosols often found in the lower atmosphere, i.e., water fog, diesel soot, and Arizona road dust.

DTIC

Extinction; Backscattering; Mie Scattering; Aerosols; Bacillus

26
METALS AND METALLIC MATERIALS

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

20010041339 Universities Space Research Association, Huntsville, AL USA

Experimental and Theoretical Investigations of the Solidification of Eutectic Al-Si Alloy

Sen, S., Universities Space Research Association, USA; Catalina, A. V., Universities Space Research Association, USA; [2001]; 1p; In English; International Conference on Solidification Science and Processing, 18 Feb. 2001, Bangalore, India

Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

The eutectic alloys have a wide spectrum of applications due to their good castability and physical and mechanical properties. The interphase spacing resulting during solidification is an important microstructural feature that significantly influences the

mechanical behavior of the material. Thus, knowledge of the evolution of the interphase spacing during solidification is necessary in order to properly design the solidification process and optimize the material properties. While the growth of regular eutectics is rather well understood, the irregular eutectics such as Al-Si or Fe-graphite exhibit undercoolings and lamellar spacings much larger than those theoretically predicted. Despite of a considerable amount of experimental and theoretical work a clear understanding of the true mechanism underlying the spacing selection in irregular eutectics is yet to be achieved. A new experimental study of the solidification of the eutectic Al-Si alloy will be reported in this paper. The measured interface undercoolings and lamellar spacing will be compared to those found in the literature in order to get more general information regarding the growth mechanism of irregular eutectics. A modification of the present theory of the eutectic growth is also proposed. The results of the modified mathematical model, accounting for a non-isothermal solid/liquid interface, will be compared to the experimental measurements.
Author
Eutectic Alloys; Solidification; Aluminum Alloys; Silicon Alloys

20010043368 National Inst. of Standards and Technology, Materials Science and Engineering Lab., Gaithersburg, MD USA
Materials Science and Engineering Laboratory Metallurgy Division FY 2000 Programs and Accomplishments
Jan. 2001; 74p; In English
Report No.(s): PB2001-104602; NISTIR-6597; Copyright; Avail: National Technical Information Service (NTIS)
This report describes major programs and accomplishments of the Metallurgy Division of the NIST Materials Science and Engineering Laboratory (MSEL) in FY2000. The mission of the NIST Metallurgy Division is to provide critical leadership in the development of measurement methods, standards, and fundamental understanding of metals behavior needed by U.S. materials producers and users. As a fundamental part of this mission we are responsible not only for developing new measurement methods with broad applicability across materials classes and industries, but also for working with individual industry groups to develop and integrate measurements, standards, and evaluated data for specific, technologically important applications.
NTIS
Industries; Leadership; Metals; Materials Science

20010043652 Colorado School of Mines, Golden, CO USA
Hydrogen Trapping and Cracking Susceptibility with Different Restraint
Park, Y. D., Colorado School of Mines, USA; Maroef, I., Colorado School of Mines, USA; Landau, A., Ben Gurion Univ. of the Negev, Israel; Olson, D. L., Colorado School of Mines, USA; Apr. 04, 2001; 11p; In English; 20th ASM Heat Treating Society Conference, 9-12 Oct. 2000, Saint Louis, MO, USA
Contract(s)/Grant(s): DAAG55-98-I-0085
Report No.(s): AD-A387029; ARO-37378.14-MS; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Retained austenite, which is a meta-stable microstructure, can be found in high strength steel weldment as much as four vol. pct. Previous investigation has shown that this microstructure also behaves as a strong hydrogen trap. Hydrogen thermal desorption analysis has also shown that a complete removal of hydrogen from retained austenite can be achieved only after heat treatment above 650 C. Due to high solubility and slow diffusivity of hydrogen in the parent austenite phase of the steel weldment, retained austenite always contains significant amount of hydrogen after welding cooling cycle.
DTIC
Austenite; Microstructure; Heat Treatment

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.

20010040848 Howard Univ., Washington, DC USA
The Polymer Chemistry of Butatrienes and Their Potential as Precursors of Novel Polyacetylenes ***Final Report, 15 Mar. 1995-14 Mar. 1998***
Feb. 06, 2001; 12p; In English
Contract(s)/Grant(s): F49620-95-1-0223
Report No.(s): AD-A386720; AFRL-SR-BL-TR-010-0122; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this work, we explore novel approaches to new polymers the poly(butyne-l,4-diyl). These are synthsized from 1,2,3-butatrienes, highly unsaturated monomers. Tetrasubstituted systems bearing bulky aliphatic substitutents can be polymerized under controlled conditions. The tetramethyl system cannot be controlled. Using diphenyl substitutents, we have developed a new approach to the synthesis of soluble polyacetylenes. Using 1,4-diphenyl substituted butatrienes, we polymerize these monomers to form a non-conjugated poly(l,4-diphenyl-2-butyne-l,4-diyl). This soluble, processable materials can be converted to the conjugated (poly(diphenylacetyelen-ait-acetylene) for through the application of strong protic bases. we provide synthesic procedures and characterization of both the precursor and final polymers.
DTIC
Polymer Chemistry; Polyacetylene; Trienes; Polymerization

20010040955 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Tensile Strengths of Silicon Carbide (SiC) Under Shock Loading ***Final Report, Oct. 1998-Sep. 1999***
Dandekar, Dattatraya P.; Bartkowski, Peter T.; Mar. 2001; 58p; In English
Report No.(s): AD-A388072; ARL-TR-2430; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The present work was initiated to measure and compare tensile strengths (i.e., spall thresholds) of five different types/varieties of silicon carbide materials. Two of these materials were sintered, and the remaining three were hot-pressed. Three types of silicon carbides (one sintered by Sohio and. the other two hot-pressed by Cercom) were manufactured in the USA. The remaining two varieties of silicon carbides were manufactured in France. Spall strengths of these five different silicon carbide materials were measured by performing plane shock wave experiments to a maximum impact-generated stress level of 17 GPa on the light gas-gun facility at the U.S. Army Research Laboratory (ARL). The single most important result of this investigation is that spall strength of silicon carbide, irrespective of its manufacturing process, improves initially to a certain impact stress level before it begins to deteriorate under higher impact stress. The decline in the spall strength of both sintered materials and Cercom SiC-B begin at an impact stress between 3-5 GPa. SiC-N data have a very large scatter. Spall strength of the French sintered and hot-pressed material increases to an impact stress of 11.7 GPa. Its spall strength increases from 0.8 GPa at an impact stress of 1.6 GPa to 1.8 GPa at an impact stress of 11.7 GPa. In terms of spall strength, the French sintered and hot-pressed materials show the least scatter and largest increase with an increase in the impact stress. The results of the present work thus offer new challenges to modeling ceramic materials.
DTIC
Silicon Carbides; Tensile Strength; Deterioration; Ceramics; Shock Waves

20010041316 NASA Marshall Space Flight Center, Huntsville, AL USA
Effects of Radiation on the Mechanical Properties of Polysilicon and Polydiamond thin Film
Newton, Robert L., NASA Marshall Space Flight Center, USA; Davidson, J. L., Vanderbilt Univ., USA; [2000]; 1p; In English; ASTM Conference, 15-15 Nov. 2000, Orlando, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Due to its many excellent properties, diamond is being explored as a material for MicroElectroMechanical Systems (MEMS). However, as is true in the case of silicon, a large amount of basic material characterization issues still warrant investigation. This paper presents preliminary results from charged particle irradiation of Chemical Vapor Deposited (CVD) polycrystalline diamond films. The films were simultaneously dosed to a level of 9.4 x l0(exp 13)/sq cm using 700 keV protons and 1 MeV electrons. The samples were then subject to cross-sectional nanoindention analysis and Raman spectroscopy. Polycrystalline silicon was also investigated for comparison purposes. The diamond was unaffected by the irradiation. However, the silicon did indicate a slight decrease in the Young's Modulus.
Author
Diamond Films; Polycrystals; Radiation Effects; Silicon Polymers; Thin Films

20010041331 North Carolina Univ., Dept. of Mathematics, Chapel Hill, NC USA
Fiber Flows and Technological Applications ***Final Report, 1 Oct. 1996-30 Sep. 1999***
Gregory, Forest M., North Carolina Univ., USA; Sep. 30, 1999; 7p; In English
Contract(s)/Grant(s): F49620-97-1-001
Report No.(s): AD-A386541; AFRL-SR-BL-TR-01-0037; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The primary goals of this research proposal consist of the development of mathematical tools for high performance materials. The microstructure of these complex fluids consists of macromolecules whose shape, conformation, and rigidity/flexibility interact with the flow to effect molecular scare alignment that controls the ultimate performance properties of the solid material. Our approach has focused on mesoscale, moment- averaged theories derived for liquid crystalline polymer (LCP) materials. We aim for: 1) modeling and simulation of free surface fiber processes for anisotropic, viscoelastic materials; 2) exact constructions

of the patterns that are routinely observed in experiments, and for which no mathematical descriptions were available; 3) for fundamental understanding of nematic dynamics and phase transitions, and of the response of these complex fluids to flows that approximate finer and film processes; 4) for development of numerical codes to resolve the interactions between microstructure and flow.
DTIC
Liquid Crystals; Fluid Flow; Numerical Analysis; Mathematical Models; Microstructure; Phase Transformations

20010041345 Analytical Services and Materials, Inc., Hampton, VA USA
Fracture Tests on Thin Sheet 2024-T3 Aluminum Alloy for Specimens with and Without Anti-Buckling Guides
Johnston, William M., Analytical Services and Materials, Inc., USA; March 2001; 19p; In English
Contract(s)/Grant(s): NAS1-96014; RTOP 706-61-11-02
Report No.(s): NASA/CR-2001-210832; NAS 1.26:210832; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A series of fracture test were conducted to determine the effects of specimen type specimen width and buckling on the fracture behavior of cracked thin sheet (0.063 inch thick) 2024-T3 aluminum alloy. A summary of the experimental measurements is presented for fracture tests conducted on two specimen types and various widths. Middle-crack tension M(T) and compact tension C(T) specimens were tested in the L-T and T-L orientation with duplicate tests for each condition. Four widths (W= 3, 12, 24, and 40 inch) were tested for the middle-crack tension specimens, and three widths (W=2, 4, and 6 inch) were tested for the compact tension specimens. The M(T) specimens were tested in either a constrained (out-of-plane displacements restrained with antibuckling guides) or unconstrained conditions were the specimen was free to buckle out of plane Measurements were made of load against crack extension for all specimens.
Author
Aluminum Alloys; Fracture Mechanics; Crack Propagation

20010042784 California State Dept. of Transportation, Div. of New Technology, Materials and Research, Sacramento, CA USA
Gabion Mesh Corrosion: Comparisons ***Final Report***
Racin, J. A., California State Dept. of Transportation, USA; Jun. 1991; 128p; In English
Contract(s)/Grant(s): F87TL34
Report No.(s): PB2001-103921; Rept-637353; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Corrosion studies in the laboratory and at field sites in Northern California are documented. The objective was to evaluate coatings on seven steel wire mesh products. The performance variable is ultimate tensile force of individual wires. Two wire coatings were tested: (1) Galvanized (hot-dipped zinc) and (2) Polyvinyl chloride (PVC) AND galvanized. There were two styles of mesh: twisted wire and welded wire. Results are being used to update material specifications and to guide selection of gabion materials. Similar procedures may be used to evaluate future alternative wire coatings.
NTIS
Corrosion; Wire; Coatings; Performance Tests; Mesh

20010042794 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Semipermeable Membrane From Ionomeric Self-Assembling Block Copolymer ***Final Report, Nov. 1998 - Sep. 1999***
Crawford, Dawn N.; Napadensky, Eugene; Tan, Nora C.; Sloan, Jim; Reuschle, David A.; Feb. 2001; 34p; In English
Report No.(s): AD-A387974; ARL-TR-2403; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Morphological studies have been performed on novel polystyrene-polyisobutylene- polystyrene (PS-PlB-PS) triblock copolymer films made by different processes. The PS-PIB-PS films are composed of approximately 30% polystyrene end blocks. Small-angle x-ray scattering (SAXS) and transmission electron microscopy (TEM) confirm that a self-assembled, segregated cylindrical morphology forms in the copolymer. Dynamic mechanical analysis (DMA) is used as a tool to investigate the structure-property relationships in these polymers. Fourier-transform infrared (FTIR) spectroscopy and solvent-sorption studies have validated the membrane transport properties. Modified PS-PJB-PS copolymers have also been characterized. Modifications of the copolymers were carried out by converting approximately 20% of the polystyrene end blocks to styrene-sulfonic acid. The presence of sulfonic acid groups disrupts the morphology and significantly enhances water transport properties. Morphological features of the copolymers are discussed as they relate to mechanical and transport properties.
DTIC
Membranes; Block Copolymers; Morphology

28
PROPELLANTS AND FUELS

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

20010040829 SRI International Corp., Menlo Park, CA USA
Synthesis of New High Energy Density Matter (HEDM): Extra High Energy Oxidizers and Fuels ***Final Report, 23 Jan. 1996-23 Jan. 1999***
Schmitt, Robert J.; Bottaro, Jeffrey C.; Petrie, Mark; Penwell, Paul E.; Sep. 2000; 39p; In English
Contract(s)/Grant(s): F04611-96-K-0013; AF Proj. 1011
Report No.(s): AD-A387992; PROJECT,1198; AFRL-PR-ED-TR-1998-0023; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This program focused on the discovery and synthesis of new, extra-high energy oxidizers and fuels for the High Energy Density Matter (HEDM) program. The goals included the preparation of new compounds having unusual bonding to yield high energy, dense materials for propellant applications. The specific objectives for this program were: (1) to develop new fuels and oxidizers for propellant applications. The materials must be simple to make (cubane is difficult); be storable and usable; have significantly improved performance over conventional materials; develop burn rate accelerators to improve and accelerate combustion. (2) Invent new compositions of matter to meet needs of the program. The requirements for the new materials included simplicity of synthesis and good long-term stability to make these material candidates for propellant applications. The work was directed primarily toward the synthesis of highly energetic fuels and fuel additives because this area has been relatively unexplored, although this report discusses a new oxidizer family with great promise. A new concept of combinatorial type synthesis for energetic materials is also discussed in this report.
DTIC
Combustion; Fuels; Synthesis (Chemistry); Rocket Propellants; Rocket Oxidizers

20010043694 Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, Washington, DC USA
Renewable Energy Annual 2000, With Data For 1999
Mar. 2001; 90p; In English; Original contains color illustrations
Report No.(s): PB2001-104659; DOE/EIA-0603(2000); No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This is the sixth annual report published by the Energy Information Administration (EIA) that presents information on U.S. renewable energy consumption, capacity, and electricity generation; U.S. solar thermal and photovoltaic collector manufacturing activities; and U.S. geothermal heat pump manufacturing activities. The renewable energy resources included in the report are: biomass (wood, woodwaste, municipals solid waste, landfill gas, ethanol, and other waste); geothermal; wind; solar (solar thermal and photovoltaic); and hydropower.
NTIS
Renewable Energy; Energy Consumption; Solar Energy

29
SPACE PROCESSING

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

20010041317 NASA Marshall Space Flight Center, Huntsville, AL USA
Microgravity and Macromolecular Crystallography
Kundrot, Craig E., NASA Marshall Space Flight Center, USA; Judge, Russell A., NASA Marshall Space Flight Center, USA; Pusey, Marc L., NASA Marshall Space Flight Center, USA; Snell, Edward H., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Macromolecular crystal growth has been seen as an ideal experiment to make use of the reduced acceleration environment provided by an orbiting spacecraft. The experiments are small, simply operated and have a high potential scientific and economic impact. In this review we examine the theoretical reasons why microgravity should be a beneficial environment for crystal growth

and survey the history of experiments on the Space Shuttle Orbiter, on unmanned spacecraft, and on the Mir space station. Finally we outline the direction for optimizing the future use of orbiting platforms.
Author
Crystal Growth; Crystallography; Low Gravity Manufacturing; Space Processing; Crystals

20010041341 AZ Technology, Huntsville, AL USA
Science Data Report for the Optical Properties Monitor (OPM) Experiment *Final Report*
Wilkes, D. R., AZ Technology, USA; Zwiener, J. M., AZ Technology, USA; March 2001; 258p; In English
Contract(s)/Grant(s): NAS8-39237
Report No.(s): NASA/CR-2001-210881; NAS 1.26:210881; M-1007; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This science data report describes the Optical Properties Monitor (OPM) experiment and the data gathered during its 9-mo exposure on the Mir space station. Three independent optical instruments made up OPM: an integrating sphere spectral reflectometer, vacuum ultraviolet spectrometer, and a total integrated scatter instrument. Selected materials were exposed to the low-Earth orbit, and their performance monitored in situ by the OPM instruments. Coinvestigators from four NASA Centers, five International Space Station contractors, one university, two Department of Defense organizations, and the Russian space company, Energia, contributed samples to this experiment. These materials included a number of thermal control coatings, optical materials, polymeric films, nanocomposites, and other state-of-the-art materials. Degradation of some materials, including aluminum conversion coatings and Beta cloth, was greater than expected. The OPM experiment was launched aboard the Space Shuttle on mission STS-81 in January 1997 and transferred to the Mir space station. An extravehicular activity (EVA) was performed in April 1997 to attach the OPM experiment to the outside of the Mir/Shuttle Docking Module for space environment exposure. OPM was retrieved during an EVA in January 1998 and was returned to Earth on board the Space Shuttle on mission STS-89.
Author
Optical Properties; Optical Equipment; Aerospace Environments; Measuring Instruments; Space Missions

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.

20010040898 Naval Postgraduate School, Monterey, CA USA
Simulation and Performance Analysis of the AD HOC On-Demand Distance Vector Routing Protocol for Tactical Mobile AD HOC Networks
Theriot, Tyrone P.; Dec. 2000; 103p; In English; Original contains color plates
Report No.(s): AD-A388021; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis presents a simulation and analysis of the Ad Hoc On-Demand Distance Vector Routing Protocol (AODV) for mobile ad hoc network (MANET) environments using the Network Simulator 2 (NS2) tool. AODV is being suggested for possible implementation in the Joint Tactical Radio System (JTRS) for the USA military. Utilizing an AODV model resident in NS2, the simulation focuses on key performance parameters that include the packet delivery fraction, routing loss, buffer loss, total loss, throughput and goodput. The AODV node movement and traffic connection files have been generated to measure the network performance for a given environment using specific parameters. The results reported in this thesis indicate that the network environment size, packet rate and offered load are critical to the network performance. Node velocity played a minimal role in affecting the overall network performance.
DTIC
Computerized Simulation; Software Development Tools; Protocol (Computers); Communication Networks; Reliability Analysis; Simulators

20010040998 Michigan Univ., Ann Arbor, MI USA

High Efficiency Micromachined Antennas: Micromachined Antennas for Microwave and Mm-Wave Applications ***Final Report, 1 Oct. 1994 - 31 Dec. 1997***

Katehi, Linda P., Michigan Univ., USA; March 1997; 179p; In English

Contract(s)/Grant(s): N00014-95-1-0546

Report No.(s): AD-A337198; UM/EECS-033095-1-F; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This project concentrates on the development of high efficiency Si micromachined antennas. Microstrip antennas are used in a broad range of applications from communication systems (radars, telemetry and navigation) to biomedical systems, primarily due to their simplicity, conformability and low manufacturing cost. With the recent development of microwave and millimeter-wave integrated circuits and the trend to incorporate all mi crowave devices on a single chip for low-cost and high density, there is a need to fabricate microstrip antennas in a monolithic fashion with the rest of the circuitry on semiconducting materials such as Silicon, GaAs or InP. These antennas, despite their planar character and low cost, suffer from high surface-wave excitation resulting in compromised efficiency, reduced bandwidth and degradation of the radiation pattern. Furthermore, in monolithic designs the feed lines share in most chases the same interface with the antennas and lead into parasitic radiation which deforms the antennas pattern and increases cross-talk. During the reporting period, our group has investigated the development of a variety of micromachined as listed below: (1) The antennas are Si micromachined for high efficiency and are excited by a corporate feed network which is packaged on-wafer to achieve reduced parasitic radiation and reduced cross polarization levels. (2) Micromachined antennas fed by a vertically integrated network, which excites the radiation elements by electromagnetic coupling through planar slots printed on the ground plane of the antennas. (3) Micromachined antennas, which can be reconfigured by use of a very fast, very low loss, MEMS switch. (4) Modeling of antenna and circuit structures using time domain multiresolution analysis. The study performed in each of these areas is described in detail in this report.

DTIC

Antenna Arrays; Antenna Radiation Patterns; Microstrip Antennas; Millimeter Waves

20010041033 Brown Univ., Div. of Applied Mathematics, Providence, RI USA

High-Order Time-Domain Methods for Maxwells Equations ***Final Report, 15 Aug. 1996-31 Aug. 2000***

Gottlieb, David; Aug. 2000; 16p; In English

Contract(s)/Grant(s): F49620-96-1-0426

Report No.(s): AD-A387844; AFRL-SR-BL-TR-01-0174; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A concentrated effort has recently been initiated to develop methods for solving the time domain Maxwells equations in complex geometries and media using an fully unstructured grid. The USEMe code (Unstructured Spectral Element Method) is the resulting implementation of a numerical scheme which employs nodal high-order/spectral multi-domain methods. Each component of the code has been carefully designed with efficiency, accuracy, flexibility, and robustness in mind. The standard geometric building block by which the computational domain is gridded in USEME is the triangular element in 2D, and the tetrahedral element in 3D. This allows for the use of standard finite element or finite volume type meshes using these elements to describe arbitrarily complex domains, hence overcoming one of the main concerns associated with the structured grid methods. The use of triangles and tetrahedrons remains of the most important design principles of the method as it enables a tight integration with industry standard mesh generators. USEMe is based on penalty/discontinuous Galerkin (DGM) type scheme, which is a particular form of a penalty scheme that guarantees elemental conservation and global stability. Neighboring elements are patched together through the use of penalty terms to account for jumps across their shared boundary. This formulation has the advantage that it allows material coefficients to vary discontinuously at the interface between two elements, while still preserving high order accuracy. Additionally this allows for efficient communication in parallel computations.

DTIC

Numerical Analysis; Unstructured Grids (Mathematics); Time Domain Analysis; Maxwell Equation

20010041037 Matis, Inc., Atlanta, GA USA

High Frequency Electromagnetic Propagation/Scattering ***Final Report, 1 Sep. 1998 - 31 Aug. 2000***

Oliker, Vladimir; Engquist, Bjorn; Osher, Stanley; Dec. 16, 2000; 13p; In English

Contract(s)/Grant(s): F49620-98-C-0042

Report No.(s): AD-A387862; AFRL-SR-BL-TR-01-0155; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two directions of work have been pursued under this effort. The first direction is concerned with further extensions of our geometric techniques for spatial and surface ray tracing and applications of these techniques to problems in high-frequency electromagnetics. In addition, high-frequency physical optics methods were developed for accurate and efficient calculation 0 scattered fields due to currents in the penumbra region. The second direction is concerned with development of grid methods for

capturing the motion of self-intersecting interfaces and related PDEs connected with propagation of high-frequency waves. In both directions significant progress has been achieved.
DTIC
Wave Propagation; Electromagnetic Wave Transmission; Electromagnetic Scattering

20010041107 Army Research Lab., Advanced Computational and Information Sciences Directorate, Aberdeen Proving Ground, MD USA
Description of an Automated Tool for Evaluating a Tactical Communications Protocol ***Final Report, Jun. 1998-Jun. 1999***
Lopez, Maria C.; Mar. 2001; 26p; In English
Report No.(s): AD-A388044; ARL-MR-509; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Adaptive networking (AN) focuses on creating a logical and extendible framework for a multiyear effort in AN research. The U.S. Army Research Laboratory (ARL) designed an experiment to identify which communications protocol's parameters were more likely to have a relevant effect on network congestion. The software, called experiment control software (exp
DTIC
Evaluation; Performance Tests; Software Development Tools

20010041109 Ohio State Univ., ElectroScience Lab., Columbus, OH USA
Development of Computational Tools for Predicting the Radar Scattering from Targets on a Rough Sea Surface ***Final Report***
Burkholder, R. J.; Janpugdee, P.; Colak, D.; Jan. 2001; 92p; In English
Contract(s)/Grant(s): N00014-98-1-0243
Report No.(s): AD-A388046; ESL-735231-3; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The radar scattering from 2D and 3D targets on a rough sea surface is investigated using computational techniques developed specifically for this problem. Numerical simulations and Monte Carlo studies yield insight into the scatter phenomenology. It is found that the scattering from a target on a random rough sea surface becomes more coherent as the incident field becomes more coherent, e.g., for low wind speeds or low elevation angles. For the less coherent case, the average and peak scattering levels of a target on a rough surface may be significantly higher or lower than for a flat surface, depending on the target geometry. A tilted plan model is proposed for predicting the variations in the RCS of a target on a rough sea surface by mounting the target on a locally planar surface which can tilt, similar to the two-scale composite model of ocean scattering. It is found that tilting the plane, or equivalent, rolling the target on a horizontal plane fields as much or more variation in the RCS than caused by the rough surface. However, the cross polarization introduced by the rough surface in 3D is not well predicted by the tilted plane model, nor is the unexplained behavior near the Brewster angle for vertical polarization.
DTIC
Ocean Models; Ocean Surface; Radar Scattering; Software Development Tools

20010041165 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Navy Collaborative Integrated Information Technology Initiative ***Quarterly Report, 1 Nov. 2000-31 Jan. 2001***
Reifsnider, Kenneth; Habayeb, Rick; Aug. 30, 2000; 103p; In English
Contract(s)/Grant(s): N00014-00-1-0549
Report No.(s): AD-A387796; 14; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Quarterly progress report on NAVCIITI hardware and software configurations of smart antennas, multi-function antennas, secure configurable platform, command & control visualization, visualization and HCI, collaboration workspace, digital ships, mechanically flexible displays, fiberoptic LAN, network protocol interoperability, network system interoperability, and scheduling and resource management.
DTIC
Information Systems; Integrated Circuits; Navy; Radio Control; Display Devices

20010041350 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Subband Channelized Radar Detection and Bandwidth Estimation for FPGA Implementation
Burke, Bryan T., Illinois Univ. at Urbana-Champaign, USA; January 2000; 69p; In English
Report No.(s): AD-A387799; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
The theory of optimum radar detection is well known and is generally implemented in expensive ASICs or supercomputers. However, today's state-of-the-art FPGAs are capable of performing relatively complex algorithms and provide the added benefit of being reconfigurable with new algorithms or methods on-site. Los Alamos National Laboratory has undertaken the goal of

developing a receiver that is capable of performing detection and bandwidth estimation of pulsed radar systems. It is designed to function in electronic intelligence (ELINT) applications, where the goal is to determine the capabilities of threatening systems, such as radars which guide aircraft or missiles to targets. This thesis addresses methods of pulse detection and bandwidth estimation that are able to be implemented on an FPGA. The framework is that which is commonly used in this application: a polyphase filter bank subband frequency decomposition of the RF signal, followed by statistical detection methods. The optimal fixed-sample-size (FSS) estimator for this subband decomposition is shown to be the F-test, based on the output statistics of the filter bank, which are found to be chi-squared. An alternative to fixed-sample-size methods, the sequential probability ratio test (SPRT) is, however, more suited to ELINT due to its ability to adapt the test length to the received data. The SPRT is shown to achieve a higher probability of detection with approximately 1/5 the required sample size of the FSS method. The complexity of the SPRT is equivalent to that of the FSS method, and the statistic that results from the optimal SPRT implementation also lends itself to easy calculation of the bandwidth of the signal.
DTIC
Computer Programs; Algorithms; Radar Detection; Targets; Radio Frequencies

20010041379 Devaney (Anthony J.) Associates, Boston, MA USA
Research in Electromagnetic Scattering ***Final Report, 01 Jan. 1998-30 Nov. 2000***
Yaghjian, Arthur D., Devaney (Anthony J.) Associates, USA; Feb. 26, 2001; 10p; In English
Contract(s)/Grant(s): F49620-98-C-0011; AF Proj. 2304
Report No.(s): AD-A387664; AFRL-SR-BL-TR-01-0165; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy
This document constitutes a final report for our research in electromagnetic scattering during the years 1998-2000. The technical research accomplishments during each year divide conveniently into the areas of time-domain electromagnetics, high-frequency diffraction, and surface integral equations. In the year 2000, work also was initiated in the area of analyzing arrays of small elements using a source scattering-matrix description of coupled radiators.
DTIC
Diffraction; Electromagnetic Scattering; Electromagnetism; Integral Equations

20010043366 Federal Aviation Administration, Washington, DC USA
Potential for Accommodating Third Generation Mobile Systems in the 1710-1850 MHz Band: Federal Operations, Relocation Costs, and Operational Impacts ***Final Report***
Druhan, W. T.; Camacho, J. P.; Patrick, G. M.; Wilson, R. C.; Mar. 2001; 174p; In English; Original contains color illustrations
Report No.(s): PB2001-104735; NTIA-SP-01-46; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
The objectives of this study were to document the Federal Government use of the 1710- 1850 MHz band, and to address other issues relevant to the possible accommodation of 3G mobile systems in this band. These issues include sharing options, continuity of Federal operations, time lines for relocation, and the estimated costs related to any relocation of Federal users from the band.
NTIS
Telecommunication; Mobile Communication Systems; Policies

20010043643 Naval Research Lab., Washington, DC USA
An Introduction to the Functionality of the ISAR Radar
Madden, Richard, Naval Research Lab., USA; Feb. 28, 2001; 22p; In English
Report No.(s): AD-A387762; NRL/MR/5313--01-8533; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
There are many types of sensors to sense or analyze most any type of environment, environmental conditions, or even targets that are of interest. Radar, which is only the broad definition, is a remote sensor. Many different types of radar are in use. ISAR radar is in use by the U.S. Navy and the Coast Guard. The ISAR radar was first realized in the early 1970s and, even after almost thirty years of existence, there isn't one book that has explained the fundamentals of ISAR radar. There have been many articles in the trade journals about ISAR and how to improve the radar. Someone new to the field would have to go through the many articles on ISAR and the many articles and books on SAR. Even though ISAR is very signal processing oriented, this report is not. The purpose of this report is to introduce some of the basic principles of the ISAR radar and how it works. Some explanation of the type of information a trained individual can exploit from an ISAR image is also included.
DTIC
Remote Sensors; Side-Looking Radar

20010043669 NASA Ames Research Center, Moffett Field, CA USA

Matrix Failure Modes and Effects Analysis as a Knowledge Base for a Real Time Automated Diagnosis Expert System

Herrin, Stephanie, NASA Ames Research Center, USA; Iverson, David, NASA Ames Research Center, USA; Spukovska, Lilly, NASA Ames Research Center, USA; [1994]; 6p; In English

Contract(s)/Grant(s): RTOP 106-30-01; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Failure Modes and Effects Analysis contain a wealth of information that can be used to create the knowledge base required for building automated diagnostic Expert systems. A real time monitoring and diagnosis expert system based on an actual NASA project's matrix failure modes and effects analysis was developed. This Expert system Was developed at NASA Ames Research Center. This system was first used as a case study to monitor the Research Animal Holding Facility (RAHF), a Space Shuttle payload that is used to house and monitor animals in orbit so the effects of space flight and microgravity can be studied. The techniques developed for the RAHF monitoring and diagnosis Expert system are general enough to be used for monitoring and diagnosis of a variety of other systems that undergo a Matrix FMEA. This automated diagnosis system was successfully used on-line and validated on the Space Shuttle flight STS-58, mission SLS-2 in October 1993.

Author

Automatic Control; Diagnosis; Expert Systems; Failure Analysis; Space Shuttle Payloads; System Failures

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also 60 Computer Operations and Hardware; and 76 Solid-State Physics. For communications equipment and devices see 32 Communications and Radar.

20010040899 Naval Postgraduate School, Monterey, CA USA

Design of a Synchronous Pipelined Multiplier and Analysis of Clock Skew in High-Speed Digital Systems

Calvert, John R., Jr; Dec. 2000; 149p; In English; Original contains color plates

Report No.(s): AD-A388019; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Digital systems implemented with high-speed transistor technologies face a variety of design challenges in an effort to keep pace with the accelerating demand for performance. As device switching frequencies climb comfortably into the gigahertz range, clock skew in digital systems threatens to limit the advantages of synchronous pipelined designs. This research investigates the limitations of clock skew on high-speed digital systems by designing and simulating an 8x8 bit synchronous, pipelined multiplier using Indium phosphide (InP), heterostructure bipolar junction (HBT) transistor technology. Fundamentals of circuit analysis and the principles of junction transistor behavior are applied to design an optimal family of logic devices using current-mode logic. All testing and simulation data is based upon results obtained from Tanner SPICE design tools. Using the building blocks of this logic family, an array multiplier is constructed and further configured into five distinct pipeline implementations. by employing a different number of pipeline stages in each implementation, the trade-offs of pipelining are illustrated and clock skew is analyzed at a variety of throughput rates. Finally, the impact of clock skew on throughput performance is quantified and summarized as a reference point for further research into asynchronous control techniques.

DTIC

Digital Systems; Multipliers; Pipelining (Computers); Synchronism; Computerized Simulation; Control Systems Design

20010041163 California Univ., Dept. of Materials Science and Engineering, Los Angeles, CA USA

Vanadium Oxide Aerogel Electrode Materials ***Final Report, 1 Dec. 1999-31 Dec. 2000***

Dunn, Bruce; Mar. 2001; 12p; In English

Contract(s)/Grant(s): N00014-00-1-0165; Proj-01PRO2906-00

Report No.(s): AD-A387801; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research consists of two studies related to the incorporation of vanadium oxide aerogels in electrode structures for secondary lithium batteries. A common theme in this work is that the electrode structures retain their interconnected mesoporous morphology so that there is electrolyte access to the solid oxide phase. One series of experiments is directed at creating a nanocomposite electrode based on combining carbon nanotubes with vanadium oxide aerogels. Excellent results are observed, particularly at high discharge rates. The second study involves the development of electrode fabrication methods, with the

objective of increasing electrode loading. Specific capacities in excess of 350 mAh/g are obtained with electrodes containing 10 mg/sq cm.
DTIC
Electrodes; Lithium Batteries; Aerogels; Vanadium Oxides; Fabrication

20010042795 Department of Defense, Office of the Inspector General, Arlington, VA USA
On-Board Jammers for the Integrated Defensive Electronic Countermeasures
Gimble, Thomas F.; Ugone, Mary L.; Santoni, Charles M.; Shaffer, Robert L.; Deats, Rebecca L.; Mar. 20, 2001; 32p; In English
Report No.(s): AD-A387977; IG/DOD-D-2001-086; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Integrated Defensive Electronic Countermeasures suite is intended to provide self-protection and increased survivability for tactical aircraft against radio frequency and infrared surface-to-air and air-to-air threats. The Navy-led program is designed to fill the electronic self-protection operational deficiency for the Navy F/A-18 E/F aircraft and will be integrated on the Air Forces B-1B and F-15 aircraft. The major hardware components to be developed are the AN/ALQ-214 radio frequency countermeasures system and the AN/ALE-55 Fiber Optics Towed Decoy. Total program cost is estimated to be $2.7 billion (then-year dollars). The AN/ALQ-214 development cost is $85.8 million and the procurement cost is $1.1 billion (458 units at $2.3 million each). The Navy plans to have an inventory of 366 radio frequency countermeasures systems and 10,980 decoys. The Air Force plans to have an inventory of 92 radio frequency countermeasures systems, 3,069 decoys for the B-1B, and 15,048 decoys for the F-15.
DTIC
Countermeasures; Electronic Countermeasures; Jammers

20010043655 Cincinnati Univ., Nanoelectronics Lab., OH USA
Low-Voltage GaN:Er Green Electroluminescent Devices
Heikenfeld, J., Cincinnati Univ., USA; Lee. D. S., Cincinnati Univ., USA; Garter, M., Cincinnati Univ., USA; Birkhahn, R., Cincinnati Univ., USA; Steckl, A. J., Cincinnati Univ., USA; Applied Physics Letters; 2000; ISSN 0003-6951; Volume 76, No. 11, pp. 1365-1367; In English
Contract(s)/Grant(s): DAAD19-99-I-0348
Report No.(s): AD-A387002; ARO-40045.2-EL; Copyright; Avail: Defense Technical Information Center (DTIC)

Green light emission has been measured from Er-doped GaN electroluminescent devices (ELDs) at an applied bias as low as 5 V. The GaN-Er ELDs were grown by solid source molecular beam epitaxy on Si (111) substrates. We have achieved this low-voltage operation (ten-fold reduction in optical turn-on voltage) by using heavy doped (approximately 0.01 Omega cm) Si substrates and by decreasing the GaN-Er layer thickness to several hundred nanometers. A simple device model is presented for the indium tin oxide/GaN-Er/Si/Al ELD. This work demonstrates the voltage excitation efficiency of Er(3+) luminescent centers and the compatibility of GaN rare earth-doped ELDs with low-voltage drive circuitry.
DTIC
Low Voltage; Gallium Nitrides; Erbium; Doped Crystals

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.

20010040816 Mississippi State Univ., Mississippi State, MS USA
CFD Simulation and Visual Analysis of Complex Time-Dependent Flight Vehicle Flow Fields ***Final Report, 1 Sep. 1996-31 Aug. 2000***
Marcum, David L.; Aug. 31, 2000; 193p; In English
Contract(s)/Grant(s): F49620-96-1-0441
Report No.(s): AD-A388051; AFRL-SR-BL-TR-01-0197; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The primary objective of this research project was to produce a research capability to perform detailed CFD simulations and Scientific Visualization analysis of unsteady, three-dimensional, compressible, viscous flow fields about flight vehicle configurations of interest to the Department of Defense (DoD). The target applications include, but are not limited to, separation of single or multiple stores from aircraft or missiles, launch vehicle or missile booster separation, separation of crew escape modules or ejection seats, separation of fairings, etc. from missile systems, and maneuvering aircraft or missiles. Target flow

conditions include, compressible flow regimes with vehicles operating at Mach numbers from high subsonic to moderate hyper-sonic, laminar and turbulent viscous flow, and flow of gases in chemical and thermal equilibrium.
DTIC
Simulation; Computational Fluid Dynamics; Flow Distribution

20010040952 Notre Dame Univ., Dept. of Aerospace and Mechanical Engineering, IN USA
Dynamic Modeling and Flow Control Strategies for Rectangular Jets: Application of POD and Wavelet Analysis ***Final Report, 15 Nov. 1999-14 Nov. 2000***
Thomas, Flint O.; Nov. 14, 2000; 27p; In English
Contract(s)/Grant(s): F49620-00-1-0013
Report No.(s): AD-A388063; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research effort has as its objectives: the experimental characterization and low order modeling of the coherent structure dynamics of high Reynolds number rectangular jets of low and moderate aspect ratios via a joint application of the proper orthogonal decomposition (POD) and wavelet analysis techniques. This includes the extraction and characterization of the u, v, and w-component POD eigenfunctions and associated eigenvalues. The rectangular jet dynamics (embodied in the POD temporal coefficients) is obtained by projection of the POD eigenfunctions onto instantaneous realizations of the flow field. This projection is performed via wavelet analysis. Similarly Galerkin projection of a truncated subset of the empirical eigenmodes onto the Navier-Stokes equations is used to develop a low-order dynamical systems model of the rectangular jet flow field. The validity of assumptions associated with the treatment of the truncated modes and their effect on the coherent structure is established by comparing the dynamic behavior resulting from the model ODE's with those from projection of POD modes onto the actual flow. The dynamical system model of the rectangular jet will be utilized for the establishment of rectangular jet flow control strategies. The flow control algorithm will be demonstrated via both the model and laboratory jet flows.
DTIC
Jet Flow; Dynamic Response; Flow Distribution; Models; Turbulent Flow; Wavelet Analysis; Navier-Stokes Equation; Dynamical Systems; Galerkin Method; Thrust Vector Control

20010041076 Defence Science and Technology Organisation, Melbourne, Australia
An Investigation into the Feasibility of Measuring Flow-Induced Pressures on the Surface of a Model in the AMRL Water Tunnel
Erm, Lincoln P., Defence Science and Technology Organisation, Australia; November 2000; 40p; In English
Report No.(s): DSTO-TN-0323; AR-011-650; Copyright; Avail: Issuing Activity

A study has been undertaken to assess the feasibility of measuring flow-induced pressures on the surface of a model in the AMRL flow-visualization water tunnel. These pressures are extremely small due to the low free-stream velocities generally used for flow-visualization experiments in the tunnel. For a free-stream velocity of 0.1 m/s, flow-induced pressures are typically less than about 15 Pa. In the past the pressures could not be measured accurately since suitable pressure transducers were not available. In this report it is shown that it is now possible to measure the pressures using a modern highly-sensitive transducer. Flow-induced pressures were measured on a delta wing in the AMRL water tunnel, and at the same time the vortical. flow over the wing was visualized, enabling the loading on the wing to be properly interpreted in relation to the observed flow patterns around the wing. This is believed to be the first time that flow induced pressures have been measured on a model in a flow-visualization water tunnel at such a low flow velocity.
Author
Water Tunnel Tests; Feasibility; Measuring Instruments; Pressure Measurement; Delta Wings

20010041164 Massachusetts Inst. of Tech., Dept. of Ocean Engineering, Cambridge, MA USA
Integrated Lifting-Surface and Euler/Boundary-Layer Theory Analysis Method for Marine Propulsors
Hanson, Christopher J.; Feb. 2001; 63p; In English
Contract(s)/Grant(s): N00014-95-1-0369
Report No.(s): AD-A387797; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A propeller lifting surface design and analysis program is automatically coupled with a Euler/integrated Boundary Layer Theory (IBLT) axisymmetric flow solver. The lifting surface method solves the localized propeller problem, while the Euler/IBLT solver handles the global flowfield, capturing the effective inflow problem. For viscous flows, the boundary layer is constructed based upon the parameters specified by the IBLT solution, and is merged with the inviscid Euler flowfield. The robust coupled method is capable of representing open propellers, ducted propulsors, and internal flow cases, including multi-blade row applications. For large axisymmetic bodies, the user may specify a nominal inflow, and the coupled method is used for the

localized propulsor problem only, further increasing the computational efficiency. The specified nominal flow field may be calculated by other numerical flow solvers, obtained from experimental results, or calculated from a Euler/IBLT solution of the entire body. The coupled code is an extremely rapid flowfleld gridding, calculation, and convergence method, which allows an order of magnitude reduction in convergence time when compared to the current efforts using Reynolds Averaged Navier Stokes (RANS) as the flow solver. Experimental validation is demonstrated for open, ducted, and internal flow propulsors.
DTIC
Computation; Boundary Layers; Marine Propulsion; Lifting Bodies; Design Analysis

20010041371 Naval Surface Warfare Center, Bethesda, MD USA
A Verification and Validation Procedure for Computational Fluid Dynamics Solutions ***Final Report***
Ebert, Michael P., Naval Surface Warfare Center, USA; Gorski, Joseph J., Naval Surface Warfare Center, USA; February 2001; 20p; In English
Report No.(s): AD-A387772; NSWCCD-50-TR-2001/0006; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report presents the mechanics of performing a verification and validation analysis for practical problems, focusing mainly on the estimation of uncertainty in the numerical prediction due to the use of finite grid sizes. A detailed example is presented along with discussions regarding many of the practical issues involved in performing a rigorous verification and validation analysis. The particular approach outlined in this report is mainly based on theoretical work performed at the Iowa Institute of Hydraulic Research. This approach requires numerical solutions on 3 related grids; however, an alternative approach requiring solutions on only 2 grids is also demonstrated.
DTIC
Computational Fluid Dynamics; Proving

20010041382 Alabama Univ., Dept. of Aerospace Engineering and Mechanics, Tuscaloosa, AL USA
Experimental Investigation of High-Speed Boundary Layers with Wall Roughness ***Final Report, 1 Oct. 1997-30 Sep. 2000***
Bowersox, Rodney D. W., Alabama Univ., USA; Feb. 23, 2001; 168p; In English
Contract(s)/Grant(s): F49620-98-1-0038
Report No.(s): AD-A387556; UA-AEM-APL-2001-001; AFRL-SR-BL-TR-01-0170; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

A comprehensive investigation of the influence of surface roughness on the mean and turbulent flow properties of a high-speed turbulent boundary layer flow was performed. Six wall topologies, including a smooth and five rough surfaces consisting of three random sand-grain plates and two uniformly machined plates (k = 0 - 1.7 mm), were tested at three high Reynolds number (Re/m = 2 x lO (exp 7) Mach numbers (0.22, 0.65 and 2.75). Mean flow measurements included surveys of the velocity and density. Turbulence quantities included measurements of the kinematic velocity turbulence intensities, mass flux turbulence intensities, kinematic Reynolds shear stress, compressible Reynolds shear stress, density-transverse-velocity fluctuation correlation, velocity spectra, auto-correlations, micro- and integral-scales and turbulent structure angles. Numerical simulations included evaluating three algebraic turbulence models with a boundary layer program. A three-year program was performed.
DTIC
Boundary Layer Flow; High Reynolds Number; Surface Roughness; Turbulent Boundary Layer; Turbulent Flow; Walls; Turbulence Models

35
INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; 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.

20010040993 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Automation of Clothing Tests: Investigations into Detection Method ***Final Report***
Kaaijk, J., Prins Maurits Lab. TNO, Netherlands; vanEenennaam, R. J., Prins Maurits Lab. TNO, Netherlands; vanSwieten, S. C., Prins Maurits Lab. TNO, Netherlands; December 1997; 50p; In Dutch
Report No.(s): AD-A341144; TNO-PML-1997-B68; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Investigations were carried out into a suitable detector for recording on line the breakthrough concentration of toxic chemicals in protective clothing material tests. The flame ionization detector (FID) was selected for further research. Three different configurations for application the FID were examined. The system using a sample loop and gas chromatographic column in combination with the FID was the most suitable. This technique was used successfully to measure the breakthrough of mustard gas. The results showed a good agreement with the results of the method currently in use. The detector system was found to be suitable for breakthrough measurements of both chemical warfare agents and industrial chemicals. Selections were made for the hardware and software for the control, measurement and data acquisition of an automated test system.
DTIC
Protective Clothing; Gas Chromatography

20010041356 Michigan Univ., Dept. of Atmospheric, Oceanic and Space Sciences, Ann Arbor, MI USA
A Small Lightweight Radiometer to Improve the Temporal Sampling of Rainfall ***Final Report, 1 Oct. - 31 Jan. 2001***
Ruf, Christopher S., Michigan Univ., USA; [2001]; 2p; In English
Contract(s)/Grant(s): NAG5-9967; No Copyright; Avail: Issuing Activity; Abstract Only

This project is a continuation of work begun under NASA Grant NAG5-8005 with the PI (Ruf) at the Pennsylvania State University. The PI left Penn State to join the faculty at the University of Michigan at Ann Arbor in July 2000. The bulk of funds originally obligated to Penn State for this work have been transferred to NASA Grant NAG5-9762 with U-M ('Design Study of a Synthetic Aperture Precipitation Radiometer', Project period 01/01/01-07/31/02), which is ongoing. A small portion of the original NAG5-8005 funds were retained at Penn State to settle outstanding obligations and then transferred to U-M as NAG5-9967.
Author
Radiometers; Sampling; Synthetic Apertures

36
LASERS AND MASERS

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

20010041048 Naval Postgraduate School, Monterey, CA USA
Free Electron Laser Development for Directed Energy
McGinnis, Roger D.; Dec. 2000; 150p; In English; Original contains color plates
Report No.(s): AD-A387898; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This dissertation investigates power requirements for a Free Electron Laser to burn through various missile radome materials. It also includes computer simulation results for several FEL system configurations designed to achieve maximum power while maintaining strict energy spread constraints. The method used to determine power requirements to burn through materials was to use the Thomas Jefferson National Accelerator Facility's Free Electron Laser to conduct material damage experiments. As the laser was improved and increased in power, the laser spot sizes on the target materials was increased while maintaining a constant irradiance. The key results from these experiments included determining minimal spot sizes that can be used for future experiments, and validation that an irradiance level of 10 kW/cm2can burn through most missile radome materials in a few seconds. The computer simulations involved changing various parameters of a EEL such as electron energy levels, pulse lengths, magnetic field strengths, desynchronism, as well as several other parameters, to determine the best possible configuration to achieve the desire power levels and energy spread requirements for development of a weapon size EEL.
DTIC
Computerized Simulation; Free Electron Lasers; Electron Energy; Energy Levels

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.

20010040869 Southwest Research Inst., Belvoir Fuels and Lubricants Research Facility, San Antonio, TX USA
Impact of Lube Oil on Advanced Light-Duty CIDI Engine Emissions ***Interim Report, Oct 1999-May 2000***
Froelund, Kent; Owens, Edwin C.; Buckingham, Janet P.; Frame, Edwin A.; Jul. 2000; 149p; In English
Contract(s)/Grant(s): DAAK-70-92-C-0059; DAAE07-99-C-L053
Report No.(s): AD-A387714; IR-TFLRF-351; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Partnership for a New Generation of Vehicles (PNGV) has identified the compression-ignition, direct-injection (CIDI) diesel engine as a promising technology in meeting the PNGV goal of an 80-mpg, production prototype, mid-size sedan by 2004. challenges remain in reducing emission levels of the CIDI engine to meet future emissions standards. Techniques under consideration for this project include the use of an alternative fuel (ADMM15) and the use of different lubricants. The objective of this program was to perform an initial screening of three different lubricants to obtain information on their contribution to the particulates emitted by the engine and the potential for emission reduction in a CIDI engine.
DTIC
Lubricating Oils; Petroleum Products; Diesel Engines

20010040872 Naval Academy, Annapolis, MD USA
The Effects of Thermal Shock on Pressure Transducers in Internal Combustion Engines
Mathis, William M.; May 08, 2000; 63p; In English; Accepted by the U.S. Trident Scholar Committee. The original document contains color images.
Report No.(s): AD-A387702; USNA-TSPR-275; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The objective of this project is to characterize engine-combustion-pressure measurement errors caused by flame induced transducer thermal stress. Thermal shock measured in an engine flame simulator was compared to data from a running engine. The engine-flame simulator impinged an oxygen-acetylene flame on a pressure transducer at atmospheric pressure. At constant pressure, any change in the transducers output can be attributed to thermal shock. This identifies the exact instant at which thermal shock begins and the start of its subsequent recovery.
DTIC
Pressure Sensors; Thermal Shock; Internal Combustion Engines; Pressure Measurement; Combustion

20010041318 NASA Marshall Space Flight Center, Huntsville, AL USA
Vehicle Dynamics due to Magnetic Launch Propulsion
Galaboff, Zachary J., NASA Marshall Space Flight Center, USA; Jacobs, William, NASA Marshall Space Flight Center, USA; West, Mark E., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; Advances in Navigation and Control Technology Workshop, 1 Nov. 2000, Redstone Arsenal, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The field of Magnetic Levitation Lind Propulsion (MagLev) has been around for over 30 years, primarily in high-speed rail service. In recent years, however, NASA has been looking closely at MagLev as a possible first stage propulsion system for spacecraft. This approach creates a variety of new problems that don't currently exist with the present MagLev trains around the world. NASA requires that a spacecraft of approximately 120,000 lbs be accelerated at two times the acceleration of gravity (2g's). This produces a greater demand on power over the normal MagLev trains that accelerate at around 0.1g. to be able to store and distribute up to 3,000 Mega Joules of energy in less than 10 seconds is a technical challenge. Another problem never addressed by the train industry and, peculiar only to NASA, is the control of a lifting body through the acceleration of and separation from the MagLev track. Very little is understood about how a lifting body will react with external forces, Such as wind gusts and ground effects, while being propelled along on soft springs such as magnetic levitators. Much study needs to be done to determine spacecraft control requirements as well as what control mechanisms and aero-surfaces should be placed on the carrier. Once the spacecraft has been propelled down the track another significant event takes place, the separation of the spacecraft from the carrier. The dynamics involved for both the carrier and the spacecraft are complex and coupled. Analysis of the reaction of the carrier after losing, a majority of its mass must be performed to insure control of the carrier is maintained and a safe separation of the spacecraft is achieved. The spacecraft angle of attack required for lift and how it will affect the carriage just prior to separation, along with the impacts of around effect and aerodynamic forces at ground level must be modeled and analyzed to define requirements on the launch vehicle design. Mechanisms, which can withstand the expected forces and allow the spacecraft to

separate at the desired time must be developed. Modeling and analysis of the full-scale system must be developed to derive the requirements for design of the separation mechanisms. A description of several MagLev demonstrators will be presented and the testing and analysis to model the demonstrators will be included.
Author
Aerodynamic Forces; Launch Vehicles; Levitation; Magnetic Suspension; Propulsion; Magnetic Levitation Vehicles

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STRUCTURAL MECHANICS

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

20010040765 Bharat Heavy Electricals Ltd., Machine Dynamics Lab., Hyderabad, India
Development of Computerized On-Line Vibration Monitoring, Analysis and Assessment Systems for Power Plant Machinery
Ramakrishna, K., Bharat Heavy Electricals Ltd., India; International Journal of COMADEM; April 2001; ISSN 1363-7681; Volume 4, No. 2, pp. 5-12; In English; Copyright; Avail: Issuing Activity

Vibration-monitoring constitutes one of the most important aspects of rotating machine condition monitoring for machine severity assessment and fault diagnosis. It becomes essential for critical rotating machinery like steam turbine generators, hydro turbine and generators, gas turbines and auxiliaries like Boiler Feed Pumps (BFP), ID/FD fans, etc which are supposed to run non-stop for months/years. it is therefore vital to assess the machine condition through on-line vibration monitoring and analysis for condition based predictive maintenance. It helps to plan maintenance schedule and avoid unscheduled shutdown or failure. Aid of a computer is a prerequisite to handle large amount of high speed data for acquisition, signal analysis, trending, assessment, display, mass storage for archiving and retrieval, hard copies etc. This paper presents the development of Personal Computer (PC) based systems for on-line vibration monitoring, analysis, trending, condition assessment and fault diagnosis customized for typical power plant rotating machinery consisting of hydro turbine generator, steam turbine generator and BFP. Utility of the same in power plant machinery is discussed with typical cases.
Author
Vibration; Dynamic Structural Analysis; Computer Techniques; On-Line Systems; Gas Turbines; Diagnosis; Rotation

20010040767 Vaexjoe Univ., School of Industrial Engineering, Stockholm, Sweden
Prediction of the Vibration Level When Monitoring Rolling Element Bearings in Paper Mill Machines
Al-Najjar, Basim, Vaexjoe Univ., Sweden; International Journal of COMADEM; April 2001; ISSN 1363-7681; Volume 4, No. 2, pp. 19-26; In English; Sponsored in part by UTC, FoU and Stora Hylte A.B.
Contract(s)/Grant(s): FoU-99571; Copyright; Avail: Issuing Activity

Rolling element bearings in paper mill machines are considered in this paper due to their critical role in the machine function. in general, the cost-effectiveness of a vibration-based maintenance policy mainly depends on the technical and economic effectiveness of the vibration monitoring system, - i.e. software, hardware, and personnel, being used. In this paper, a model for predicting the vibration level of rolling element bearings in paper mills is developed. In the model, a combination of bearing vibration history, current condition and data from operating conditions are used to predict the vibration level of a bearing during its immediate future. The factors influencing the condition of rolling element bearings during operation are discussed. These factors are related partly to operating and environmental conditions and partly to previous changes in the condition of the bearing. The operating life of a bearing is divided into four phases characterized by their vibration behaviour. One of the important conclusions is that a mechanistic model would be more appropriate than other models for predicting the vibration level of a rolling element bearing and describing the deterioration process, which are needed to achieve better understanding of the bearing vibration behaviour.
Author
Vibration; Bearings; Predictions; Cost Effectiveness; Maintenance; Machinery

20010041113 Corps of Engineers, Vicksburg, MS USA

Extended Load/Unload/Reload Hyperbolic Model for Interfaces: Parameter Values and Model Performance for the Contact Between Concrete and Coarse Sand ***Final Report***

Gomez, Jesus E.; Filz, George M.; Ebeling, Robert M.; Dec. 2000; 98p; In English; Prepared in collaboration with Virginia Polytechnic Institute and State University, Blacksburg, VA.

Report No.(s): AD-A388061; ERCD/ITL-TR-00-7; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The extended hyperbolic model for interfaces developed by Gomez, Filz, and Ebeling (Technical Report ITL-99-1; Report 2) can model the response of interfaces subjected to complex stress paths that may include simultaneous changes in shear and normal stresses and unloading-reloading. These types of loading can occur at soil-structure interfaces of multi-anchored systems used in navigation projects. Therefore, it is possible that finite element analyses of multi-anchored systems can be performed that incorporate the extended hyperbolic model for interfaces. Performance of the model is excellent for interfaces between fine sands and concrete. However, the model has not been evaluated against the results of shear tests between coarse sand and concrete. In this investigation, a number of interface tests between coarse sand and concrete were performed. Comparisons were made between the calculated and measured interface response. These comparisons show that the extended hyperbolic model is also accurate for this type of interface and, therefore, that it can be used for a large variety of interfaces between granular soils and concrete.

DTIC

Finite Element Method; Concretes; Cyclic Loads; Sands; Mathematical Models

20010043662 NASA Langley Research Center, Hampton, VA USA

Cryogenic Tank Structure Sizing With Structural Optimization Method

Wang, J. T., NASA Langley Research Center, USA; Johnson, T. F., NASA Langley Research Center, USA; Sleight, D. W., NASA Langley Research Center, USA; Saether, E., NASA Langley Research Center, USA; [2001]; 16p; In English; 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 16-19 Apr. 2001, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-1599; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Structural optimization methods in MSC/NASTRAN are used to size substructures and to reduce the weight of a composite sandwich cryogenic tank for future launch vehicles. Because the feasible design space of this problem is non-convex, many local minima are found. This non-convex problem is investigated in detail by conducting a series of' analyses along a design line connecting two feasible designs. Strain constraint violations occur for some design points along the design line. Since MSC/NASTRAN uses gradient based optimization procedures, it does not guarantee that the lowest weight design can be found. In this study, a simple procedure is introduced to create a new starting point based on design variable values from previous optimization analyses. Optimization analysis using this new starting point can produce a lower weight design. Detailed inputs for setting up the MSC/NASTRAN optimization analysis and final tank design results are presented in this paper. Approaches for obtaining further weight reductions are also discussed.

Author

Composite Structures; Cryogenic Fluid Storage; Sandwich Structures; Storage Tanks; Structural Analysis; Applications Programs (Computers); Design Analysis; Design Optimization

20010043670 NASA Langley Research Center, Hampton, VA USA

Detection of Micro-Leaks Through Complex Geometries Under Mechanical Load and at Cryogenic Temperature

Rivers, H. Kevin, American Inst. of Aeronautics and Astronautics, USA; Sikora, J. G., American Inst. of Aeronautics and Astronautics, USA; Sankaran, S. N., Analytical Services and Materials, Inc., USA; [2001]; 1p; In English; 42nd Structures, Structural Dynamics, and Materials Conference and Exhibit, 16-19 Apr. 2001, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-1218; Copyright Waived; Avail: CASI; A01, Hardcopy; A01, Microfiche

Polymer Matrix Composite (PMC) hydrogen tanks have been proposed as an enabling technology for reducing the weight of Single-Stage-to-Orbit reusable launch vehicles where structural mass has a large impact on vehicle performance. A key development issue of these lightweight structures is the leakage of hydrogen through the composite material. The rate of hydrogen leakage can be a function of the material used, method of 6 fabrication used to manufacture the tank, mechanical load the tank must react, internal damage-state of the material, and the temperatures at which the tank must operate. A method for measuring leakage through a geometrically complex structure at cryogenic temperature and under mechanical load was developed, calibrated and used to measure hydrogen leakage through complex X-33 liquid-hydrogen tank structure sections.

Author

Polymer Matrix Composites; Leakage; Propellant Tanks; Cryogenic Temperature; Liquid Hydrogen; Fault Detection; Composite

20010043671 NASA Langley Research Center, Hampton, VA USA
The Nonlinear Response of Cracked Aluminum Shells Subjected to Combined Loads
Rose, Cheryl A., NASA Langley Research Center, USA; Young, Richard D., NASA Langley Research Center, USA; Starnes, James H., Jr., NASA Langley Research Center, USA; [2001]; 1p; In English
Report No.(s): AIAA Paper 2001-1395; Copyright Waived; Avail: CASI; A01, Hardcopy; A01, Microfiche

The results of a numerical study of the nonlinear response of thin unstiffened aluminum cylindrical shells with a longitudinal crack are presented. The shells are analyzed with a nonlinear shelf analysis code that accurately accounts for global and structural response phenomena. The effects of initial crack length on the prebuckling, buckling and postbuckling responses of a typical shell subjected to axial compression loads, and subjected to combined internal pressure and axial compression loads are described. Both elastic and elastic-plastic analyses are conducted. Numerical results for a fixed initial crack length indicate that the buckling load decreases as the crack length increases for a given pressure load, and that the buckling load increases as the internal pressure load increases for a given crack length. Furthermore, results indicate that predictions from an elastic analysis for the initial buckling load of a cracked shell subjected to combined axial compression and internal pressure loads can be unconservative. In addition, the effect of crack extension on the initial buckling load is presented.
Author
Cylindrical Shells; Cracks; Axial Compression Loads; Internal Pressure; Thin Walled Shells; Dynamic Response; Aluminum; Damage; Structural Failure

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20010040860 Geological Survey, Water Resources Div., Honolulu, HI USA
Response of the Iao Aquifer to Ground-Water Development, Rainfall, and Land-Use Practices between 1940 and 1998, Island of Maui, Hawaii
Meyer, W.; Presley, T. K.; 2001; 72p; In English
Report No.(s): PB2001-104386; USGS/WRI-00-4223; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Ground water pumped from the Iao aquifer has been used for agricultural purposes since 1948, and domestic purposes since 1955. In 1990, the Hawaii State Commission on Water Resource Management established a value of 20 million gallons per day for the sustainable yield of the aquifer. Water-level data from observation wells throughout the aquifer and information on the depth to and thickness of the transition zone between freshwater and saltwater at the Waiehu deep monitor well indicate that pumping rates near the sustainable yield value of 20 million gallons per day could result in saltwater intrusion in some pumped wells.
NTIS
Aquifers; Rain; Hydrogeology; Water Resources; Resources Management; Ground Water; Land Use

20010042785 Geological Survey, Water Resources Div., Albuquerque, NM USA
Use of Air-Pressurized Slug Tests to Estimate Hydraulic Conductivity at Selected Piezometers Completed in the Santa Fe Group Aquifer System, Albuquerque, New Mexico
Thomas, Carol L., Geological Survey, USA; Thorn, Conde R., Geological Survey, USA; 2000; 30p; In English
Report No.(s): PB2001-103557; USGS/WRI-00-4253; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The City of Albuquerque Public Works Department, Water Resources Management (City), is interested in quantifying aquifer hydraulic properties in the Albuquerque, New Mexico, area to better understand and manage water resources in the Middle Rio Grande Basin. In 1998, the City and the U.S. Geological Survey entered into a cooperative program to determine hydraulic properties of aquifer material adjacent to screened intervals of piezometers in the Albuquerque area. Investigators conducted slug tests from March 8 through April 8, 1999, to estimate hydraulic conductivity of aquifer material adjacent to the screened interval of 25 piezometers from 11 nested-piezometer sites in the Albuquerque area.
NTIS
Aquifers; Piezometers; Hydraulic Equipment; Fluid Flow

20010043371 Rocky Mountain Research Station, Ogden, UT USA
Monitoring Wilderness Stream Ecosystems ***Final Report***
Davis, J. C.; Minshall, G. W.; Robinson, C. T.; Landres, P.; Jan. 2001; 154p; In English
Report No.(s): PB2001-104534; RMRS-GTR-70; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

A protocol and methods for monitoring the major physical, chemical, and biological components of stream ecosystems are presented. The monitoring protocol is organized into four stages. At stage 1 information is obtained on a basic set of parameters that describe stream ecosystems. Each following stage building upon stage 1 by increasing the number of parameters and the detail and frequency of the measurements. Stage 4 supplements analyses of stream biotic structure with measurements of stream function: carbon and nutrient processes. Standard methods are presented that were selected or modified through extensive field application for use in remote settings.
NTIS
Ecosystems; Wilderness; Ecology

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20010041321 NASA Marshall Space Flight Center, Huntsville, AL USA
Remote Sensing of Aerosol Backscatter and Earth Surface Targets by Use of An Airborne Focused Continuous Wave CO2 Doppler Lidar Over Western North America
Jarzembski, Maurice A., NASA Marshall Space Flight Center, USA; Srivastava, Vandana, Universities Space Research Association, USA; [2000]; 1p; In English; Workshop in Multi/Hyperspectral Sensors, Measurements, Modeling Simulation, 7-9 Nov. 2000, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Airborne lidar systems are used to determine wind velocity and to measure aerosol or cloud backscatter variability. Atmospheric aerosols, being affected by local and regional sources, show tremendous variability. Continuous wave (cw) lidar can obtain detailed aerosol loading with unprecedented high resolution (3 sec) and sensitivity (1 mg/cubic meter) as was done during the 1995 NASA Multi-center Airborne Coherent Atmospheric Wind Sensor (MACAWS) mission over western North America and the Pacific Ocean. Backscatter variability was measured at a 9.1 micron wavelength cw focused CO2 Doppler lidar for approximately 52 flight hours, covering an equivalent horizontal distance of approximately 30,000 km in the troposphere. Some quasi-vertical backscatter profiles were also obtained during various ascents and descents at altitudes that ranged from approximately 0.1 to 12 km. Similarities and differences for aerosol loading over land and ocean were observed. Mid-tropospheric aerosol backscatter background mode was approximately 6 x 10(exp -11)/ms/r, consistent with previous lidar datasets. While these atmospheric measurements were made, the lidar also retrieved a distinct backscatter signal from the Earth's surface from the unfocused part of the focused cw lidar beam during aircraft rolls. Atmospheric backscatter can be highly variable both spatially and temporally, whereas, Earth-surface backscatter is relatively much less variant and can be quite predictable. Therefore, routine atmospheric backscatter measurements by an airborne lidar also give Earth surface backscatter which can allow for investigating the Earth terrain. In the case where the Earth's surface backscatter is coming from a well-known and fairly uniform region, then it can potentially offer lidar calibration opportunities during flight. These Earth surface measurements over varying Californian terrain during the mission were compared with laboratory backscatter measurements using the same lidar of various Earth surfaces giving good agreement, suggesting that the lidar efficiency, and thus a lidar calibration factor for detection, can be estimated fairly well using Earth's surface signal.
Author
Earth Surface; Aerosols; Backscattering; Optical Radar; Remote Sensing; Airborne Radar

20010041562 NASA Ames Research Center, Moffett Field, CA USA
The reflection for dense plant canopies from the one-angle radiative transfer equation
Ganapol, B. D., NASA Ames Research Center, USA; [1994]; 1p; In English; IGARSS 1994 - International Geoscience and Remote Sensing Symposium, 8-12 Aug. 1994, Pasadena, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

An essential component of remote sensing of vegetation canopies from satellites is fundamental understanding. Since passive remote is driven by photons, the modeling of photon interactions with vegetation is a basic building block in that understanding. Several such photon transport models have been developed during the past two decades and continue to be developed. Different

approaches have been followed including monte carlo, radiosity methods, geometric shadowing, and radiative transfer. In general, each approach has application for canopies with specific attributes. This presentation concerns the application of radiative transfer to dense vegetation canopies in which the soil does not participate. The approach taken here is novel in that a consistent theory for photon transport for non-rotationally invariant leaf scattering is developed in a canopy with a general leaf angle distribution (LAD). The theory is limited to the one-angle approximation (azimuthally averaged radiance) and is based on Chandrasekhar's analytical theory. While such a model is admittedly only approximate, it does fulfill a unique function in our search for understanding. In particular, the model is simple in its construct yet contains the essential features of canopy architecture that are mainly responsible for observed responses. Thus, this model will not only be a predictive tool but also an educational one. The mathematical setting is the radiative transfer equation in a dense (semiinfinite) canopy. The leaf scattering phase function is assumed to be Lambertian with different reflectance and transmittance. In addition, abaxial and adaxial differentiation is allowed which effectively destroys optical reciprocity. The analytical solution for the canopy BRDF is obtained by manipulation of the integral transport equation (a la Chandrasekhar) for a general LAD. With discretization of the. leaf angle, the resulting set of integral equations are solved iteratively including an acceleration procedure when the single scatter albedo is near one (in the NIR). Results will be compared to the LARS soybean canopy radiances as well as to broadleaf results from a recent Ames experiment. Author

Canopies (Vegetation); Remote Sensing; Radiative Transfer; Mathematical Models; Spectral Reflectance

20010042793 Naval Postgraduate School, Monterey, CA USA

An Invariant Display Strategy for Hyperspectral Imagery

Diersen, David I.; Dec. 2000; 125p; In English; Original contains color plates

Report No.(s): AD-A387973; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Remotely sensed data produced by hyperspectral imagers contains hundreds of contiguous narrow spectral bands at each spatial pixel. The substantial dimensionality and unique character of hyperspectral imagery requires display techniques that differ from traditional image analysis tools. This study investigated the appropriate methodologies for displaying hyperspectral images based on the physical principles of human color vision and a generalized set of linear transformations. Principal components (PC) analysis is a powerful tool for reducing the dimensionality of a data set, and PC-based strategies were explored in creating a broadly applicable image display strategy. It is shown that the invariant display strategy and generalized eigenvectors developed within this study offer a first look capability for a wide variety of spectral scenes. PC transformations utilizing this generalized set of eigenvectors allow for

DTIC

Display Devices; Imagery; Image Analysis; Image Processing

44
ENERGY PRODUCTION AND CONVERSION

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

20010040822 Naval Academy, Annapolis, MD USA

Neural Network Control of the Integrated Power System

Cerrito, Johnathan J.; May 07, 2000; 98p; In English

Report No.(s): AD-A387932; USNA-273; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Neural networks are investigated for fault tolerant stabilization and control of an Integrated Power System (IPS). Neural networks can be robust in the sense that they are not disabled by incomplete or inconsistent information. As non-model based observers, neural networks are ideally suited to estimation of complex, interactive power systems. Specifically, the ability of neural networks to adapt to uncertain eventualities such as flooding, fire, and combat casualties is investigated. The IPS under consideration will provide integrated propulsion and ship's service power generation and distribution for the next generation of U.S. Navy surface ships also known as the DD-21. These solid state power systems involve nonlinear dynamics which can lead to negative impedance instability and voltage collapse. Feedforward back-propagating neural networks were evaluated with respect to variable structure and data degradation. This research represents an initial step toward unifying nonlinear, negative

impedance stabilization with robust neural network fault detection and isolation. The Naval Sea Systems, Integrated Power System and the Office of Naval Research, Electrically Reconfigurable Ship programs motivated this research.
DTIC
Feedforward Control; Network Control; Neural Nets; Nonlinear Systems; Integrated Energy Systems

45
ENVIRONMENT POLLUTION

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

20010041072 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Satellite-Based Stratospheric and Tropospheric Measurements: Determination of Global Ozone and other Trace Species ***Final Report, 1 Nov. 1996 - 31 Dec. 2000***
Chance, K. V., Smithsonian Astrophysical Observatory, USA; April 2001; 10p; In English
Contract(s)/Grant(s): NAG5-3461; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report summarizes research done under NASA Grant NAG5-3461 from November 1, 1996 through December 31, 2000. The research performed during this reporting period includes development and maintenance of scientific software for the GOME retrieval algorithms, consultation on operational software development for GOME, sensitivity and instrument studies to help finalize the definition of the SCIAMACHY instrument, leading the development of the SCIAMACHY Scientific Requirements Document for Data and Algorithm Development, consultation and development for SCIAMACHY near-real-time (NRT) and off-line (OL) data products, radiative transfer model development for utilization in GOME, SCIAMACHY and other programs, development of infrared line-by-line atmospheric modeling and retrieval capability for SCIAMACHY, and participation in GOME and SCIAMACHY validation studies. The Global Ozone Monitoring Experiment was successfully launched on the ERS-2 satellite on April 20, 1995, and remains working in normal fashion. SCIAMACHY is currently planned for launch in late 2001 on the ESA Envisat satellite. Three GOME-2 instruments are now scheduled to fly on the Metop series of operational meteorological satellites (Eumetsat). K. Chance is a member of the reconstituted GOME Scientific Advisory Group, which will guide the GOME-2 program as well as the continuing ERS-2 GOME program.
Author
Troposphere; Stratosphere; Trace Elements; Ozone; Software Engineering; Computer Programming

20010041075 Environmental Protection Agency, National Exposure Research Lab., Las Vegas, NV USA
Atmospheric Nitrogen Deposition to Coastal Estuaries and their Watersheds
Meyers, T.; Sickles, J.; Dennis, R.; Russel, K.; Galloway, J.; 2001; 28p; In English
Report No.(s): PB2001-104136; NERL-LV-ESD-00-053; EPA/600/A-01/013; Copyright; Avail: National Technical Information Service (NTIS)

As part of the overall process of evaluating the impacts of total atmospheric deposition of nitrogen on coastal ecosystems and estuaries, estimates of wet and dry deposition of nitrogen to both watershed and water bodies are required. Currently, most bays, estuaries, and watersheds lack onsite deposition monitoring data. In this first order attempt to assess the impact and fate of nitrogen delivered from atmospheric processes, estimates of wet and dry nitrogen deposition are derived using data from either regional monitoring activities of calibrated atmospheric deposition models. The components of estimated wet nitrogen deposition include, nitrate, ammonium and organic nitrogen. For dry deposition, the gas phase components include nitric acid vapor and ammonia, while the aerosol components consist of nitrate and ammonium. Total annual N deposition (wet plus dry) ranged from 3 to 14 kg N ha(-1), with wet deposition generally comprising about 60% of the total.
NTIS
Deposition; Estuaries; Nitrogen; Watersheds; Ecosystems; Atmospheric Models

20010041303 Massachusetts Univ., Dept. of Civil and Environmental Engineering, Amherst, MA USA
Natural Attenuation of Hydrocarbon and Trichloroethylene Vapors in the Subsurface Environment at Plattsburgh Air Force Base ***Final Report, 19 Sep. 1995 - 30 Sep. 1996***
Ostendorf, David W.; Lutenegger, Alan J.; Ergas, Sarina J.; Hinlein, Erich S.; Suchana, Russell J.; Mar. 26, 1997; 382p; In English
Contract(s)/Grant(s): F41624-95-C-8012
Report No.(s): AD-A387968; No Copyright; Avail: CASI; A03, Microfiche; A17, Hardcopy

The Civil and Environmental Engineering Department of the University of Massachusetts at Amherst (UMASS) was contracted by the USA Air Force Center for Environmental Excellence (AFCEE) to conduct field research from 19 September

1995 to 30 September 1996 under Contract No. F41624-95-C-8012 ”Surface Emissions from Jet Fuel Bioventing at Plattsburgh AFB”. The work focused on bioventing of residual JP4 jet fuel and chlorinated solvents in the unsaturated zone and capillary fringe beneath Fire Training Area FT-002 at the Air Force Base in Plattsburgh, NY. UMASS tested the hypothesis that natural attenuation processes, stimulated by injected air, reduce emissions of hydrocarbons and trichloroethylene vapors to acceptable air quality standards at the site. Drs. David W. Ostendoff, Alan J. Lutenegger, and Sarina J. Ergas were the UMASS Principal Investigators, while Patrick Haas served as AFCEE Technical Representative for the contract. This report describes the one year effort. The contract was performed in four tasks: unsaturated zone characterization, soil gas and solid core sampling, maximum assimilative capacity testing, and emissions testing. UMASS completed this work through detailed subtasks:
DTIC
Structural Engineering; Attenuation; Hydrocarbons; Trichloroethylene; Fuel Contamination; Air Quality; Jet Engine Fuels; Environmental Engineering

20010041383 US Global Change Research Program, USA
Climate Change Impacts on the USA: The Potential Consequences of Climate Variability and Change. Overview Report
2000; 164p; In English
Report No.(s): PB2001-102616; ISBN-0-521-000742; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy
This document is the Assessment Overview, written by the National Assessment Synthesis Team (NAST). The NAST is a committee of experts drawn from governments, universities, industry, and non-governmental organizations. It has been responsible for broad oversight of the Assessment, with the Federal agencies of the USGCRP. This Overview is based on a longer, referenced ”Foundation” report, written by the NAST in cooperation with independent regional and sector assessment teams. These two national-level, peer-reviewed documents synthesize results from studies conducted by regional and sector teams, and from the broader scientific literature.
NTIS
Climate Change; Variability; USA

20010041550 Sorbent Technologies Corp., Twinsburg, OH USA
Recoverable-Mercury Sorbents ***Final Report, 1 Nov. 1995 - 7 Nov. 1998***
Wang, Anbo, Sorbent Technologies Corp., USA; Nelson, Sid, Jr., Sorbent Technologies Corp., USA; Nov. 1998; 13p; In English
Contract(s)/Grant(s): F08637-95-C-6036
Report No.(s): AD-A387692; AFRL-ML-TY-TP-2001-0020; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
An inexpensive material was recently developed that appears to effectively capture mercury from simulated coal-fired flue gases when injected into ductwork at modest rates. Importantly, the new sorbents appear to be effective at high temperatures, 300 F to 400 F. This means that inexpensive gas-cooling or fabric-filter retrofits are not required and that fly ash will remain saleable. Consequently, preliminary estimates of their cost effectiveness suggest costs approximately one-tenth of those estimated by the EPA for other technologies.
DTIC
Mercury (Metal); Sorbents; Air Pollution; Pollution Control; Flue Gases; Fly Ash

20010043363 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Source Category: Large Appliances Surface Coating Operations. Background Information for Proposed Standards
Sep. 2000; 122p
Report No.(s): PB2001-104863; EPA-453/R-00/006; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The Background Information Document (BID) provides background information on, and rationale for, decisions by the Environmental Protection Agency (EPA) related to the proposed standards for the reduction of hazardous air pollutants (HAP) emitted from large appliances surface coating operations. The BID supplements the preamble for the proposed standards. This document is separated into seven chapters providing a combination of background information and EPA rationale for decisions made in the standards development process. Chapters 2, 3, and 4 provide background information including: an industry description in Chapter 2, a description of the control techniques used by the industry in Chapter 3, and the model plants developed for this industry in Chapter 4. Chapter 5 provides the determination of the Maximum Achievable Control Technology (MACT) floors, and an evaluation of control beyond the MACT Floor. Chapters 6 and 7 present the predicted HAP emission reductions and cost impacts associated with the proposed standards. Appendix A provides a listing of major and synthetic minor facilities thought to be subject to the standards. Appendix A also contains factors for converting Metric units to English units. Supporting

information and more detailed descriptions for technical and rationale chapters are provided in the items referenced in this document and located in the project docket.
NTIS
Environment Protection; Air Pollution; Coating; Emittance

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.

20010040806 Wyoming Univ., Dept. of Geology, Laramie, WY USA
DEPSCOR 95 Calibration of Nuclear Monitoring and Development of Regional Velocity Structure Using Unique Seismic Data Sets from Former Soviet Union ***Final Report, 15 Jun. 1996-14 Jun. 2000***
Smithson, Scott B.; Feb. 02, 2001; 69p; In English
Contract(s)/Grant(s): F49620-96-1-0326
Report No.(s): AD-A387885; AFRL-SR-BL-TR-01-0161; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
We study long seismic profiles in the Former Soviet Union that are sourced by a number (1-4) of Peaceful Nuclear Explosions (PNE's). These profiles offer explosions in different geologic materials that generate strong seismic waves that propagate through different tectonic provinces, affecting their propagation characteristics. The ultra-long Deep Seismic Sounding (DSS) profile "Quartz' crosses 6 major geologic provinces in Eurasia and is sourced by 3 nuclear (PNE) and 48 chemical explosions. High velocity (8.4 km/sec) uppermost mantle is found under the Mezenskaya depression and under the east flank of the Urals. One almost continuous upper mantle boundary occurs at 65 to 80 km depth, and another with an approximately 40-km thick LVZ occurs at 120-140 km depth. The shallow upper mantle blocks and the two extensive interfaces indicate strong upper mantle heterogeneity imaged by this unique profile. Using travel-time modeling techniques, we associate the teleseismic P(sub n) with whispering gallery modes traveling within the top 160 km of the mantle. The long incoherent coda of this phase results from scattering and from reverberations of seismic waves within the crust. We examine the unusually strong and extensive coda of the long-range P(sub n) interpreted as a whispering gallery, phase propagating to beyond 3000 km. Such an extensive coda is inherent not only to WG but to all other P-wave phases and can be explained by crustal scattering. The long coda is a result of excitation of short-period scattered waves within the crust by the waves incident from the mantle, or, conversely, by generation of mantle phases from crustal guided waves within the source region. Seismic records from nuclear explosions recorded by Deep Seismic Sounding profiles provide valuable information about the propagation of regional and teleseismic S waves and L(sub g) phases across a variety of tectonic structures of Northern Eurasia.
DTIC
Calibrating; Nuclear Explosions; Seismic Waves; Seismology; Explosives Detection

20010041560 NASA Ames Research Center, Moffett Field, CA USA
An Assessment of Wall Effects in Low-Gravity Aerosol Experiments
Stratton, David M., NASA Ames Research Center, USA; [1994]; 1p; In English
Contract(s)/Grant(s): RTOP 185-52-72; No Copyright; Avail: Issuing Activity; Abstract Only
Low-gravity aerosol experiments are currently being considered for research relating to a variety of science disciplines. One potential difficulty for these low-gravity experiments is the influence of the container on the aerosol's evolution, i.e., wall effects. In an attempt to understand the magnitude of the effects of containment on low-gravity aerosol experiments, this work compares three simulated environments: (1) a ground-based laboratory experiment environment, (2) a zero-gravity experiment environment of an orbiting facility, and (3) a spatially unbounded ideal aerosol environment (also with no gravity). This paper describes the five-dimensional model (three spatial dimensions, plus particle size and time) developed to describe the zero-gravity aerosol experiment environment, and compares the output of this model and the output of a model of an Earth-gravity aerosol experiment environment to a model of particle aggregation alone. The zero-gravity experiment model is found to be a much closer approximation to pure aggregation than the Earth-gravity aerosol experiment model.
Author
Aerosols; Environment Models; Experiment Design

20010043697 Army Research Lab., Adelphi, MD USA
Three-Dimensional Correlation and Spectral Functions for Turbulent Velocities in Homogeneous and Surface-Blocked Boundary Layers ***Final Report, 1 Feb. - 30 Apr. 1996***
Wilson, David K.; Jul. 1997; 48p; In English
Report No.(s): AD-A327709; ARL-TR-1287; No Copyright; Avail: Defense Technical Information Center (DTIC)

A pair of three-dimensional (3D) models for correlation functions and spectra of velocity fluctuations in turbulent boundary layers is presented. First, the case of homogeneous turbulence is considered. Von Karman's energy spectrum is used to develop a complete set of 3D correlation and spectral equations. Second, it is shown how the homogeneous spectra can be modified to include the effect of eddy-blocking at the ground. Assuming that the disturbance to the turbulent flow resulting from the blocking is irrotational, an equation is developed that allows one to write the vertically inhomogeneous, 2D cross spectra as a function of the 2D cross spectra for a homogeneous flow. Although there are only two adjustable parameters in the inhomogeneous model, the variance and a length scale, the model is shown to agree quite well with a variety of previous results for the atmospheric convective boundary layer (CBL).
DTIC
Turbulent Boundary Layer; Three Dimensional Models; Spectra; Turbulent Flow; Velocity

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20010040759 NASA Marshall Space Flight Center, Huntsville, AL USA
Seasonal Rates for Atlantic Basin Tropical Cyclones During the Present Epoch
Wilson, Robert M., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Ten-year moving averages of the seasonal rates for "named storms," tropical storms, hurricanes, and major (or intense) hurricanes in the Atlantic basin since 1950 suggest that the present epoch is one of enhanced activity. Consequently, the outlook for the 2001 hurricane season and immediately succeeding seasons is for all categories of Atlantic basin tropical cyclones to have seasonal rates at levels equal to or above their long-term median rates, especially when the season is designated non-El Nino-related. Only when the season is designated El Nino-related does it appear likely that seasonal rates might be slightly diminished.
Author
Cyclones; Tropical Storms; El Nino

20010040847 Air Force Weather Agency, Offutt AFB, NE USA
Catalog of Air Force Weather Technical Documents, 1941-2000
Sep. 2000; 167p; In English
Report No.(s): AD-A386674; AFWTL/TC--00/001; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This catalog lists unclassified technical documents produced by or for the Air Force Weather Agency and its subordinate units from 1941 through 2000. Documents listed include: technical reports, technical notes, data summaries, project reports, special studies, and forecaster memos, along with availability data and ordering instructions.
DTIC
Catalogs (Publications); Weather

20010041074 North Dakota State Univ., Mountain Plains Consortium, Fargo, ND USA
Inclement Weather Signal Timings
Martin, P.; Perrin, J.; Hansen, B.; Quintana, I.; Jul. 2000; 112p; In English
Report No.(s): PB2001-104287; MPC-01-120; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

This study examines signal timing in inclement weather conditions. With the completion of the Utah DOT's Advanced Traffic Management System (ATMS), UDOT will have the capability to change signal timing plans from a central location by communicating with each controller through fiber optic technology. With this ability, it has become feasible to have a library of special signal timing plans. One of these plans could be for inclement weather conditions. This research reviews relevant literature

for similar studies, interviewing other state departments of transportation, and collecting local traffic flow data to determine traffic flow characteristics during inclement weather.
NTIS
Weather; Management Systems; Traffic; Time Measurement

20010041320 NASA Marshall Space Flight Center, Huntsville, AL USA
Optical Lightning Detection From Space
Christian, Hugh J., Jr., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 6 Nov. 2000, Tucson, AZ, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Since 1995 we have had one or more optical lightning sensors in low earth orbit (LEO) providing near continuous lightning observations of the earth. The resulting data sets have enabled scientists to study global lighting distributions and their variable. Diurnal, seasonal and interannual variabilities are clearly revealed. In addition, because of the exceptionally high detection efficiency of the optical sensing technique and the high spatial resolution, it is possible to study individual clouds and cloud system despite a viewing time that is often as short as 80 seconds. These case studies have demonstrated the importance of total lightning measurements in the study of severe weather. Results from these space-based lightning measurements will be presented as well as the next logical concept - optical observations from geostationary orbit (GEO). With a Lightning Mapper Sensor (LMS) in GEO, it will be possible to monitor severe weather on a continuous basis and to disseminate the data in less than 60 seconds.
Author
Lightning; Remote Sensing; Satellite Observation; Meteorological Satellites

48
OCEANOGRAPHY

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

20010042210 Texas A&M Univ., Dept. of Oceanography, College Station, TX USA
Northeastern Gulf of Mexico Chemical Oceanography and Hydrography Study: Year 3 ***Annual Report***
Jochens, Ann E., Texas A&M Univ., USA; Nowlin, Worth D., Jr., Texas A&M Univ., USA; Nov. 2000; 100p; In English
Contract(s)/Grant(s): MMS-1435-01-97-CT-30851
Report No.(s): PB2001-104359; MMS-200-078; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The Northeastern Gulf of Mexico Physical Oceanography Program (NEGOM) is supported by the Minerals Management Service (MMS) of the U.S. Department of the Interior. Through a contract between MMS and the Texas A&M Research Foundation, several components of the Texas A&M University System are conducting the Chemical Oceanography and Hydrography study of NEGOM (NEGOM-COH). This report covers activities from July 1999 through August 2000. Data were collected from hydrographic and acoustic Doppler current profiler (ADCP) surveys conducted in the Gulf of Mexico over the continental shelf and upper slope between the Mississippi delta and Tampa Bay in water depths of 10 to 1000 m. Additionally, historical and concurrent data from other programs in this region were collected. Four hydrographic/ADCP surveys, N6, N7, N8, and N9, were conducted with 98, 98, 101, and 98 hydrographic sampling stations and 89, 84, 78, and 75 expendable bathythermograph stations on respective cruises. Each survey also included continuous ADCP measurements along the cruise track. At each hydrographic sampling station continuous profiles were made of conductivity, temperature, pressure, downwelling irradiance, fluorescence, and light transmission.
NTIS
Gulf of Mexico; Hydrography; Marine Chemistry; Ocean Dynamics; Surveys; Oceanography

20010042789 Woods Hole Oceanographic Inst., MA USA
Turbulence in the Shallow Nearshore Environment During SANDYDUCK '97
Fredericks, J. J.; Trowbridge, John H.; Voulgaris, George; Feb. 2001; 52p; In English
Contract(s)/Grant(s): OCE-9810609
Report No.(s): AD-A387826; WHOI-2001-02; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An array of five acoustic Doppler velocimeters (ADV), which produce high quality measurements of the three-dimensional velocity vector in a sample volume with a scale of one centimeter, was deployed from late August through late November of 1997, at a water depth of approximately 4.5 m off Duck, North Carolina. The sensors were deployed near the sea floor but above the centimeters-thick wave boundary layer, and the sampling scheme was designed to resolve turbulence statistics averaged over tens

of minutes, much longer than typical wave periods but shorter than time scales associated with variability of energetic wind-driven and wave-driven along shore flows. The purpose of this report is to document the instrumentation and deployment of the ADV array, to present an overview of the data, to describe the data processing and preliminary analysis, and to document the formats of the data archives.
DTIC
Turbulence; Velocity Measurement; Oceanography

20010043698 Woods Hole Oceanographic Inst., MA USA
Dynamic Response of a Semi-Enclosed Sea to Atmospheric and Tidal Forcing ***Final Report, 1 Jan. 1995 - 31 Dec. 1996***
Candela, Julio; Jul. 23, 1997; 4p; In English
Contract(s)/Grant(s): N00014-95-1-0315
Report No.(s): AD-A327670; No Copyright; Avail: Defense Technical Information Center (DTIC)

The internal dynamics of a semi-enclosed sea is influenced by its thermohaline structure, atmospheric forcings, interactions with lateral boundaries, bottom topography and remote interactions transmitted through interconnecting straits. The construction of simple and accurate representations of the dynamical response of a semi-enclosed sea facilitates dynamical interpretation and it is conducive to robust data assimilation models for nowcast and forecast. Our specific objectives are: (1) to develop and exploit practical and efficient barotropic/baroclinic spectral primitive equation models with data assimilation capabilities for (2) accurate simulations of the dynamical response of semi-enclosed seas to observed atmospheric and tidal forcings; (3) to conduct studies of dynamical processes and exercise assimilation schemes in the Mediterranean Sea and in the Gulf of Mexico-Caribbean Sea Basin.
DTIC
Ocean Models; Ocean Currents; Dynamic Response

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20010040764 NASA Marshall Space Flight Center, Huntsville, AL USA
Killing of Bacillus Megaterium Spores by X-rays at the Phosphorus K-edge
Richmond, Robert C., NASA Marshall Space Flight Center, USA; Frigo, Sean P., Argonne National Lab., USA; Ehret, Charles F., General Chronobionics, USA; [2001]; 1p; In English; 48th Radiation Research Society Meeting, 22 Apr. 2001, San Juan, Puerto Rico; No Copyright; Avail: Issuing Activity; Abstract Only

This study continues a progression of experiments on the radiation-induced killing of bacterial spores that began at the Argonne National Laboratory in 1957. A series of aliquots of Bacillus megaterium spores were prepared onto polycarbonate filters and irradiated with photons of 2159 eV compared to 2140 eV energy on the 2-IDB beamline at the Advanced Photon Source. Flux density was approximately 10(exp 18) photons/sec/sq mm. The phosphorous K-edge absorption spectrum in these spores was determined to peak at 2159 eV, wheras 2140 eV was determined to be outside that absorption spectrum. Spores on filters were irradiated at ambient conditions, and were either immediately plated for colony formation after irradiation, or were held for postirradiation exposure to oxygen prior to plating. Slopes of survival curves from the four conditions of irradiation, i.e., two photon energies each comparing immediate plating vs postirradiation holding, were used for quantitative determination of differences in rates of spore killing over a range of radiation doses. It was found that spores irradiated at the phosphorus K-edge were killed 20% more efficiently than when irradiated with 2140 eV photons, and this was true for both immediate plating and postirradiation holding in air. Postirradiation holding in air increased killing efficiency by about 12% for both photon energies compared to plating immediately after irradiation. The increase of killing efficiency with postirradiation holding is less than expected from earlier experiments using relatively low-flux X-rays, and raises the possibility of dose-mitigation by radical-radical recombination in the case of high-flux X-rays from the synchrotron.
Author
Bacillus; Exposure; Irradiation; Phosphorus; X Rays; Survival

20010040810 California Univ., Los Angeles, CA USA

Identification and Characterization of Transcriptional Intermediary Factors Involved in Androgen-Independence of Prostate Cancer ***Annual Report, 1 Jul. 1999-30 Jun. 2000***

Chen, Charlie; Jul. 2000; 7p; In English

Contract(s)/Grant(s): DAMD17-99-1-9514

Report No.(s): AD-A387878; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In my first year training that was supported by the DOD, I have been working on the identification of genes involved in the androgen independence progression of prostate cancer at the University of California, Los Angeles (UCLA), with Dr. Charles L Sawyers. This training not only guides me to a better understanding of prostate cancer progression and scientific research as a whole, but also reassures that I want to devote my career to the prostate cancer research. During the course of this training period, I organized a joint meeting among four laboratories at UCLA who are studying the progression of prostate cancer. I regularly presented my experimental data in the laboratory meeting and the joint meeting. I attended seminar series such JCCC seminar, pharmacology department seminar. I reviewed papers that were submitted for publication in journals such as Molecular and Cellular Biology, Oncogene, Cancer Research, Cell Growth and Differentiation, and the Journal of Clinical Investigation. I became a reviewer for Cancer Research.

DTIC

Cancer; Clinical Medicine; Prostate Gland; Medical Science; Hormones

20010040811 Weizmann Inst. of Science, Rehovot Israel

ErB-2/HER2 Oncogene in Breast Cancer: Does Bivalency of Growth Factors Drive Tumoorigenicity Through Receptor Heterodimerization ***Final Report, 1 Oct. 1997-30 Sep. 2000***

Yarden, Yosef; Oct. 2000; 174p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-97-1-7290

Report No.(s): AD-A387875; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The hypothesis that an overexpressed ErbB-2 can transform epithelial cells by enhancing binding of many stromal ligands has been tested with neuregulins. Neuregulins and other epidermal growth factor (EGF-) like ligands exert their pleiotropic effects and oncogenic signals through four ErbB receptor tyrosine kinases capable of generating homo- and hetero- dimeric combinations. Ligand-induced dimerization of ErbB proteins is driven by the apparent bivalence of EGF-like molecules. In the case of neuregulin-1 the two putative receptor-binding sites localize, in part, to the two termini of the EGF-like motif. We show that chemical coupling of the two sites can reconstitute bio-activity. The short synthetic ligand, but not derivative peptides, specifically activated the most transforming receptor heterodimer, namely: a combination of ErbB-2, a ligand-less oncogenic receptor, and ErbB-3, a kinase-defective receptor. No other ErbB combination, including those containing ErbB-4, underwent stimulation. Although its binding affinity was compromised, the analog, like neuregulins, stimulated receptor phosphorylation, intracellular signaling, and proliferation of cells. These results imply that miniaturization of neuregulins and their precise targeting to specific ErbB combinations are feasible. Within the framework of the IDEA research, this last line of evidence joins the previously reported findings in collectively supporting a bivalent mode of ligand-ErbB interactions.

DTIC

Carcinogens; Cells (Biology); Mammary Glands; Growth; Dimerization; Cancer; Epidermis

20010040812 Duke Univ., Medical Center, Durham, NC USA

Ribozyme-Mediated Repair of Mutant p53 Transcripts in Breast Cancer Cells ***Final Report, 15 Aug. 1997-14 Aug. 2000***

Sullenger, Bruce A.; Sep. 2000; 13p; In English

Contract(s)/Grant(s): DAMD17-97-1-7278

Report No.(s): AD-A387872; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project explores the potential of a new and innovative approach to human gene therapy that may prove to be useful for the treatment or prevention of a range of genetic diseases including many types of cancer. We have previously demonstrated that a trans-splicing group I ribozyme can be employed to repair mutant transcripts in E. coli (Sullenger and Cech, Nature 1994) and mammalian cells (Jones et al., Nature Medicine 1996; Lan et al., Science 1998). Ribozyme-mediated repair of mutant mRNAs associated with a range of human diseases is now experimentally tractable, and we have begun to assess the therapeutic potential of this process for the repair of mutant transcripts implicated in the development and progression of breast cancer. Because mutation of the p53 gene is the most common genetic change seen m a wide variety of malignancies including breast cancer, we have initially focused on repair of mutant p53 transcripts. Toward this end, we have mapped the accessible sites for ribozyme

binding on p53 RNAs, and using this information we have generated ribozymes that can react with and repair mutant p53 transcripts in breast cancer and other cell lines.
DTIC
Cancer; Cells (Biology); Genetics; Mammary Glands; Mutations; Ribonucleic Acids; Genetic Engineering

20010040813 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA
Identification of Chromosomes Alterations in Primary Breast Cancer Using Premature Chromosome Condensation ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Griffin, Constance A.; Sep. 2000; 12p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9237
Report No.(s): AD-A387871; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Site-specific chromosome alterations have led to the identification of numerous genes directly involved in hematologic malignancies and selected solid tumors. Recognition of recurrent chromosome translocations are particularly informative because they can lead directly to the cloning and identification of genes which are altered in neoplasms. We hypothesize that, as been shown in other human tumors, early clinical breast cancers have site-specific, clonal chromosomal translocations which have not been identified previously. We are developing a new method, premature chromosome condensation (PCC),using mitotic Xenopus extracts that will allow us to obtain G-banded karyotypes from primary, uncultured breast cancer specimens. We have made such extracts and are optimizing conditions for use. We are also using a sensitive new technique termed spectral karyotyping (SKY), to identify site-specific, recurrent clonal chromosomal translocations in these PCC-induced karyotypes of primary breast cancer specimens. The problems in application at this point are technical and being addressed. Following the identification of recurrent, site specific chromosome alterations and particularly translocations in primary breast cancer, future investigations would target our long-term goal of identifying the genes directly involved at these chromosomal breakpoints.
DTIC
Cancer; Chromosomes; Mammary Glands; Neoplasms; Genetics; Genetic Code; Genes

20010040819 Washington Univ., Grant and Contract Services, Seattle, WA USA
Is Homeopathy Effective for Hot Flashes and other Estrogen-Withdrawal Symptoms in Breast Cancer Survivors? A Preliminary Randomized Controlled Trial ***Annual Report, 1 Sep. 1999-31 Mar. 2000***
Jacobs, Jennifer; Apr. 2000; 6p; In English
Contract(s)/Grant(s): DAMD17-99-1-9438
Report No.(s): AD-A387237; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Background- Hot flashes, and other symptoms of estrogen withdrawal are common in breast cancer survivors. The standard treatment for these symptoms, hormone replacement therapy, is contraindicated in breast cancer survivors. Homeopathic medicines have been used to treat hot flashes and other menopausal symptoms for more than 100 years. Objectives- to carry out a pilot study to determine whether there is evidence that homeopathy is an effective treatment to improve the quality of life in breast cancer survivors who are experiencing hot flashes and other menopausal-type symptoms. Methods- A randomized double-blind placebo controlled trial will be carried out in a group of 105 breast cancer survivors with hot flashes and other menopausal symptoms. Subjects will be recruited from the Comprehensive Breast Center at Providence Hospital in Seattle and other affiliated clinics. Subjects should have a history of hot flashes for at least one month, with an average of at least 3 hot flashes per day. Subjects will be randomized to one of three treatment arms: classical homeopathy, a combination homeopathic remedy, or placebo. Number of hot flashes menopausal index scores, general health status patient satisfaction, and the use of health care services will be measured over a period of 12 months.
DTIC
Cancer; Clinical Medicine; Estrogens; Mammary Glands

20010040825 Washington Univ., Grant and Contract Services, Seattle, WA USA
Pathogenesis of Germline and Somatic NF1 Gene Rearrangements ***Final Report, 30 Sep. 1997-29 Sep. 2000***
Stephens, Karen; Oct. 2000; 75p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7344
Report No.(s): AD-A387943; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We have identified novel rearrangements of the NF1 gene in germline and somatic tissues of patients with neurofibromatosis type 1. Germline microdeletions are caused by recombination between repeated elements flanking the NF1 gene. Our data provide strong support for a novel gene within 1 Mb of NF1 that potentiates neurofibromagenesis. Our clinical and molecular analyses of NF1 deletion patients suggest that at least some NF1 microdeletions may be predictive for an early age at onset and heavy burden

of cutaneous neurofibromas. We identified a patient who is mosaic for an NF1 microdeletion, which proves that these rearrangements can occur in somatic tissues and that mosaicism may be more prevalent than expected. We have identified novel somatic rearrangements in leukemic cells of NF1 children that arise by double mitotic recombination with clustered breakpoints. Because both the germline and somatic rearrangements involve not only the NF1 gene but many other contiguous genes, our data implicate other elements/loci that play an important role in sporadic cases of NF1 and in somatic inactivation of NF1 during leukemogenesis and possibly during other NFl-associated neoplasms. In addition, these results have direct implications for rationale design of putative therapies.
DTIC
Genes; Neoplasms; Pathogenesis; Chromosomes; Clinical Medicine; Neurology

20010040826 Minnesota Univ., Minneapolis, MN USA
Soy, Probiotics, and Breast Cancer Prevention ***Annual Report, 15 sep 1999-14 Sep. 2000***
Kurzer, Mindy S.; Oct. 2000; 6p; In English
Contract(s)/Grant(s): DAMD17-99-1-9297
Report No.(s): AD-A387983; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The purpose of this study is to investigate the effects of soy and probiotic consumption on estrogen and phytoestrogen metabolism. The methods include in vitro studies to determine the intestinal microflora responsible for phytoestrogen metablism, and a human feeding study in which 18 postmenopausal breast cancer survivors and 18 controls consume four different dietary supplements for six weeks each. The supplements are: 1) soy powder; 2) soy powder + probiotic; 3) milk power; 4) milk powder plus probiotic. Urine is collected for three days before the study begins and for three days at the end of each diet period, for evaluation of urinary estrogen and phytoestrogen metabolites. Food records are collected on the same days as the urines. Feces are collected before the study begins and at the end of each diet period, for evaluation of intestinal microflora profiles. At this point, in vitro studies have been completed. The results suggest that cell culture is not a good model for human intestinal metabolism. All subjects have been recruited into the human feeding study, urines have been collected and processed and fecal samples have been analyzed. Ten subjects have completed the study and all subjects will be done by June, 2001.
DTIC
Cancer; Diets; Intestines; Mammary Glands; Soybeans; Estrogens

20010040827 Miami Univ., FL USA
A New Invasion and Metastasis Molecule, Tiaml and Its Interaction With the Cytoskeleton Are Involved in Human Breast Cancer Progression ***Annual Report, 7 Jul. 1999-6 Jul. 2000***
Bourguignon, Lilly Y.; Aug. 2000; 41p; In English
Contract(s)/Grant(s): DAMD17-97-1-7014
Report No.(s): AD-A387990; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Members of the Rho subclass of the ras superfamily SMALL MOLECULAR WEIGHT GTPases, (e.g. RhoA, Raci and CDC42) are known to be associated with changes in the membrane-linked cytoskeleton (Ridley and Hall, 1992; Hall, 1998). For example, activation ofRhoA, Raci and CDC42 have been shown to produce specific structural changes in the plasma membrane-cytoskeleton associated with membrane ruffling, lamellipodia, filopodia, and stress fiber formation (Ridley and Hall, 1992; Hall, 1998). The coordinated activation of these GTPases is thought to be a possible mechanism underlying cell motility, an obvious prerequisite for metastasis (Dickson and Lippman, 1995; Jiang et al., 1994; Lauffenburger and Horwitz, 1996).
DTIC
Mammary Glands; Cancer; Cells (Biology)

20010040833 Institute for Research and Education, Minneapolis, MN USA
A Randomized Clinical Trial to Evaluate Advanced Nursing Care for Women With Newly Diagnosed Breast Cancer ***Final Report, 1 Oct. 1994-30 Jun. 2000***
Ritz, Laurie; Jul. 2000; 138p; In English
Contract(s)/Grant(s): DAMD17-94-J-4449
Report No.(s): AD-A388011; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The purpose of the research funded by this grant (DAMD17-94-J-4449) was to determine if advanced practice nurses (APN's) improve quality of life(QOL) and decrease costs of care of women newly diagnosed with breast cancer. In a randomized clinical trial, the control group (n = 104) received standard care; the intervention group (n = 106) received standard care plus APN interventions. QOL was measured by tests with established reliability and validity at seven intervals over two years. Costs of care were collected through billing records. Uncertainty in illness decreased significantly more from baseline in the intervention group

vs. the control group at 1, 3, and 6 months after diagnosis. Intervention and control groups did not differ in mood disturbance or well-being except among unmarried women and women and no history of breast cancer. Intervention and control costs did not differ. In a second descriptive study, similar QOL improvements were demonstrated with a less costly 6-month APN intervention. Qualitative analysis of participants' comments further describes the participants' experiences. In conclusion, APN interventions improved some QOL indicators but did not significantly affect costs. Women newly diagnosed with breast cancer have multiple needs requiring interventions. Further research is critical to maximize both quality and cost outcomes.
DTIC
Mammary Glands; Cancer; Medical Services; Medical Personnel; Diagnosis

20010040834 Clemson Univ., SC USA
Rational Design of Human Prolactin Receptor Antagonists for Breast Cancer Therapy ***Annual Report, 15 Sep. 1999-14 Sep. 2000***
Chen, Wen Y.; Oct. 2000; 24p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9129
Report No.(s): AD-A388013; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
There were three tasks proposed for the first year of this project. All three tasks have been accomplished. We have cloned and confirmed by sequencing the cDNAs encoding hPRL, hPRL-G129R and hPRL-BP (task 1). All three cDNAs have been transfected into mouse L cells and stable mouse L cells have been established (task 2). We have also maintaining 12 human cancer cell lines purchased from ATCC(task 3). In addition, we have demonstrated that hPRL-G129R is able to inhibit breast cancer cell proliferation via induction of apoptosis (Clinical Cancer Research, 5:3583-3593, 1999) . We are confident that the project will go on as proposed in years two and three.
DTIC
Cancer; Mammary Glands; Deoxyribonucleic Acid; Cells (Biology)

20010040835 National Indian Health Board, Inc., Denver, CO USA
National Native American Breast Cancer Survivor's Network ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Burhansstipanov, Linda; Sep. 2000; 13p; In English
Contract(s)/Grant(s): DAMD17-99-1-9310
Report No.(s): AD-A388018; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Native American Breast Cancer Survivors' Support Network (DAMDl7-99- 1-9310) is a three year-project supported by the Department of Defense. This project is being conducted by Native American Cancer Research in collaboration and partnership with the National Indian Health Board. The purpose of this project is to improve the survival from breast cancer and quality of life after being diagnosed with breast cancer for both the patient and loved ones of the cancer patient. The study objectives follow: (a) using key and well recognized Native American cancer leaders from geographically diverse regions of the country, identify and recruit Native American breast cancer patients into the survivors' network and database; and (b) refine, and evaluate the survivor's database to determine patterns of disease and patterns of care experienced by Native American breast cancer survivors. The intended population is Native American breast cancer patients, both genders, ages 20 and older, living anywhere on the North American continent. Preliminary findings include documentation that Native breast cancer survivors are not receiving quality care, less than one-third have access to insurance (and thus access to improved quality of care) and standard protocols used with other survivors are ineffective with Native cancer survivors.
DTIC
Cancer; Mammary Glands; Minorities; Public Health

20010040836 North Carolina Univ., Chapel Hill, NC USA
G1 Cell Cycle Control by Regulated Proteolysis in Normal and Tumorigenic Breast Cells ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Xiong, Yue, North Carolina Univ., USA; Sep. 2000; 9p; In English
Contract(s)/Grant(s): DAMD127-99-1-9574
Report No.(s): AD-A388020; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy
The p53 tumor suppressor gene mediates a major tumor suppression pathway in mammalian cells that is frequently altered in human cancers, including breast cancer. p53 protein is kept at low level during normal cell growth by its short half-life and is stabilized following oncogenic stimulation and DNA damage. Growing evidence has identified oncoprotein MDM2 (mouse double minute) as a key negative regulator and tumor suppressor ARF (alternative reading frame) as a key positive regulator of p53 protein stability. Two findings were made over the past year that extended our understanding into the p53 control by MDM2

and ARF. First, we found that human tumor suppressor ARF impedes S-phase progression independent of p53. Second, we discovered that p53 protein contains two separate nuclear export signals (NES) that functional collaborate to mediate an MDM2-independent nuclear export.
DTIC
Neoplasms; Cells (Biology); Cancer; Suppressors; Carcinogens

20010040837 Miami Univ., FL USA
Cyclin D1, Anchorage-Independent Growth and Breast Cancer ***Annual Report, 15 Sep. 1998-14 Sep. 1999***
Welsh, Catherine; Oct. 1999; 19p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7013
Report No.(s): AD-A388035; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Derangements in the cell cycle machinery contribute to uncontrolled cell growth and tumorigenesis. Regulators of G1 progression including cyclin D1 and the cyclin-dependent kinase inhibitors p21 and p27 appear to be of particular importance in the pathogenesis of breast cancer. We suggest that aggressive breast cancer will involve both (i) overexpression of cyclin D1 and (ii) the failure to undergo a compensatory upregulation of cdk inhibitors. The specific aims are designed to test these hypotheses in cell culture models, nude mice, and breast cancer biopsies. We have generated mouse embryo fibroblasts (MEFs) that stably express a tetracycline-regulated cyclin D1 construct. In contrast to the data in NIH-3T3 cells, there was no compensatory upregulation of p2l in MEFs despite significant overexpression of cyclin D1. This may be due to the acquisition of p53 mutations. In addition, human breast cancer tissues have been analyzed for cyclin D1, p27 and Ki67 expression. Following optimization of p21 staining and analysis, correlation with prognostic factors will be performed.
DTIC
Pathogenesis; Cells (Biology); Culture Techniques; Cancer

20010040838 Beth Israel Deaconess Medical Center, Boston, MA USA
A Novel Screen for Suppressors of Breast Tumor Cell Growth Using an Oriented Random Peptide Library Method to Identify Inhibitors of the ErbB2 Tyrosine Kinase ***Final Report, 12 May 1997-12 May 2000***
Carraway, Kermit; Jun. 2000; 19p; In English
Contract(s)/Grant(s): DAMD17-97-1-7026
Report No.(s): AD-A388037; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aberrant activation of the ErbB2 receptor tyrosine kinase activity appears to play an active role in the progression of some mammary tumors to malignancy. It is therefore of value to identity compounds that efficiently and specifically inhibit ErbB2 kinase activation. Using cyclic peptide library technology we have developed a method for screening up to 17 billion related compounds in a single experiment for the ability to bind with high affinity to the ErbB2 receptor extracellular domain. Libraries were designed based on the Loop3 structure of the EGF-like growth factors because preliminary observations indicated that a modified form of this subdomain could act as an antagonist of ligand-stimulated ErbB2 activity. Cyclic peptide libraries were synthesized containing ten to 15 residues where up to eight positions were each 19-fold degenerate in the natural ammo acids (excluding cysteine), and at least five positions were fixed with non-degenerate orienting amino acids. Libraries were then incubated at 100-fold molar excess with purified ErbB2 extracellular domain, so that those peptides that bind to ErbB2 with highest affinity were selected from the mixture. Receptor-bound peptides were then isolated and sequenced by Edman degradation to determine the optimal receptor binding motif provided by that library. While specific binding to the receptor extracellular domain was observed, these did not yield any significant high affinity binding motifs.
DTIC
Mammary Glands; Peptides; Cancer; Cells (Biology)

20010040840 Scripps Research Inst., La Jolla, CA USA
Antigene Strategy in Breast Cancer Therapy: Rationales for Direct Targeting of erbB2/Her2 DNA with Polymides ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Katritch, Vsevolod Y.; Sep. 2000; 34p; In English
Contract(s)/Grant(s): DAMD17-99-1-9323
Report No.(s): AD-A387869; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed a complex computational approach to identify the best fragments within erbB2/HER2/neu promoter suitable for targeting with a novel class of Pyrrole-Imidazole containing polyamide molecules and to design the most potent polyamide binders to these targets. The target identification takes into account the most important regulatory elements in the promoter; whole-genome specificity of the targets and possible mutations in the target sequences. We have designed a variety of

conformationally feasible polyamide molecules, matching the best candidate 11-14 bp DNA target sequences. We have developed an algorithm, based on the 1CM molecular modeling package, to build all-atom 3D models of various polyamide-DNA complexes with different sequences and polyamide topology, and to predict polyamide-DNA binding constants. We continue to improve and benchmark the algorithm with new experimental results, such as a series of experimentally measured affinity data and NMR structural data. This fast and reliable algorithm will help to identify the best polyamide candidate antigene inhibitors to be synthesized and tested during the next stage of the project.
DTIC
Cancer; Deoxyribonucleic Acid; Mammary Glands; Polyamide Resins; Antigens; Physiological Defenses; Mathematical Models

20010040841 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
A Novel Repressor of Estrogen-Regualted Genes for Breast Cancer Growth Suppression ***Final Report, 1 Aug. 1997-31 Jul. 2000***
Shapiro, David; Aug. 2000; 32p; In English
Contract(s)/Grant(s): DAMD17-97-1-7241
Report No.(s): AD-A387868; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this project was to develop a system for generating estrogen receptor mutants targeting DNA sequences in estrogen receptor regulated genes in breast cancer cells so that they could be experimentally suppressed (”turned off”) or activated (”turned on”) in response to small molecules. These estrogen receptor mutants would allow testing of the effect of activating or suppressing specific estrogen regulated genes on the growth of breast cancers. To achieve this objective we set out to develop a novel type of genetically selected mutant estrogen receptor able to bind to the genes of specific estrogen receptor-regulated genes. These mutant receptors could then be converted into chimeric receptors to efficiently and quantitatively suppress both estrogen-dependent and estrogen-independent expression of estrogen-regulated growth stimulatory genes. We used information from a genetic selection done using our modified P222 challenge phage system to identify mutations of interest which were then incorporated into full-length estrogen receptor (ER) for further testing. to repress transcription of estrogen receptor regulated genes we created chimeras in which full length ER, or the ER DNA binding domain, is fused to a powerful KRAB repressor domain. We showed that these chimeras form powerful, easily- regulated, ligand-dependent repressors. Wild-type ER, fused to KRAB domains, was unable to repress transcription of the native p52 gene, while a KRAB-ER chimera containing a set of up-binding mutations we identified in our challenge phage selections was a powerful ligand-dependent repressor of both basal and estrogen-induced transcription of the pS2 gene. Further analysis of wild and mutant ERs revealed the surprising finding that the affinity of wild type ER for the imperfect ERE half site in the pS2 gene was 100- 200 fold lower than its affinity for the consensus ERE half site.
DTIC
Cancer; Estrogens; Genes; Mammary Glands; Mutations; Growth

20010040842 Mayo Foundation, Rochester, MN USA
MUCI Facilitation of Growth in Chemically Induced Mammary Gland Tumors in Muc-1 Mutant and MUCI Transgenic Mice ***Final Report, 1 Aug. 1997-31 Jul. 2000***
Gendler, Sandra; Aug. 2000; 19p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7274
Report No.(s): AD-A387867; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Muci is a cell-associated mucin glycoprotein that is highly over-expressed in greater than 90% of mammary gland tumors. Our studies have focused on elucidating the effect of Muci on tumor development, metastasis, and immune function. Muci-deficient mice were bred with mice expressing the c-neu protooncogene under control of the MMTV promoter to generate spontaneous mammary tumors. These mice developed unifocal tumors between 7 and 18 months of age. Tumor onset, progression, metastasis, and immune function were analyzed in the Mud-deficient and Muc1-expressing mice. Tumors developed in 93% (51/55) Muci mice and in 91% (51/56) of Muci* mice. Age of tumor onset was seven weeks lower for mice lacking Muci, and these mice +1+ were 1.5-times as likely to have lung metastasis as Muci mice. We found that the immune system of the Mud-deficient mice was severely compromised, as both T cells and natural killer cells failed to be activated and dendritic cells were non-functional. Thus, the lack of Muci protein had a dramatic effect on tumor latency, metastasis and general immune competence. These results add a new dimension to the function of this important tumor antigen.
DTIC
Antigens; Mammary Glands; Proteins; Cancer; Carcinogens; Immunity

20010040843 Johns Hopkins Univ., Baltimore, MD USA

Development of targeted Sindbis Virus Vectors for Potential Application to Breast Cancer Therapy ***Final Report, 15 Sep. 1997-14 Sep. 2000***

Oct. 2000; 15p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-97-1-7073

Report No.(s): AD-A387865; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The future progress of cancer gene therapy relies on the development of efficient and safe vectors that can deliver therapeutic genes specifically to tumor cells. Using a replication-competent viral vector targeted to tumor cells may be the most efficient way of killing a large number of malignant cells. We intend to develop Sindbis virus (SV), an alphavirus, into a targeted replication-competent viral vector for breast cancer therapy. Since SV kills cells by apoptosis, specific destruction of tumor cells will occur if the virus is targeted to breast cancer cells. to target SV to breast cancer cells, the putative receptor-binding domain(s) of the SV E2 glycoprotein was replaced with the ligand, heregulin, or with an NGR-containing peptide motif that binds to the CD 13 receptor expressed on tumor-associated endothelial cells. A heregulin-containing SV preferentially kills a breast cancer cell line that expresses the appropriate receptors. The replication and spread of the heregulin-containing SV vectors is significantly attenuated. However, SV antigen expression and heregulin-E2 glycoprotein expression was detected in BHK cells transfected with SV RNA containing heregulin sequence. We have isolated an NGR-containing SV clone, TE-NGR, that is replication competent in BHK and SLK cells. We are investigating the ability of TE-NGR to preferentially kill cancer cells.

DTIC

Antigens; Cancer; Cells (Biology); Mammary Glands; Therapy; Viruses; Genetic Engineering

20010040844 Ohio State Univ., Research Foundation, Columbus, OH USA

Social Support and Endocrine Function: A Randomized Trial with Breast Cancer Patients ***Final Report, 1 Aug. 1997-31 Jul. 2000***

Golden-Kreutz, Deanna; Aug. 2000; 72p; In English

Contract(s)/Grant(s): DAMD17-97-1-7062

Report No.(s): AD-A387863; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

While there is clear evidence that psychological/behavioral interventions with cancer patients provide adjustment and coping benefits (Mark & Meyer, 1995) as well as positive immune and survival benefits (Fawzy et al., 1993; Speigel et al., 1989), the mechanisms for the benefits of such groups are not clearly understood. We propose that one of the mechanisms for the success of intervention groups may be through the provision of social support. Thus, by receiving needed support, patients may be ”buffered” or protected from the more negative effects of the cancer stressor (e.g., depressive symptoms, Spiker, Trijsburg, & Duivenvoorden, 1997; and immune down- regulation, Andersen et al., 1998). Therefore, we are studying the impact of a psychological/behavioral intervention with 231 breast cancer patients, using treatment (intervention) and control (no intervention) arms, on social support and endocrine responses. We found (1) The intervention participants do not have significantly higher levels of social support than the assessment only subjects. Although there are trends that suggest that the intervention participants maintain support levels while the assessment only subjects report lower support over time. (2) The intervention participants do have significantly lower levels of stress hormones than the assessment only subjects. Furthermore, psychological stress (ie., perceived stress and life events), across groups, is associated with depressive symptoms. (3) There is no support for the stress buffering hypothesis of social support in this sample. In fact, those women who belong to 1 or more groups show higher stress hormones in comparison to women who do not. However, women in the intervention, regardless of outside group participation, show stable or decreasing stress hormone levels over time. Intervention effects, however, over time (12-months), are not well-maintained and may well be related to transitioning from weekly meetings to monthly ones.

DTIC

Cancer; Mammary Glands; Patients; Survival; Human Behavior

20010040846 Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM USA

Critical Role for Aberrant CpG Island Methylation in the Evolution and Progression of Breast Cancer: Characterization of Known Genes and Identification of Novel Genes ***Annual Report, 1 Sep. 1999-31 Aug. 2000***

Belinsky, Steven A.; Sep. 2000; 10p; In English

Contract(s)/Grant(s): DAMD17-99-1-9258

Report No.(s): AD-A387838; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

CpG island methylation is an epigenetic modification of DNA associated with the silencing of gene transcription. The hypothesis of this proposal is that breast cancers develop along different pathways, some involving aberrant CpG island methylation for gene inactivation. Some of the genes or CpG islands identified in the methylation-dependent pathways will also

be inactivated early in breast cancer evolution and/or will be associated with prognosis. These hypotheses will be tested in innovative studies that will identified novel CpG islands methylated in stage I or III breast cancers using the new technique of methylation specific representation differential analysis. The frequency and timing for methylation of these novel CpG islands will be defined in a case control study of ductal cell carcinoma in situ, stage I, and stage III ductal cell carcinomas. This study is collecting data on other risk factors (e.g., hormone profiles, alcohol intake) for breast cancer. In addition, cellular and genetic endpoints that are potentially prognostic for this disease: cell proliferation index (Ki-67), HER2/neu, progesterone receptor and estrogen receptor expression are being determined in this ongoing study. The novel technique of methylation-specific polymersae chain reaction will be used to detect methylated alleles in DNA from fixed tissue. Together, these results will identify novel CpG islands in breast cancer, define their timing for inactivation, identify pathways that may lead to breast cancer through gene inactivation by methylation, and identify markers of prognosis.
DTIC
Hormones; Genes; Methylation; Estrogens; Cancer; Cells (Biology)

20010040850 Michigan Univ., Ann Arbor, MI USA
NMR Reconstructive Elasticity Imaging of Breast: Surrogate Remote Palpation Using Quantitative 3-D Displacement and Strain Estimations ***Final Report, 11 Aug. 1997-10 Aug. 2000***
Chenevert, Thomas L.; Sep. 2000; 66p; In English
Contract(s)/Grant(s): DAMD17-97-1-7079
Report No.(s): AD-A387833; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The goal of this research program is to develop a sensitive diagnostic technique based on quantitative elasticity imaging permitting surrogate palpation of deep lying breast lesions. The remote measurement of elasticity in breast tissues may provide unique information which could increase detection and/or characterization of potentially malignant masses not accessible to manual palpation. The primary technical objective of this study is to refine and test an MRI method for the acquisition of high resolution 3- dimensional (3D) spatial displacement data through the imaged object for quantitative estimation of internal strain and elastic modulus. Proof-of-concept of the proposed 3D displacement-encoding, stimulated echo technique has been completed and published using two-dimensional test objects. A pneumatically-driven deformation device under acquisition sequence control has been designed, constructed, and demonstrated to produce highly reproducible deformations of the imaged object. The image acquisition sequence has been generalized to encode 3D displacements over a 3D volume using ”classic” 3D and fast-spin- echo schemes. Volumetric datasets of 3D phantoms have been acquired and submitted for processing using newly developed 3D elasticity reconstruction algorithms. Comparisons between 2D and 3D elasticity reconstructions from simulated and experimental displacement data shows higher accuracy of the 3D elasticity reconstruction.
DTIC
Mammary Glands; Diagnosis; Coding; Displacement; Nuclear Magnetic Resonance

20010040851 Pennsylvania Univ., Wistar Inst., Philadelphia, PA USA
Structural Studies of the pRB Tumor Suppressor Complexed with Human Papillomavirus E7 Proteins ***Final Report, 1 Jun 1997-31 May 2000***
Clements, Adrienne; Jul. 2000; 29p; In English
Contract(s)/Grant(s): DAMD17-97-1-7063
Report No.(s): AD-A387831; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Since viral oncoproteins are expected to compete with and imitate interactions that pRB has with cyclin Dl, understanding high affinity pRB-viral oncoprotein complexes will provide tremendous insight into the specific interactions required for the development of small compounds that can destabilize pRB-cyclin Dl complexes in cyclin Dl -mediated breast cancer. Therefore, the primary goal of this project is to determine the three dimensional structure of pRB bound HPV E7 and Adenovirus 5 El A. Additionally, since p53 functions as a tumor suppressor that is often inactivated in breast cancer, a secondary goal of this project is to determine the structure of the PCAF acetyltransferase domain with coenzyme A and a p53-derived peptide in order to gain insight into PCAF-mediated p53 activation This study demonstrates that bacterially coexpressed pRB(376-792) and viral oncoproteins form complexes. To date, these purified complexes have resisted crystallization. However, crystallography of HPV 1 a E7 and NMR studies of Adenovirus 5 El A have had preliminary success. Sedimentation equilibrium experiments of the pRB/viral oncoprotein complexes and their individual components have been utilized to characterize protein oligomerization states. Additionally, the crystal structure of PCAF bound to coenzyme A has been solved and provides insight into PCAF-mediated p53 acetylation and activation.
DTIC
X Rays; Crystallography; Nuclear Magnetic Resonance; Mammary Glands; Cancer

20010040868 Washington Univ., Grant and Contract Services, Seattle, WA USA

Evaluation of Prostatic Acid Phosphatase (PAP) as a Candidate Antigen for the Development of Cancer Vaccines for Prostate Cancer ***Annual Report, 15 Sep. 1999-14 Sep. 2000***

McNeel, Douglas G.; Oct. 2000; 16p; In English

Contract(s)/Grant(s): DAMD17-99-1-9529

Report No.(s): AD-A387715; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this proposal is to evaluate prostatic acid phosphatase (PAP), a prostate tissue-specific protein, as a candidate tumor antigen for a prostate cancer vaccine. PAP is a well-defined protein, whose expression is limited to normal and malignant prostate tissue. In addition, data presented suggests that some patients with prostate cancer have a pre-existent immune response to PAP, suggesting that immune tolerance to this ”self’ protein can be circumvented. Studies described here will evaluate the immune response to PAP in patients with various stages of prostate cancer, characterize the T helper subset active in endogenous PAP-specific immunity, and test whether PAP-specific CTL derived from individual patients can lyse prostate tumor cells. The results of investigations described in this proposal will lead to a human phase I clinical vaccine trial targeting PAP in patients with prostate cancer. The specific aims of the current proposal are: (1) to determine whether patients with prostate cancer have a pre-existing CD4+ T cell immunity to PAP, and (2) to determine whether patients with prostate cancer have a pre-existing CD8+ T cell response to PAP and whether PAP-specific CTL derived from individual patients can lyse prostate tumor cells.

DTIC

Prostate Gland; Cancer; Vaccines; Antigens

20010040870 Baylor Coll. of Medicine, Houston, TX USA

C-Jun N-Terminal Kinase and Apoptosis in Breast Cancer ***Final Report, 15 May 1997-14 May 2000***

Chen, Yi-Rong; Tan, Tse-Hua; Jun. 2000; 43p; In English

Contract(s)/Grant(s): DAMD17-97-1-7078

Report No.(s): AD-A387706; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Understanding the biochemical mechanisms of apoptosis is important for revealing cancer biology and for improving cancer therapies. The c-Jun N-terminal kinase (JNK) pathway participates in cellular responses to both environmental stresses and mitogenic signals. JNK is involved in cellular signaling during apoptosis induced by various agents including gamma-radiation, UV-radiation, anti-carcinogenic isothiocyanates, and retinoid analog N-(4-hydroxyphenyl) retinamide (4-HPR) in various cancer cells. Interfering with the JNK pathway suppressed the induction of apoptosis. JNK activation by apoptotic stimuli can be caspase-dependent or independent. Different apoptotic stimuli induce JNK activation through distinct mechanisms. We found that oxidative stress is a major cause of JNK activation in apoptosis induced by several agents. The involvement of JNK in both mitogenic and apoptotic signaling implies that a subtle regulatory mechanism must exist for the signaling decision. Our studies reveal that the duration of JNK induction may determine cell fate. Curcumin is a potent inhibitor for JNK activation by various stimuli. This inhibitory effect may explain the anti-carcinogenic effect of curcumin. In conclusion, our study reveals the importance of the JNK pathway in apoptotic signaling. These results provide important information for the studies of oncogenesis and the mechanisms of radiation and drug resistance in cancer cells.

DTIC

Lymphocytes; Apoptosis; Mammary Glands; Cancer

20010040871 Washington Univ., Grant and Contract Services, Seattle, WA USA

Retinoids and Retinoid Metabolism in Breast Cancer ***Final Report, 16 Jun. 1997-15 Jun. 2000***

Paik, Jisun; Swisshelm, Karen; Jul. 2000; 63p; In English

Contract(s)/Grant(s): DAMD17-97-1-7252

Report No.(s): AD-A387705; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Retinoids play diverse roles in human physiology. Retinoid actions are mediated via retinoid receptors (RARs and RXRs). Little is known about the biosynthetic pathway of 9-cis-retinoic acid, the physiological ligand for RXRs. Thus, we studied cis-retinol dehydrogenase (cRDH), an enzyme that oxidizes cis-retinols, a first step needed for 9-cis-retinoic acid synthesis. LRDHSN/Hep O2 cells were developed to study the characteristics of cRDH and its role in 9-cis-retinoic acid synthesis. We observed that cRDH oxidizes 9-cis-retinol and follows Michaelis-Menten kinetics. Nonetheless, cRDH over-expression did not result in increased synthesis of 9-cis-retinoic acid, which likely arises from the inhibition of 9-cis-retinal oxidation by high concentrations of 9-cis-retinol in vitro. We also studied the role of cRDH in 9-cis-retinol metabolism and in cell proliferation of MCF7 cells, a human breast cancer line. We demonstrated that both cRDH and 9-cis-retinol treatment were required to bring about a growth inhibitory effect on MCF7 cells. This growth inhibition was not mediated by 9-cis-retinoic acid but by other 9-cis-retinol

metabolites like 9-cis-retinal and/or an unknown metabolite. Our studies suggest that a two pronged approach of targeted gene therapy with cRDH in combination with a low dose of 9-cis-retinol treatment may be a useful breast cancer treatment.
DTIC
Retinene; Metabolism; Metabolites; Enzymes; Mammary Glands; Cancer

20010040875 Burnham Inst., La Jolla, CA USA
Isolation of Signaling Molecules Involved in Anigiogenic Pathways Mediated Alpha V Integrins ***Annual Report, 15 Jul. 1999-15 Jul. 2000***
Cardo-Vila, Marina; Aug. 2000; 19p; In English
Contract(s)/Grant(s): DAMD17-99-1-9090
Report No.(s): AD-A387699; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Integrins that bind to vitronectin are highly expressed in neovasculature and play an important regulatory role in angiogenesis. There are at least two cytokine-dependent pathways that lead to angiogenesis in vivo, and there is evidence indicating that they can be distinguished by their dependency on specific alphav integrins. Here we aim to define what molecules are involved in alphavBeta3- and alphavbeta5- selective angiogenic signaling. We hypothesize that: (I) molecules that associate with either of those integrins after angiogenesis is triggered by defined cytokines are different; (ii) the assembly of specific molecules associating with the beta3 or beta5 cytoplasmic domains results in selective signaling. The strategy that will be used to approach these questions is based on the panning of phage peptide libraries of beta3 and beta5 cytoplasmic domains. We will also investigate whether phosphorylation events can modulate the interaction with such integrin cytoplasmic domain- binding peptides. Finally, by using microinjection-based techniques, we will study the effect of integrin cytoplasmic domain binding peptides in cell adhesion, migration and proliferation upon stimulation with factors that activate endothelial cells in vitro. These studies will shed light into molecular basis of selective signal transduction pathways initiated by alphavbeta3 and alphavbeta5. New ways of inhibiting angiogenesis, and ultimately, new strategies to treat breast cancer may result from this work.
DTIC
Mammary Glands; Molecules; Peptides; Cytoplasm; In Vitro Methods and Tests; Bacteriophages

20010040878 SRI International Corp., Menlo Park, CA USA
Restore Wild-Type Functions to P53 Mutants Using an RNA-Based Combinatorial Approach ***Final Report, 15 May 1997-14 May 2000***
Green, Christopher; Jun. 2000; 31p; In English
Contract(s)/Grant(s): DAMD17-97-1-7036
Report No.(s): AD-A387678; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The p53 protein is a transcription factor and a suppressor regulating the expression of a wide range of genes involved in apoptosis, growth control, and inhibiting the proliferation of tumor cells in animal models. Mutations that inactivate the p53 gene are important steps in tumor progression and often affect the protein's DNA binding ability. Attempts were made to select RNA molecules that bind to human p53 protein or a small peptide from its carboxyl terminus to determine whether these could be used to alter the protein's ability to bind the p53 consensus DNA-binding sequence. These attempts were unsuccessful, however the experience gained will be applied to another somewhat easier targets involved in tumor growth.
DTIC
Mutations; Genes; Ribonucleic Acids; Regeneration (Physiology); Molecules; Proteins

20010040880 California Univ., Davis, CA USA
Tyrosine Kinase Display of Prostate Cancer Cells ***Annual Report, 1 Apr. 1999-30 Mar. 2000***
Kung, Hsing-Jien; Apr. 2000; 29p; In English
Contract(s)/Grant(s): DAMD17-99-1-9021
Report No.(s): AD-A387675; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this proposal, we present an innovative approach, tyrosine kinase display, to rapidly identify tyrosine kinases differentially expressed in prostate carcinomas. Our hypothesis is that tyrosine kinases play central roles to the growth and progression of prostate carcinomas. The innovative PCR-based approach developed here requires only restriction digestion and gel electrophoresis, and allows all or nearly all expressed tyrosine kinases to be directly "read" from the gel. It is rapid, quantitative, and insensitive to RNA degradation. When fully developed, it is expected to have wide applications in both basic and clinical settings. In the past year (May, 1999 to Apr. 2000) we have made the significant progress, notably 1). We have established comprehensive tyrosine kinase profiles for all five widely used prostate cancer cell lines, as well as those of immortalized prostate epithelial cells and the normal primary cultures of prostate stromal and epithelial cells; 2). We have identified several kinases

differentially expressed in prostate cancer cells, in androgen dependent as well as independent cells. These are potential prognostic markers and intervention targets; and 3). We have identified a new kinase whose expression is induced by DHT and which may mediate signals channeled by androgen receptor. Modulation of this kinase activity may restore androgen sensitivity or block androgen independent growth.
DTIC
Tyrosine; Growth; Electrophoresis; Cancer

20010040882 Duke Univ., Medical Center, Durham, NC USA
Biological Basis for Chemoprevention of Ovarian Cancer ***Annual Report, 1 Oct. 1999-30 Sep. 2000***
Berchuck, Andrew; Oct. 2000; 18p; In English
Contract(s)/Grant(s): DAMD17-98-1-8656
Report No.(s): AD-A387659; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Since reduction of ovulation is protective against ovarian cancer, prevention may represent a feasible approach to decreasing mortality. to achieve a better understanding of the etiology of ovarian cancer, which will translate into more effective chemoprevention strategies, we have initiated a molecular epidemiologic study in North Carolina. The study will consider genetic susceptibility, reproductive/hormonal and other exposures and acquired genetic alterations. The award from the DOD has been supplemented by a grant from the NCI allowing us to increase the number of cases and controls included; and the study will now be population-based with subjects recruited from 48 counties of central North Carolina. Subjects are interviewed in their homes, rather than by telephone, and about 200 women with ovarian cancer and 200 controls have been accrued thus far. Blood and cancer samples have been collected and DNA extracted and molecular analyses of p53, c-myc and genetic polymorphisms have recently commenced. Because progestins have a potent apoptotic effect on ovarian epithelial cells, the use of levonorgestrel in chemoprevention of ovarian cancer is being explored in chickens and women. A chemoprevention trial is ongoing in chickens and we will begin a trial to determine whether levonorgestrel induces apoptosis in the ovarian epithelium of women undergoing oophorectomy.
DTIC
Apoptosis; Cancer; Etiology; Genetics; Ovaries

20010040883 Scripps Research Inst., La Jolla, CA USA
Isolation of Genes Required for the Regulated Separation of Sister Chromatids ***Final Report, 1 Jun 1997-31 May 2000***
Clarke, Duncan; Jun. 2000; 147p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7059
Report No.(s): AD-A387658; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Failure in cell cycle checkpoint controls causes aneuploidy which is a significant factor in the tumorogenic progression of breast cancer cells. We identified and characterised a novel Pdsl-dependent checkpoint pathway that prevents aneuploidy by coordinating DNA replication with mitotic anaphase. The yeast anaphase inhibitor Pdsl is critically involved in this regulation. It is a distinct checkpoint control system from the previously described S-phase checkpoint pathway. Two more genes required for regulated chromosome segregation were identified, Rad23 and Ddil. When overproduced, these proteins suppress the S-phase checkpoint defect of a pdsl mutant strain. Structure/function studies revealed a likely mechanism through which Rad23 and Ddil may regulate Pdsl (by binding to ubiqutinated Pdsl) . Fad23 and Ddil contain a novel protein interaction domain (UBA) that binds to ubiquitin and ubiquitinated proteins. Rad23 and Ddil UBAs are essential for suppression of the pdsl mutant. These genes have closely related human homologues that are likely to be required for human checkpoint controls. Failure in such checkpoint mechanisms are a potential cause of aneuploidy that contributes to the etiology of breast cancer.
DTIC
Cancer; Chromosomes; Etiology; Genes; Inhibitors; Isolation; Mammary Glands

20010040885 Oregon Health Sciences Univ., Portland, OR USA
Anti-Proliferative Actions of IGFBP-3 and Its Proteolytic Fragments in Human Prostate Cancer ***Annual Report, 1 Jul. 1999-30 Sep. 2000***
Devi, Gayathri; Sep. 2000; 115p; In English
Contract(s)/Grant(s): DAMD17-99-1-9522
Report No.(s): AD-A387653; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Insulin-like growth factor binding protein-3 (IGFBP-3), the predominant IGF carrier protein in circulation, is post-translationally modified in vivo by IGFBP-3 protease(s) into a number of fragments. Based on the ascertained and predicted recognition sites for known IGFBP-3 proteases, like prostate specific antigen, recombinant intact and proteolytic fragments of

IGFBP-3 were generated. The NH2- and COOH-terminal fragments bound both IGF and insulin specifically, albeit with significantly reduced affinity for IGF but higher affinity for insulin, when compared to IGFBP-3. IGFBP-3 and (1-97)IGFBP-3 NH2-terminal fragment inhibited IGFIR activation. However, unlike the 1-97 fragment, the COOH terminal fragments of IGFBP-3 retained their ability to associate with the cell surface similar to intact IGFBP-3. Using IGF analogs, we demonstrate that IGFBP-3 does not directly interact with the IGFIR. Further, the role of endogenous IGFBP-3 on prostate cell growth was evaluated by stable transfection of human IGFBP-3 cDNA into a tumorigenic and metastatic prostate epithelial cell line (M12). IGFBP-3 causes significant growth inhibition, induces early apoptosis in the cancer cells and causes decreased tumor formation in vivo. These data suggest that IGFBP-3 has a suppressive effect on prostate cancer development and various forms of IGFBP-3 fragments resulting from proteolysis may have different effects on the IGF-IGFIR axis, as well as potential IGF-independent actions.
DTIC
In Vivo Methods and Tests; Cancer; Cells (Biology); Prostate Gland; Apoptosis; Cell Division; Protease

20010040886 California Univ., Berkeley, CA USA
Alteration in the Nuclear Structure of Breast Cancer Cells in Response to ECM Signaling ***Annual Report, 16 Aug. 1999-16 Aug. 2000***
Galande, Sanjeev; Sep. 2000; 18p; In English
Contract(s)/Grant(s): DAMD17-98-1-8303
Report No.(s): AD-A387652; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Eukaryotic chromosomes are thought to be separated into topologically independent loop domains by periodic attachment onto an intranuclear frame known as the nuclear matrix. Specific DNA sequences that bind to the nuclear matrix are called matrix attachment regions (MARs), in which a specialized DNA context sequences exhibiting high base unpairing propensity (BUR) is typically found. Besides organization of eukaryotic DNA, BURs/MARs may also be important for various functions including replication, transcription and recombination. A strong BUR-binding activity, p1 14, previously reported in breast carcinoma cells, was identified to be a combined property poly ADP-ribose polymerase (PARP) and scaffold attachment factor A (SAF-A). PARP is upregulated in breast carcinoma SK-BR-3 cells as compared to normal mammary epithelial cells in culture. Additionally, HMG 1(Y) was also found to be a BUR-binding protein, and its expression was well correlated with aggressive breast cancer cells. Thus, we have shown that the expression of several BUR-binding proteins correlates strongly with the aggressive phenotype of breast carcinoma cells. Specific binding of these proteins to BURs in cancers may contribute towards gene regulation to trigger or maintain the malignant phenotype in response to signals from extracellular matrix (ECM), or during progression of tumorigenesis and differentiation.
DTIC
Cancer; Mammary Glands; Nuclear Structure; Deoxyribonucleic Acid; Chromosomes; Cells (Biology)

20010040887 Virginia Univ., Charlottesville, VA USA
Mitochondrial Apoptosis: A New Foundation for Combing Agents in Prostate Cancer Treatment ***Annual Report, 15 Feb. 1999-14 Feb. 2000***
Myers, Charles E.; Mar. 2000; 88p; In English
Contract(s)/Grant(s): DAMD17-99-1-9468
Report No.(s): AD-A387651; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This grant sought to examine synergy between androgen withdrawal and drugs known to have activity against hormone-refractory prostate cancer. The hypothesis is that apoptosis induced by these various agents would converge on mitochondria enhancing tumor cell kill. During the first year, we were able to clearly show that none of the agents tested were synergistic or even additive with hormonal therapy. However, we did find promising synergy between HMG-Co reductase inhibitors or phenylbutyrate on one hand and the chemotherapy drugs, taxol, etoposide and suramin. Our original hypothesis of synergy between androgen withdrawal and apoptosis induced by chemotherapy was predicted on the idea that all of these agents converged on mitochondria as the common pathway to apoptosis. We sought the explanation for the failure of this hypothesis. We found that prostate cancer cells contain large amounts of preformed FAS and FAS-L that are sequestered at distinct intracellular sites. In addition to mitochondrial apoptosis, rapid translocation of FAS or FAS-L to the cell surface represent a second independent pathway to cell death.
DTIC
Apoptosis; Cancer; Prostate Gland; Inhibitors; Mitochondria; Hormones

20010040888 Weizmann Inst. of Science, Rehovot Israel

New Strategy for the Redirection of Cytolytic T Lymphocytes to Breast Tumors ***Annual Report, 1 Sep. 1999-31 Aug. 2000***

Eshhar, Zelig; Sep. 2000; 60p; In English

Contract(s)/Grant(s): DAMD17-99-1-9446

Report No.(s): AD-A387650; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The main objective of this research project has been to apply the T-body approach for the immunotherapy of breast cancer. to this end we have altered the specificity of patient-derived lymphocytes through stable modification with chimeric receptor genes consisting of either an anti-breast tumor single-chain variable (scFv) region of anti- HER2 antibody or the Erb-B NDF ligand linked to a T cell activation molecule (the gamma subunit of the Fc epsilon receptor) Both receptors recognize molecules specifically overexpressed on many breast tumors. A special receptor configuration developed and tested in this study included part of the extracellular and the entire intracellular domains of the co- stimulatory CD2B molecule in-between the scFv and the gamma moieties of the chimeric receptors. This three partied receptor appeared functional in redirecting hybridoma cell lines, human PBLs and resting lymphocytes of transgenic mice. Such genetically modified redirected lymphocytes will be tested on explanted breast tumor cells for specific lysis and secretion of cytokines in vitro, and for elimination of human breast tumor cells passaged in NOD/SCID mice in vivo. These model systems will serve to determine the optimal conditions towards clinical trials. Altogether, this therapeutic strategy may allow new approaches towards the adoptive immunotherapy of breast cancer in humans. DTIC

Genes; Cytology; Lymphocytes; Mammary Glands; Antibodies; Cancer; Therapy

20010040889 Sloan-Kettering Inst. for Cancer Research, New York, NY USA

Synthesis of Epothilone Analogs: Toward the Development of Potent Anticancer Drugs ***Annual Report, 1 Jan. 1999-31 Jul. 2000***

Lee, Chul B.; Danieshefsky, Samuel J.; Aug. 2000; 33p; In English

Contract(s)/Grant(s): DAMD17-98-1-8155

Report No.(s): AD-A387649; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Having accomplished total syntheses of epoithilone A and B, we have been engaged in a new stage of investigation that involves development of efficient strategies for a large scale epothilone preparation and search for more potent analogues. Efficient and processable syntheses of key building blocks of 12,1 3-desoxyepothilone B (dEpoB) by catalytic asymmetric induction has been achieved. dEpoB is a potent anticancer agent, showing a highly promising therapeutic potential in the currently undergoing phase I study. The syntheses of two epothilone analogues, 15(S)-aza-12,13-desoxyepothilone B and the epimeric 15(R)-aza-12,13- -desoxyepothilone B have been accomplished. Tubulin binding and cytotoxicity profiles of these analogues have also been investigated. Another epothilone, 12,13-desoxyepothilone F (dEpoF), was synthesized and evaluated for antitumor potential. The results from an in vitro assay reveal that this new analogue is highly active against various tumor cell lines with a potency comparable to that of dEpoB. In particular, the growth of resistant tumor cells is inhibited by dEpoF at concentrations where paclitaxel (Taxol) is basically ineffective. A preliminary assessment of its in vivo activity is also promising. The new analogue, containing an additional hydroxyl group at C21, provides advantages over other epothilones in terms of water solubility and can serve as a readily functionalizable handle to produce other useful compounds for pertinent biological studies. DTIC

Drugs; In Vivo Methods and Tests; Antibiotics; Cancer; Assaying; Mammary Glands

20010040890 Thomas Jefferson Univ., Philadelphia, PA USA

Contrast Enhanced 3D Color Amplitude Imaging of the Breasts ***Annual Report, 15 Sep. 1999-14 Sep. 2000***

Forsberg, Flemming; Oct. 2000; 20p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-97-1-7116

Report No.(s): AD-A387647; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In total, 21 patients with 6 cancers and 15 benign lesions have been enrolled in the Optison arm of the study. These numbers were much less than anticipated, due to personnel illness and changes. No data analysis has yet been carried out due to the limited data set available for Optison. A one year no-cost extension with a carryover of the unspent balance was requested and granted to allow completion of the project, including data collection and analyses. The histomorphometry system has been used to analyze vessel distribution and vessel density maps from 14 patients. Contrast enhanced color flow imaging was found to provide some quantitative parameters, which correlated with direct pathologic vascularity assessments such as the iMVD. Specifically, the microvessel area and count for vessels 30 to 39 %m in diameter were most significant. These results indicate that ultrasound

imaging with contrast may produce a quantitative measure of the neovascularity within breast tumors. However, the current patient population in the sub-study is very small and further cases are currently being analyzed.
DTIC
Cancer; Mammary Glands; Ultrasonics; Images; X Ray Optics; Imaging Techniques

20010040894 Illinois Univ., Broad of Trustees, Chicago, IL USA
Role of Drug-Induced Fas Ligand Expression in Breast Tumor Progression ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Beck, William T.; Oct. 2000; 12p; In English
Contract(s)/Grant(s): DAMD17-99-1-9220
Report No.(s): AD-A387625; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Fas/Fas ligand (FasL) is one of the key elements of the signaling pathway leading to cell death (apoptosis). It has been shown that FasL is overexpressed in some solid tumors and importantly, anticancer agents induce FasL expression in many tumor cell lines. Therefore, we have been using a mouse tumor model to investigate whether anticancer agents such as VP- 16 induce FasL expression in vivo and whether FasL expression promotes the growth of Fas deficient tumor cells. Preliminary data with mouse mammary tumor cells (CRL-21 16) support our hypothesis that anticancer drugs can induce FasL expression in vivo although more experiments are under way to confirm these results. to test the effect of drug-induced FasL expression on tumor growth, we will use CRL- 2116 cells to construct a stable Fasdef cell line that can be used as a negative control. Thus, we have cloned the wild-type mouse Fas and its dominant negative Fas mutant, and confirmed that both clones are expressed exogenously. Once a stable Fasdef CRL-21 16 cell line is obtained, we will examine the effect of the drug- induced FasL on tumor growth of the Fasdef CRL-2 116 cells.
DTIC
Mammary Glands; Cancer; Ligands; Chemotherapy; Drugs; Cells (Biology)

20010040897 Illinois Univ., Broad of Trustees, Chicago, IL USA
A Breast Tumor Suppressor Gene on 8p22: Identification by the Genetic Suppressor Element Approach ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Banerjee, Kumarika; Sep. 2000; 10p; In English
Contract(s)/Grant(s): DAMD17-99-1-9222
Report No.(s): AD-A387608; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We are currently investigating a putative tumor suppressor gene (TSG) located at chromosomal band 8p22 that is involved in breast cancer. We have proposed to apply the genetic suppressor element (GSE) approach to the identification of this TSG. Briefly, a library of short gene fragments will be introduced into a cell line which demonstrates suppression of clonogenicity in soft agar with the transfer of chromosome 8. Presumably, the 8p22 TSG is responsible for the suppression of clonogenicity, and the introduction of an ”active” GSE from the library into the suppressed cells should inhibit the 8p22 TSU contained in the hybrid cells and allow reversion back to the parental phenotype, the ability to grow in soft agar. Any clones that form will be isolated and further evaluated, as a candidate for the TSU. Currently, several ESTs have been identified in the 8p22 interval using various methods. Construction of the USE library consisting of these ESTs is currently underway. All preliminary optimization experiments for retroviral library delivery have been completed. Any positive USE clones identified will be characterized and evaluated as candidate TSGs.
DTIC
Mammary Glands; Cancer; Suppressors; Genetics

20010040900 Tufts Univ., Medford, MA USA
Frequency-Domain Optical Mammograph ***Annual Report, 1 Oct. 1999-30 Sep. 2000***
Fantini, Sergio; Oct. 2000; 31p; In English
Contract(s)/Grant(s): DAMD17-99-1-9218
Report No.(s): AD-A388016; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research project involves the analysis of a clinical data set of frequency-domain optical mammograms (150 patients) to assess the performance of this approach to breast cancer detection. The analysis of the breast images is complemented by theoretical and experimental studies to characterize the proposed algorithms of image processing. The objective of this research is to identify the strengths and the weaknesses of the current instrument design, and to guide the design of new optical instrumentation for breast cancer detection. During the first year of this research project, we have completed the initial analysis of the optical mammograms at each one of the four wavelengths used (690, 750, 788, 856 nm). The comparison of the single-wavelength optical mammograms with the pathology reports has led to building an ROC (Receiver Operating Characteristic)

curve for this method. This ROC curve shows that single wavelength optical mammograms, while potentially sensitive to breast cancer, do not perform well in terms of discrimination of benign and malignant tumors. to exploit the spectral information, we have developed a perturbation approach to analyze the four wavelength images, whose application to a subset of 19 patients has led to promising results. We are currently extending this analysis to a larger subset of data, and we are complementing it with alternative image-processing approaches.
DTIC
Images; Image Processing; Mammary Glands; Cancer

20010040901 California Univ., San Francisco, CA USA
Outcomes of Screening Mammography in Elderly Women ***Annual Report, 1 Oct. 1999-30 Sep. 2000***
Smith-Bindman, Rebecca; Oct. 2000; 5p; In English
Contract(s)/Grant(s): DAMD17-99-1-9112
Report No.(s): AD-A388015; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

There is uncertainty about whether women older than age 65 should undergo screening mammography. Although screening mammography may benefit some elderly women through the detection of early breast cancers, it may potentially harm other women through false positive diagnoses and the detection and surgical treatment of clinically insignificant lesions. This research study involves the design and implementation of a data analysis of HCFA Medicare billing claims linked with National tumor registry data from the Surveillance Epidemiology and End Results (SEER) program. The specific aims of this research will evaluate 1) differences in breast cancer mortality, 2) differences in breast cancer treatment and 3) difference in breast cancer tumor attributes (such as size and stage) between women who were screened and those who were not. In the first year of this grant the PI has developed the methodologies for performing the analyses, has obtained the NCI created linked Medicare/SEER database, she has organized the appropriate research team to analyze this data set, and she has begun the project to validate that Medicare claims are accurate for determining the use of screening mammography by collaborating with multiple sites that participate in the NCI funded Breast Cancer Screening Consortium.
DTIC
Mammary Glands; Cancer; Epidemiology

20010040902 Harvard Medical School, Boston, MA USA
The Role(s) of Heparan Sulfate Proteoglycan(s) in the wnt-1 Signaling Pathway ***Final Report, 1 Aug. 1997-31 Jul. 2000***
Lin, Xinhua; Aug. 2000; 65p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7220
Report No.(s): AD-A388012; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Drosophila Wingless (Wg) is the homologue of the vertebrate Wnt-1 that is implicated in breast cancer. I have investigated the role of heparan sulfate proteoglycans (HSPGs) in Wg signaling. HSPGs are cell surface macromolecules that consist of a protein core to which heparan sulfate (HS) glycosaminoglycan (GAG) chains are attached. My genetic studies in Drosophila have uncovered critical functions of HSPGs in Wg signaling. First, I have shown that in the absence Sulfateless (Sfl), an essential enzyme involved in the biosynthesis of HS GAGs, Wg signaling is defective, suggesting that HSPGs play key role(s) in Wg signaling. I further demonstrated that Division abnormally delayed (Dally), a Drosophila HSPG of Glypican-type, is involved in Wg signaling. Genetic interaction experiments are consistent with a model in which Dally acts as a co-receptor for Wg. Finally, I have found that Dally-like protein (Dlp), a 2nd member of Drosophila Glypican play a key role in the regulation of the extracellular distribution of Wg protein. These findings provide new insights into our understanding of the extracellular regulation of Wnt signaling and will help for therapeutic interventions by the development of specific drugs for the prevention and treatment of breast cancer.
DTIC
Drosophila; Membranes; Macromolecules; Enzymes; Sulfates

20010040903 Thomas Jefferson Univ., Philadelphia, PA USA
Cell-Cell Adhesion and Insulin-Like Growth Factor I Receptor in Breast Cancer ***Annual Report, 15 Aug. 1999-14 Aug. 2000***
Bartucci, Monica; Surmacz, Ewa; Sep. 2000; 68p; In English
Contract(s)/Grant(s): DAMD17-97-1-7211
Report No.(s): AD-A388009; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The insulin-like growth factor I receptor (IGF-IR) is a multifunctional tyrosine kinase that has been recently implicated in breast cancer. The IGF-IR is often overexpressed in estrogen receptor (ER)- positive breast tumors and this feature predicts

enhanced tumor drug- and radio-resistance and cancer recurrence at the primary site. Our previous work demonstrated that the IGF-IR induces cell survival, growth and estrogen-independence in hormone-sensitive cells. Our next goal was to study IGF-IR function in metastatic breast cancer cells that have lost the expression of important markers of good prognosis such as E-cadherin and the ER. Using MDA-MB-231 metastatic breast cancer cells and their IGF-IR-overexpressing derivatives, we demonstrated that, unlike in ER-positive cells, IGF-I has no growth or survival function in these cells but it is necessary to stimulate cell motility. The IGF-I-induced motility was mediated through PI-3 and p38 kinases, and was inhibited by the activation of ERK1/ERK2 kinases.
DTIC
Mammary Glands; Insulin; Epithelium; Hormones; Cell Division; Cancer

20010040904 Illinois Univ., Broad of Trustees, Chicago, IL USA
The Social Construction of Breast Cancer in Mass Media and its Influence on Public Understanding and Citizen Decision-Making ***Annual Report, 15 Sep. 1999-14 Sep. 2000***
Sharf, Barbara F.; Oct. 2000; 38p; In English
Contract(s)/Grant(s): DAMD17-97-1-7240
Report No.(s): AD-A388007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to assess the ways in which mass media play a significant role in constructing the public's understanding of breast cancer as a social problem, a disease, and personal illness experience. This third annual report contains results of three main parts of the investigation. First is a survey of print media depictions of breast cancer from 1986-1994. This period was marked by controversy about the efficacy of lumpectomy compared with mastectomy, the increasing visibility of well-known women with the disease, and shift of attention to topics in mainstream publications, such as environmental and genetic factors, as well as an increased critique of medical practices. Second is an examination of the decision whether to use the drug tamoxifen as prevention with healthy women, albeit at high risk for breast cancer, as depicted in popular print media from 1993-1999. This saga features the hope of scientific progress pitted against a critique of "disease substitution" and pharmaceutical profiteering. Third is an analysis of the quandary of decision making around the topic of genetic testing for BRCAl & BRCA2. Additionally, an "unplanned" research trajectory has been the connection between publicly communicated breast cancer narratives and the formation of health care policy.
DTIC
Mammary Glands; Cancer; News Media; Diseases

20010040905 Illinois Univ., Broad of Trustees, Chicago, IL USA
Growth Suppressors of Breast Cancer Cells ***Final Report, 1 Sep. 1997-31 Aug. 2000***
Lau, Lester F.; Sep. 2000; 43p; In English
Contract(s)/Grant(s): DAMD17-97-1-7262
Report No.(s): AD-A388005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A genetic system has been established for the isolation of candidate tumor suppressor genes in MCF7 breast cancer cells. This system includes the IPTG-inducible episomal vector, which combines the advantages of inducible expression systems and extra-chromosomal replication systems. A cDNA library from normal human breast epithelial cells was constructed in the pEpiLac vector system, and transfected into a cell line (LAP 5) derived from the human breast cancer MCF7 cells which allows the inducible expression of the library DNA. After several rounds of selections of 6,000 independent cDNA clones, 12 sequences that confer growth inhibitory effects on LAPS cells were isolated. Sequence analysis revealed that some of these sequences are fragments of known genes, while others represent novel gene sequences with no known functions. One growth inhibitory cDNA analyzed revealed a novel gene, bop1, which encodes a previously unknown nucleolar protein that is involved in the processing of the 28S and 5.8S rRNA and in the biogenesis of the 60S ribosome. Further analysis of bop1 may lead understanding the cross-talk mechanism between rRNA processing and cell cycle progression.
DTIC
Genetics; Mammary Glands; Cancer; Cells (Biology); Genes; Suppressors

20010040906 State Univ. of New York, Albany, NY USA
Computer Simulation of X-Ray Capillary Optics for Digital Mammography ***Final Report, 1 Sep. 1997-31 Aug. 2000***
MacDonald, Carolyn; Sep. 2000; 42p; In English
Contract(s)/Grant(s): DAMD17-97-1-7300
Report No.(s): AD-A388000; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Polycapillary x-ray optics, arrays of hollow capillary tubes used to guide x-rays by total reflectance, are now being used in increasing numbers of applications, such as materials analysis, microelectronics manufacturing, x-ray astronomy, and medical imaging. Because each optic contains hundreds of thousands of precisely shaped and located hollow channels, it is desirable to assess the feasibility of a variety of capillary geometries for a new application without physically constructing the optic. This assessment requires increasingly sophisticated modeling capability as new applications with more stringent requirements are developed. Previous analysis has shown that high-energy applications such as hard x-ray astronomy and medical imaging are particularly sensitive to optic profile errors such as channel waviness. A more physical model for surface waviness has been developed and included in optics simulations. The results are compared to measured data and to the results of other numerical simulation programs. Directed digital mammography can avail itself the advantages of digital processing, including tolerance to under- and over-exposure and image enhancement. In addition, a new technology, polycapillary optics, has been shown to produce clearer image by increasing contrast and resolution. Capillary optics, consisting a array of hollow glass tubes, is a relatively new technology for controlling x-ray beams. Thousands of individual capillary fiber can be strung together to form a multifiber optic. These arrays of curve polycapillary fiber can be used to focus, collimate, and filter x-ray radiation. A number of borrosilicate glass capillary fibers have been measured and simulated in the energy range 10-80 keV. The result shown potential for mammography applications, with transmission of 70% at 20 keV.
DTIC
X Ray Optics; Computerized Simulation; Image Processing; Digital Systems; Cancer

20010040907 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA
Combined Use of Tissue Morphology, Neural Network Analysis of Chromatin Texture and Clinical Variables to Predict Prostate Cancer Agressiveness from Biopsy Water ***Annual Report, 1 Oct. 1999-30 Sep. 2000***
Partin, Alan W.; Oct. 2000; 19p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-8468
Report No.(s): AD-A387999; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
To combine clinical, serum, pathologic, and computer derived information into an artificial neural network to develop/validate a model to predict prostate cancer tumor aggressiveness in both a retrospective and prospective cohort of men with clinically localized prostate cancer both prior to and after radical prostatectomy. The scope of this project is the prospective enrollment of 500 men who are scheduled to undergo radical retropubic prostatectomy (year 01), the development of an artificial neural network (year 02), and the prospective validation of this model (projected year 03). All models will be tested and developed for biopsy and prostatectomy material. to date, we have completed prospective enrollment of 557 men, collected tissue, serum, and clinical/pathological information for 493 and completed computer image data analysis of 402 samples. We currently have begun construction of a model to predict prostate cancer aggressiveness and anticipate completion of this task by December 2000. At this time, prospective enrollment of a validation subset will begin.
DTIC
Cancer; Neural Nets; Network Analysis; Prostate Gland; Morphology

20010040908 Michigan Univ., Ann Arbor, MI USA
Choices: An Interactive Decision Sport Program for Breast Cancer Treatment ***Final Report, 11 Aug. 1997-10 Aug. 2000***
Pierce, Penny F.; Sep. 2000; 10p; In English
Contract(s)/Grant(s): DAMD17-97-1-7160
Report No.(s): AD-A387996; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
When patients choose a treatment plan in a manner consistent with their values, preferences, and individual decision making style, they generally have better outcomes in part, because involvement also improves the quality of therapeutic decisions. Greater involvement may also optimize the decision-making process by which treatments are chosen thereby reducing untoward decision outcomes such as disappointment, regret, or depression. Using a multimedia CD-ROM format, Choices provides an innovative approach to personalized decision making by incorporating unique features that currently are not available in existing programs. The ultimate objective of Choices is to help patients make effective decisions under stressful and threatening circumstances. Specifically, Choices has the following unique features in contrast to existing programs: (1) the program is designed to be user-friendly and comfortable for women of all ages and education levels, (2) an assessment of the decision maker's personal decision style is used to set the structure of the program, (3) the program considers the cognitive demands of the decision making in this health care context, (4) it goes beyond eliciting personal values and preferences by providing solutions to common decision

failures, and (5) provides an opportunity for pre-decision rehearsal of different options to avoid unexpected decision outcomes or negative emotional responses.
DTIC
Emotions; Cancer; Mammary Glands; Therapy

20010040909 Medical Coll. of Georgia, Augusta, GA USA
Mechanism of p53 Dependent Apoptosis and its Role in Breast Cancer Therapy ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Chen, Xinbin; Jul. 2000; 61p; In English
Contract(s)/Grant(s): DAMD17-97-1-7019
Report No.(s): AD-A387993; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The p53 protein contains several functional domains necessary for inducing cell cycle arrest and apoptosis, that is, activation domain 1 and 2, the proline-rich domain, and the C-terminal basic domain. to further determine the role of each p53 functional domain, we found that deletion of; or mutation at, activation domain 2 abrogates the apoptotic activity but not cell cycle arrest. We also found that at least two of the three domains, that is, activation domain 1 and 2 and the proline-rich domain, are necessary for cell cycle arrest. Interestingly, we found that deletion of activation domain 1 alleviates the requirement of the C-terminal basic domain for apoptotic activity. Furthermore, we found that activation domain 2 and the proline-rich domain form an activation domain for inducing pro-apoptotic genes and the C-terminal basic domain is required for maintaining this activation domain competent for transactivation. As an extension of our studies to determine how p53 functions as a tumor suppressor, we identified two novel p53 target genes, Dickkopf-1 (Dkk-l), an antagonist of the Wnt oncogenic pathway, and TAP1, a transporter of major histocompatibility class I antigens. This suggests that p53 may suppress transformation by Wnt and play a role in immunosurveillance.
DTIC
Amino Acids; Cancer; Mammary Glands; Tumors; Therapy; Proteins

20010040914 Parsons Engineering Science, Inc., Austin, TX USA
Development of Bioavailability Adjustment Factors: A Feasibility Study
Rembish, Steve J.; Duffy, Jeff; Maull, Elizabeth A.; Dec. 2000; 68p; In English
Contract(s)/Grant(s): F43624-95-D-9018-DO-0056
Report No.(s): AD-A387935; IERA-RS-BR-TR-2001-0001; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The primary purpose of this effort is to investigate the feasibility of developing and using bioavailability adjustment factors to modify intake assumptions used in risk assessments on a site-specific basis. A survey was conducted for the Air Force Institute for Environment, Safety and Occupational Health Risk Analysis (AFIERA) to determine the policies of each state regarding the use of site-specific bioavailability data in conducting human health risk assessments. State regulatory agencies from each of the fifty states were contacted via electronic mail and/or telephone to request information on guidance documents used to determine the applicability of bioavailability considerations in risk assessment, the previous use of site-specific bioavailability adjustments, and the likelihood of state acceptability of bioavailability considerations in future risk assessments. of the responses received, a majority of the states have no current written guidance on the use of bioavailability adjustments in risk assessment, nor any plans to generate guidance. While the majority of states indicated a willingness to consider bioavailability adjustments in future risk assessments, there is a lack of precedent in most states. We conclude that, while the use of bioavailability adjustment is a powerful tool in risk assessment, initial attempts to gain acceptance of the methodology by state regulators would require a significant effort due to a lack of accepted guidance.
DTIC
Acceptability; Feasibility; Availability; Risk; Regularity; Health; Medical Science

20010040917 Harvard Univ., Cambridge, MA USA
New Strategies for Drug Discovery and Development for Plasmodium falciparum ***Final Report, 16 Dec. 1997-15 Dec. 2000***
Wirth, Dyann F.; Jan. 2001; 120p; In English
Contract(s)/Grant(s): DAMD17-98-1-8003
Report No.(s): AD-A387926; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Malaria continues as a major health threat throughout the tropical world and potential demand for antimalarials is higher than for any other medication yet the world faces a crisis-drug resistance is emerging and spreading faster than drugs are being developed and the flow in the pipeline of new drugs has all but stopped. This represents a particular threat to the US Military. In a short time there may be parts of the world where no effective antimalarial drug is available. The recent emergence of multidrug resistant malaria parasites has intensified this problem. Recognizing this emerging crisis, it is necessary to identify new strategies

for the identification and development of new antimalarials. The goal of this work is the development of a framework for antimalarial drug development into the 21st century. A new strategy for drug development is urgently needed. Current drugs are based on a small number of target molecules or lead compounds and in most cases the target of drug action is yet to be identified. Resistance is emerging rapidly and the mechanisms of resistance are poorly understood. The identification of new targets or new candidate drugs based on an understanding of the parasite biology are key elements in this new strategy. Clearly the development of a new antimalarial will require both basic and applied research working in concert with one another. The goal of this work is to use a molecular genetic approach both in the identification of new drug targets and in the investigation of mechanisms of drug resistance. The research has focused on the two objectives, namely the analysis of critical genes in the Plasmodium falciparum for their role in drug resistance and as potential new drug targets, including the analysis of gene expression in response to drug treatment using the method of Serial Analysis of Gene Expression and the use of DNA Chip technology in the analysis of the yeast heterologous system.
DTIC
Drugs; Parasitic Diseases; Physiological Responses; Pharmacology

20010040919 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Gallium-Containing Estrogens as Receptor-Based Breast Tumor Imaging Agents ***Final Report, 1 Oct. 1997-30 Sep. 2000***
Cesati, Richard R., III; Oct. 2000; 73p; In English
Contract(s)/Grant(s): DAMD17-97-1-7292
Report No.(s): AD-A387924; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We have conceived of an approach to prepare novel compounds for the estrogen receptor that might be useful in the imaging and diagnosis of breast cancer, by the creation of steroidal-based imaging agents that take advantage of the desirable properties of gallium as a radioisotope. After successful preparation of the carbon skeletons needed to assemble several these compounds, we have been unable to prepare any of the proposed gallium-containing structures. After an exhaustive effort upon these systems, we have shifted our focus toward developing analogous technetium-containing systems, which have emerged with a greater potential for developing receptor-targeted imaging agents. During this past year, the principal investigator has been awarded his doctorate degree and has prepared three manuscripts for publication. As of the time of this writing, one of these manuscripts has been published and another has been accepted for publication.
DTIC
Cancer; Estrogens; Gallium; Mammary Glands; Tumors; Imaging Techniques

20010040920 Oregon Health Sciences Univ., Portland, OR USA
Role of IGFBP-3/IGFBP-3 Receptor Interaction in Normal and Malignant Mammary Growth: A Potential Diagnostic Parameter and New Strategy for Endocrine Therapy ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Oh, Youngman; Sep. 2000; 47p; In English
Contract(s)/Grant(s): DAMD17-97-1-7204
Report No.(s): AD-A387923; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The proposal of my grant is to investigate the biological significance and mechanism of insulin-like growth factor binding protein-3 (IGFBP-3) as well as identification and characterization of the IGFBP-3 receptor in human breast cancer cells. As a third year task, we have successfully characterized binding specificity of the IGFBP-3 receptor to IGFBP-3. It revealed that only IGFBP-3 and its fragment (aa88-148) bind the IGFBP-3 receptor with high affinity, whereas IGFBPs, -2,4-, -5 and did not interact with the IGFBP-3 receptor, demonstrating specificity of the IGFBP-3 receptor. We have also identified the IGFBP-3/IGFBP-3 receptor-mediated signal transduction pathway in human breast cancer cells. Current studies demonstrated that the IGFBP-3/IGFBP-3 receptor axis causes cell cycle arrest in G1 phase and induces apoptosis. The underlying mechanisms are ablation of MAPK signaling cascades and increase of caspase activity, respectively. Further through investigation is currently in the process in my laboratory. As characterization of the structure-functional analysis of IGFBP-3 and the IGFBP-3 receptor, we identified differential effects of IGFBP-3 and those IGFBP-3 proteolytic fragments on ligand binding, cell surface association and IGF-I receptor signaling. Current findings under this grant support will provide pivotal evidence for clinical significance and potential application of the IGFBP-3/IGFBP receptor tor axis in the prevention and/or treatment of human neoplasia, in particular, breast cancer.
DTIC
Cancer; Genetics; Mammary Glands; Therapy; Cytology; Growth

20010040922 Florida Univ., Gainesville, FL USA

Dissection of the Pathogenesis of Neurofibromatosis Type 1-Associated Myeloid Leukemia ***Annual Report, 18 Sep. 1999-18 Sep. 2000***

Brannan, Camilynn I.; Oct. 2000; 13p; In English

Contract(s)/Grant(s): DAMD17-97-1-7339

Report No.(s): AD-A387921; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Although most of the tumors associated with neurofibromatosis type 1 (NF1) are benign in nature, malignant transformation of a subset of NF1 tumors is a serious complication, often leading to the death of the patient. This is true for NF 1-associated juvenile myelomonocytic leukemia (JMML), known to progress into acute myeloid leukemia (AML). Previously, we have shown that loss of Nfl in the hematopoetic lineage results in JMML. The goal of this grant is to identify the genetic events which lead to the transformation and leukemic progression of NF1 - associated JMML using a mouse model. This model system takes advantage of transgenic mice that harbor one mutant allele of the Nfl gene, but require further mutations for transformation. We have backcrossed this mutant Nfl allele for three generations to a strain of mouse that expresses a murine leukemia virus (MuLV). In this system, the MuLV acts as a mutagen to activate cooperating cellular proto-oncogenes or inactivate tumor suppressor genes, resulting in accelerated tumor development. So far, by cloning sites of somatic MuLV integration from tumor DNAs obtained from these backcrossed mice, we have identified three loci that appear to cooperate with the loss of Nfl to cause to AML.

DTIC

Genetics; Leukemias; Pathogenesis; Tumors

20010040923 Georgetown Univ., Washington, DC USA

Identifying Intracellular Targeting Sequences for Breast Cancer by a Soy Bean-Derived Inhibitor ***Annual Report, 15 Sep. 1999 - 14 Sep. 2000***

Burbelo, Peter D., Georgetown Univ., USA; October 2000; 9p; In English

Contract(s)/Grant(s): DAMD17-99-1-9190

Report No.(s): AD-A387920; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Our research goals involve identifying and characterizing proteins/peptide targeting sequences that could be used in the specific delivery of chemotherapeutic agents to breast cancer cells. In order to achieve these goals, we have developed a novel targeting system based on a genetic screen using a modified, multifunctional x bacteriophage vector. In the first year, we have developed, optimized and validated several different components of this bacteriophage display system. First, we confirmed the integrity of our test constructs, and produced both DNA and sterile bacteriophage-expressing fusion proteins on the capsid surface for internalization studies. Second, we optimized the recovery of the integrated bacteriophage DNA containing the plasmid allowing for future screening of peptides/protein libraries. Third, we demonstrate that bacteriophage-expressing a test internalization RGD peptide show enhanced uptake into MCF-7 breast cancer cells as compared to the control bacteriophage particles. Finally, we are in the process of constructing peptide and protein libraries in the bacteriophage display format. These libraries of recombinant particles will then be screened against breast cancer cells to identify potentially new peptides and proteins that are selectively endocytosed. Constructs showing enhanced uptake will be sequenced, evaluated, and compared to normal cells for their specificity in targeting only cancer cells.

DTIC

Sequencing; Mammary Glands; Peptides; Soybeans; Medical Science; Proteins

20010040924 Massachusetts General Hospital, Boston, MA USA

Utilization of a NF2-Mutant Mouse Strain to Investigate the Cellular and Molecular Function of the NF2 Tumor Suppressor, Merlin ***Annual Report, 15 Sep. 1999-14 Sep. 2000***

McClatchey, Andrea I.; Oct. 2000; 25p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-99-1-9495

Report No.(s): AD-A387918; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Neurofibromatosis type 2 (NF2) is a familial cancer syndrome that features the development of nervous system tumors. The Nf2-encoded protein, merlin, localizes to the membrane:cytoskeleton interface raising the intriguing question of how a protein that occupies such a physical niche controls cell proliferation. to generate an animal model for NF2 and to build the foundation for delineating the molecular function of merlin, we established a Nf2- mutant mouse strain through genetic engineering. NF2+ mice develop a spectrum of tumors that is distinct from that of their human counterparts, including osteosarcomas and hepatocellular carcinomas, which exhibit loss of the wild-type NF2 allele. Embryos that are homozygous for a N2 mutation fail to gastrulate, while chimeric embryos partially composed of Nf2+ cells develop additional defects, including during cardiac development. Together, these observations indicate a requirement for merlin function in several different cell types in the mouse;

the study of Nf2 function in these cell types formed the basis of this research proposal. The following report describes progress in studying merlin function during ES cell differentiation, in cardiomyocyte specification and in liver cells. Moreover, we have established an efficient and unique system for studying merlin and ERM function in the liver in vivo.
DTIC
Nervous System; Cells (Biology); Regeneration (Physiology)

20010040925 Stanford Univ., Stanford, CA USA
A Unifying Theory of Prostate Cancer ***Annual Report, 15 Feb. 1999-14 Feb. 2000***
Peehl, Donna; Mar. 2000; 81p; In English
Contract(s)/Grant(s): DAMD17-99-1-9004
Report No.(s): AD-A387911; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this project is to determine the biological basis of the many unique features of prostate cancer, including high incidence, multifocal origin, zonal specificity, and resistance to chemotherapy. We proposed that these characteristics are the result of dysregulated, albeit wild-type, p53 in prostatic epithelial cells. We determined that p53 is not induced in cells derived from either the central zone (resistant to cancer) or the peripheral zone (high frequency of cancer) in response to ionizing radiation. Since the frequency of premalignant lesions is equivalent in these zones, this finding suggests that genomic instability resulting from dysfunctional p53 predisposses both zones to cancer, but that development of invasive cancer in the central zone is limited by unknown factors. We also determined that p53 is not irreversibly nonfunctional in prostatic cells. Inhibition of RNA transcription or of nuclear export led to increased levels of p53 and increased levels of its transcriptional targets, p2l and mdm2. Therefore, mechanisms responsible for upregulation and activation of p53 protein are intact in prostatic epithelial cells. The deficiency, then, apparently lies in the inability of these cells to respond to signals sent by certain DNA-damaging agents, such as ionizing radiation. We recently found that ultraviolet irradiation, in contrast to ionizing radiation, upregulates and activates p53. This finding demonstrates that the pathway leading to induction of p53 is in fact intact in prostatic epithelial cells, but is not triggered by ionizing radiation. Determining the molecular pathways by which these cells recognize and respond to DNA damage will be extremely relevant to prevention of prostate cancer as well as to treatment.
DTIC
Proteins; High Frequencies; Cancer

20010040926 Utah Univ., Salt Lake City, UT USA
Identification of BRCA1 and 2 Other Tumor Suppressor Genes on Chromosome 17 Through Positional Cloning ***Final Report, 1 Jul. 1994-17 Mar. 2000***
White, Raymond L.; Apr. 2000; 81p; In English
Contract(s)/Grant(s): DAMD17-94-J-4129
Report No.(s): AD-A387907; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The overall goal of this project is to identify genes involved with the development and progression of breast cancer. This goal has remained unchanged since the start of the project, however the discovery of BRCA1 in 1994 together with technological advances in gene expression profiling has influenced our strategy to achieve this goal. In the early part of the project our search for tumor suppressor genes was directed by genetic or LOH mapping strategies followed by positional cloning of candidate genes. As we proposed in our revised statement of work (SOW), we have now focused our efforts entirely on microarray-based comparisons to identify breast cancer related genes. Our laboratory has gained access to this technology through collaboration with Molecular Dynamics and now we have established microarray spotting and scanning systems with over 40,000 minimally redundant sequence-verified human cDNA clones. Once candidate genes have been identified, they will be further characterized using a retroviral-based conditional expression system to assess changes in characteristics pertaining to morphology and growth rate by culturing human breast epithelial cells in an extracellular matrix.
DTIC
Neoplasms; Chromosomes; Genes; Suppressors

20010040953 Tennessee Valley Authority, Norris, TN USA
Characterization of Iron-Bearing Solids Used by Naturally-Occurring Microbes in the Anaerobic Degradation of Hydrocarbons ***Final Report, Feb. 1998 - Dec. 2000***
Powell, David C., Tennessee Valley Authority, USA; December 2000; 140p; In English
Report No.(s): AD-A388065; AFRL-ML-TY-TR-2001-0025; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

This study investigated the availability of iron-bearing minerals for use by naturally-occurring, iron-reducing microbes in the anaerobic oxidation of hydrocarbon groundwater contaminants during a field experiment at Columbus Air Force Base,

Columbus, Mississippi. While this research could find no statistically significant changes in the iron oxides in the aquifer material over time, this work did produce three important findings. First, the natural consortium of bacteria is shown to degrade hydrocarbons in a reducing environment in the presence of iron oxides. Second, there appears to be some consumption of the iron oxides during natural attenuation near the source emplacement. Third, formation of magnetite cannot be used as a primary indicator of microbial degradation in the field, since laboratory studies showed that magnetite was produced by both biotic and abiotic systems.
DTIC
Iron; Hydrocarbons; Minerals; Waste Treatment; Contaminants; Anaerobes; Water Pollution; Environment Protection; Aquifers

20010040956 Rochester Univ., NY USA
Training in Support of a Research Project Entitled Enhanced Patient Expectation and Antiemetic Drug Efficacy ***Final Report***
Roscoe, Joseph, Rochester Univ., USA; July 2000; 17p; In English
Contract(s)/Grant(s): DAMD17-97-1-7203
Report No.(s): AD-A388073; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Final report on a predoctoral training grant for a social psychology student and former cancer patient intending to work with cancer control and the psychosocial aspects of coping with cancer. Training was supervised and supported by Dr. Gary Morrow and the Behavioral Medicine Unit within the University of Rochester Cancer Center and led to the award of a doctorate in May, 2000 and the position of research assistant professor within the University of Rochester Cancer Center in July, 2000. The intervention to reduce chemotherapy-induced nausea and vomiting (NV) by increasing patients positive expectations through enhanced education was not successful. No significant differences were observed between the control (N=52) and treatment (N=45) groups in severity of nausea or occurrence of vomiting. Pilot data from a second study that was supported by this grant led to three years of additional funding from the DOD as a new idea award.
DTIC
Patients; Antiemetics and Antinauseants; Cancer; Psychology; Medical Science

20010041020 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA
Computer-Assisted Visual Search/Decision Aids as a Training Tool for Mammography ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Nodine, Calvin; Jul. 2000; 81p; In English
Contract(s)/Grant(s): DAMD17-97-1-7130
Report No.(s): AD-A388032; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The primary goal of the project is to develop a computer-assisted visual search (CAVS) mammography training tool that will improve the perceptual and cognitive skills of trainees leading to mammographic expertise. In the first two years we carried out two experiments. The first equated experience by comparing perceptual skills of expert radiologists with lay people searching non-medical pictorial scenes for hidden targets. Results show that expert radiology search and detection strategies do not transfer to the non-medical search and detection tasks. In the second study, a 75-case mammogram test set was administered to mammographers, residents and mammography technologists. The results compared effectiveness of experience and training at different levels of expertise. Not surprisingly, resident performance in detecting and classifying breast lesions was significantly inferior to experts, and no better than that of mammography technologists. In the third year we carried out an experiment to determine if retrospectively-visible cancers in mammograms attract visual attention and are accurately recognized in a blinded review. Results comparing a test set of 40 retrospectively-visible vs. directly-visible cancer cases indicated that not only did retrospectively-visible cancers fail to attract visual attention, but that they also led to higher false-positive error rates than did directly-visible cancers.
DTIC
Cancer; Detection; Computer Assisted Instruction; Display Devices

20010041022 North Carolina Univ., Chapel Hill, NC USA
The Role of BRCA1 in Normal Mammary Epithelial Development and Tumorigenesis ***Final Report, 1 Jun 1997-31 May 2000***
Backlund, Michael Hawley; Cressman, Victoria Lee; Koller, Bev; Jun. 2000; 50p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7102
Report No.(s): AD-A388038; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Germline mutations in BRCAl account for about 45% of all hereditary cases of breast cancer. However, the role of BRCAl in mammary tumorigenesis is not established. My proposal outlines two approaches to extend our knowledge of BRCAl function in normal development and malignant transformation. First, we used the cre-lox system to generate a mouse model in which loss of BRCAl is limited to mammary epithelium. Four different mouse lines expressing the Cre recombinase in mammary epithelium were generated, and we are currently working towards generating a 1ox P-Brca1-lox P mouse. Secondly, we examined synergistic effects between BRCAl and p53 in tumorigenesis. We found that survival of both p53%-/- and p53+/- mice is not altered by BRCAl-deficiency. This suggests that BRCAl does not play a role in the formation of most tumors. Similarly, the survival of the p53+/- mice after exposure to gamma-irradiation was unaltered by BRCAl-deficiency on a mixed genetic background. However, gamma-irradiated p53+/- mice on a BALB/c inbred genetic background showed a significant increase in mammary tumorigenesis as compared to mice on either a DBA/2J or mixed background. These results suggest that genetic factors in BALB/c mice along with environmental stimulus, like ionizing irradiation, play a role in mammary epithelial transformation, in particular, when cells are hemizygous for loss of p53.
DTIC
Epithelium; Neoplasms; Cancer; Mammary Glands; Genetics

20010041025 General Accounting Office, Washington, DC USA
GLOBAL HEALTH: U.S. Agency for International Development Fights AIDS in Africa, but Better Data Needed to Measure Impact
March 2001; 53p; In English
Report No.(s): AD-A387813; GAO-01-449; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) is the leading cause of death in the countries of sub-Saharan Africa, where more than two-thirds of the people who are infected with HIV live. Despite efforts by the international community to reduce the spread of HIV/AIDS in sub-Saharan Africa, the National Intelligence Council estimates 1 that as many as one-quarter of the population of the hardest-hit countries in that region will die from AIDS over the next 10 years. Further, given the scale of the epidemic, AIDS has grown beyond a public health problem to become a humanitarian and developmental crisis. For example, the National Intelligence Council concluded that the persistence of infectious diseases, such as HIV/AIDS, is likely to aggravate and in some cases provoke economic decline, social fragmentation, and political destabilization. In addition, the Council found that the epidemic threatens to weaken the military capabilities of countries and because of the involvement of sub-Saharan African troops in international peacekeeping efforts it could hinder those activities as well. Since the 1980s, the U.S. Agency for International Development has provided assistance to help fight AIDS in sub-Saharan Africa.
DTIC
Destabilization; Human Immunodeficiency Virus; Infectious Diseases; Populations; Public Health

20010041026 Texas Univ. Health Science Center, San Antonio, TX USA
Training in Support of a Research Project Entitled Regulation of BRCA1 Function by Phosphorylation ***Annual Report, 1 Sep. 1999 - 31 Aug. 2000***
Ting, Nicholas; Sep. 2000; 13p; In English
Contract(s)/Grant(s): DAMD17-97-1-7205
Report No.(s): AD-A387823; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mutations in the breast cancer susceptibility gene BRCAl account for 50% of familial cases, and about 2 to 5% of all cases of breast cancer. Most of the BRCAl linked tumors have undergone loss of heterozygozity at this locus, classifying BRCAl as a tumor suppressor. Substantial evidence implicates BRCAl to be involved in cellular DNA damage response and DNA repair pathways. Mouse cells deficient for Brcal show genetic instability, defective G2/M checkpoint control and reduced homologous recombination. BRCAl also interacts with proteins of the DNA repair machinery and regulates expression of p21 and GADD45 genes. However, it remains unclear how DNA damage signals are transmitted to modulate the repair function of BRCAl. Previous work from our laboratory have shown that BRCAl becomes hyperphosphorylated in a cell cycle dependent manner and in response to genotoxic insults. Here, we further investigated how this phosphorylation event contributes to the cellular function of BRCAl. Our results revealed a novel DNA damage response pathway that involves the protein kinase mutated in Ataxia telangiectasia (ATM), a BRCAl associated protein, CtIP, and BRCAl, thus providing a potential link between ATM deficiency and breast cancer.
DTIC
Phosphorylation; Proteins; Clinical Medicine; Mutations

20010041027 Missouri Univ., Columbia, MO USA

Epigenetic Changes in DNA Methylation in Breast Cancer ***Annual Report, 1 Aug. 1999 - 1 Aug. 2000***

Huang, Tim H.; Sep. 2000; 27p; In English

Contract(s)/Grant(s): DAMD17-98-1-8214

Report No.(s): AD-A387830; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

CpG island hypermethylation is a frequent epigenetic event in cancer. We have recently developed an array-based method, called differential methylation hybridization (DMH), allowing for a genome-wide screening of CpG island hypermethylation in breast cancer cell lines (Hum. Mol. Genet. 8: 459-470, 1999) . In the present study, DMH was applied to screen 28 paired primary breast tumor and normal samples, and to determine whether patterns of specific epigenetic alterations correlate with pathological parameters in the patients analyzed. Amplicons, representing a pool of methylated CpG DNA derived from these samples, were used as hybridization probes in an array panel containing 1,104 CpG island tags. Close to 9 of these tags exhibited extensive hypermethylation in the majority of breast tumors relative to their normal controls, while others had little or no detectable changes. Pattern analysis in a subset of CpG island tags revealed that CpG island hypermethylation is associated with histological grades of breast tumors. Poorly differentiated tumors appeared to exhibit more hypermethylated CpG islands than their moderately or well-differentiated counterparts (P-0.041) . This early finding lays the groundwork for population-based DMH study and demonstrates the need to develop a database for examining large-scale methylation data and for associating specific epigenetic signatures with clinical parameters in breast cancer.

Author (DTIC)

Clinical Medicine; Methylation; Deoxyribonucleic Acid; Mammary Glands; Cancer

20010041028 Texas Univ., M and D Anderson Cancer Center, Houston, TX USA

Cell Cycle Regulation in Prostate Cancer and Its Role in the Transition of Androgen-Dependent Prostate Cancer to Androgen-Independency ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***

Frijhoff, Anita; Jul. 2000; 11p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-99-1-9525

Report No.(s): AD-A387835; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Cell proliferation in the prostate is dependent upon androgen and is associated with specific cell cycle alterations. to examine the relation between cell cycle regulation and androgen-induced proliferation in prostate cancer the transferable human prostate tumor MDA Pca 2b was employed. Tumor tissue taken from intact, castrated and castrated, testosterone-treated mice was analyzed by (immuno)histochemistry and western blot. MDA Pca 2b grown in nude mice resembled poorly differentiated tumors. Upon castration cell proliferation decreased, and following androgen replacement cell proliferation increased. No increase in apoptotic rate was observed following androgen deprivation. Following castration no changes were observed in cyclin A, cdk2/4/6, p21 while a decrease in levels of cyclin Dl, cyclin E, p16, p27 and c-myc was detected. P27 and c-myc were also monitored after start of androgen replacement: p27 initially increased to decrease at day 5 on TP; the level of c-myc which was analyzed at days 3 and 5 on TP did not appear to change from the castrated levels. In summary, we observed that in MDA Pca 2b prostate tumors androgen acts primarily on cell proliferation rather than apoptosis which is reflected in the levels of cyclins Dl and E, p16, p27 and c-myc. DTIC

Cells (Biology); Prostate Gland; Clinical Medicine; Cancer

20010041030 Dana Farber Cancer Inst., Boston, MA USA

Effect of Inherited Breast Cancer Susceptibility on Treatment Outcomes After Conservative Surgery and Radiation Therapy ***Annual Report, 1 Sep. 1999-31 Aug. 2000***

Nixon, Asa J.; Sep. 2000; 5p; In English

Contract(s)/Grant(s): DAMD17-97-1-7139

Report No.(s): AD-A387841; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The presence of a mutation in a tumor suppressor gene, such as BRCAl, may have implications for patient management if patients with these mutations can be identified. Specifically, treatments such as breast conserving surgery and radiation therapy may be inappropriate if these patients are likely to be more susceptible to radiation-induced carcinogenesis or if they are more likely to recur locally in the breast because of multicentric disease. The performance period for this grant has recently been extended by one year to allow us to continue to accrue more patients. We have to date identified 192 eligible patients diagnosed with breast cancer at age 38 or younger and treated at the Joint Center for Radiation Therapy (JCRT) between 1987-96 of the 230 whom we expect to eventually contact. Patient accrual is steady and ongoing with 78 patients accrued to date. Lymphocytes from study subjects are being collected, immortalized and stored in liquid nitrogen. At the end of the collection period, testing for the

presence of a germ-line BRCAl mutation will be performed. Treatment outcome will then be compared between the groups of patients with and without mutations in BRCAl.
DTIC
Cancer; Mammary Glands; Mutations; Radiation Therapy; Suppressors

20010041031 Miami Univ., School of Medicine, FL USA
Enhancing the Anti-Tumor Activity of breast Cancer-Specific Cytotoxic T Lymphocytes ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Malek, Thomas; Jul. 2000; 21p; In English
Contract(s)/Grant(s): DAMD17-98-1-8208
Report No.(s): AD-A387842; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Directing the immune system to attack tumors represents a potential powerful non-toxic approach for the treatment of breast cancer. Our goal is to ultimately engineer the interleukin-2 receptor (IL- 2R) in cytotoxic T cells (CTL) to control signal transduction through this receptor and to improve the in vivo efficacy upon adoptive transfer to a tumor-bearing host. to this aim, we have continued to characterize a series of chimeric IL-2R constructs that depend upon drug-induced heterodimerization and prepare new constructs predicted to be more active as they are dependent upon homodimerization. We continue to refine our in vivo model of anti-tumor immunity. We show that naive CD8+ tumor-specific T cells very efficiently mediate anti-tumor responses independent of CD4+ helper cells.
DTIC
Lymphocytes; Mammary Glands; Toxins and Antitoxins; Cancer; Medical Science

20010041032 MacCallum (Peter) Cancer Inst., Melbourne, Australia
Mechanisms of Bone Metastasis from Breast Cancer Using a Clinically Relevant Model ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Anderson, Robin; Jul. 2000; 26p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8144
Report No.(s): AD-A387843; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed and characterised a model of breast cancer metastasis to bone that overcomes the deficiencies of earlier models. It utilises clones of a spontaneous mammary carcinoma that, after orthotopic injection of the tumor cells into the mammary gland, metastasise to bone and cause hypercalcemia. In addition, metastases are detected in some other organs, mainly lungs and liver. Other clones derived from the same primary tumor either do not metastasise, or metastasise only to lungs. In the past year, we have made substantial progress in two areas. One is in a study of the role of a gene, parathyroid hormone related protein (PTHrP), believed to be important in metastasis to bone. We have found that expression of PTHrP is not required for metastasis to bone, but once in the bone environment, high levels of PTHrP enhance tumor growth. This is consistent with a recent clinical study of the link between PTHrP and bone metastasis. Our genome wide screening for genes required for metastasis to bone has revealed several candidates, all but one of which have not been implicated previously in metastasis. They are caveolin-1, bone morphometric protein-4, osteopontin, protease nexin-1 and (33 integrin. Functional studies are underway with these genes.
DTIC
Bones; Mammary Glands; Cancer; Clinical Medicine

20010041038 Cancer Therapy and Research Foundation, San Antonio, TX USA
Clonal Hematopoiesis as a Marker of Genetic Damage Following Adjuvant Chemotherapy for Breast Cancer: Pilot Study to Evaluate Incidence ***Annual Report, 18 Aug. 1999 - 18 Aug. 2000***
Coltman, Charles A.; Sep. 2000; 51p; In English
Contract(s)/Grant(s): DAMD17-97-1-7088
Report No.(s): AD-A387873; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A serious late effect complication associated with breast cancer treatment is the increased risk for development of therapy-related hematologic malignancies. The goal of this study is to determine whether dose-intensive adjuvant regimens for breast cancer induce genetic damage to hematopoietic stem cells, defined by the emergence of clonal hematopoiesis. Clonal hematopoiesis has been proposed as an early marker of hematopoietic stem cell damage, preceding the acquisition of critical, recurring genetic alterations associated with the development of therapy-related myelodysplastic syndromes and acute leukemia. Clonal hematopoiesis is being evaluated by two different methods, the X-linked HUMARA clonality and microsatellite instability assays. All positive results will be further analyzed for MLL and RAS alterations. Study accomplishments to date: a) activation of ancillary biological protocol (S97l9) to treatment protocol (S9623), b) testing assays developed and standardized, c) specimen

collection and data analysis of 123 samples from 21 patients completed, d) protocol amendment incorporating S9719 into the clinical treatment (S9623) protocol submitted and approved by DoD and CTEP to increase patient accrual, e) S9623/S9719 declared a high priority clinical trial by the NCI, f) 59719 protocol updates given at Southwest Oncology Group meetings, and g) presentation of data collected at the Era of Hope 2000 meeting.
DTIC
Hematopoietic System; Hematopoiesis; Mammary Glands; Cancer; Chemotherapy; Clinical Medicine

20010041041 Manitoba Univ., Winnipeg, Manitoba Canada
Detection of Genetic Lesions in Breast Cancer ***Final Report, 1 Sep. 1997 - 1 Sep. 2000***
Davie, James R.; Oct. 2000; 147p; In English
Contract(s)/Grant(s): DAMD17-97-1-7175
Report No.(s): AD-A387879; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The purpose of this proposal is to develop a ”next generation” representational difference analysis that uses transcribing nuclear DNA. Organomercury and Sulfolink Coupling gel chromatography could isolate soluble transcribed chromatin from breast cancer cells. However, most transcribed chromatin is insoluble. Thus, we used ChIPs (chromatin immunoprecipitation) technique to isolate active chromatin that is bound to highly acetylated histones. Before applying Chips, we studied the dynamics of histone acetylation in breast cancer cells, and the effect of estradiol on these processes. The kinetics of histone acetylation in hormone dependent (T47D5) and hormone independent (MDA MB 231) breast cancer cells were determined. Estradiol increased hi stone acetylation by decreasing the rate of histone deacetylation in T47D5 cells. Estradiol had no effect on histone acetylation in hormone independent cells. The mechanism by which estradiol decreased the rate of histone deacetylation was explored. Estradiol affected the sub nuclear trafficking of the estrogen receptor (ER) and ER associated coactivators (SRC-1 and SRC-3, which have hi stone acetyltransferase activity) which become tightly bound to the nuclear matrix. However, estradiol did not affect the activity or subnuclear distribution of histone deacetylases. Finally, the Chips protocol was successfully used to isolate transcriptionally active DNA from T47D5 and MDA MB 231 cells.
DTIC
Mammary Glands; Cancer; Detection; Deoxyribonucleic Acid

20010041042 Wayne State Univ., Detroit, MI USA
Evaluation of the Use of DNA Adduct Dosimetry to Optimize the Timing of High Dose Therapy for Breast Cancer ***Annual Report, 1 Jul. 1999 - 1 Jul. 2000***
Everson, Richard; Aug. 2000; 51p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8352
Report No.(s): AD-A387886; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

For drugs that interact with DNA, measures of DNA damage can assess the intracellular availability of active drug at a critical molecular target. Measurements of DNA damage should reflect the integrated effect of all resistance factors, including both recognized mechanisms and uncharacterized mechanisms. Thus, molecular measures of DNA damage could provide an important tool for elucidating the time course of complex changes in resistance factors. Motivated by a recent clinical trial that demonstrated better survival when the interval between induction chemotherapy and high dose therapy was prolonged, this project is using measures of DNA damage in patient blood cells to determine whether induction chemotherapy causes transient changes in resistance. Findings indicate cyclophosphamide, cis-platin, and BCNU each produce DNA damage that can be measured in a dose dependent manner. At low doses each agent causes a similar pattern of breakage, while at high doses their pattern of damage could be distinguished. Both lymphocytes and bone marrow cells from patients can be routinely analyzed, allowing study of changes in sensitivity in multiple tissues. It is feasible to use the procedure to study whether induction therapy has a transient effect on resistance to high dose therapy.
DTIC
Deoxyribonucleic Acid; Dosage; Mammary Glands; Chemotherapy; Dosimeters; Cancer; Clinical Medicine

20010041043 Massachusetts Univ. Medical Center, Worcester, MA USA
Involvement of Nuclear Receptor Co-repressors in the Development of Human Breast Cancers ***Final Report, 1 Sep. 1997 - 31 Aug. 2000***
Chen, J. D.; Sep. 2000; 116p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7039
Report No.(s): AD-A387887; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

All-trans retinoic acids (RA) inhibits proliferation of breast cancer cells. This effect is presumably mediated by the retinoic acid receptors (RAR) . In the absence of RA, the RAR represses basal transcription through interaction with nuclear receptor corepressors such as SMRT (silencing mediator for retinoid and thyroid receptors) or N-CoR (nuclear receptor corepressor) . In this project, we have characterized receptor interaction and transcriptional repression function of SMRT and N-CoR. We have investigated the expression and regulation of SMRT in breast cancer cells. Our data suggest that there are two independent nuclear receptor interacting domains and multiple repression domains on the corepressors. The hormone-binding domain of the receptor is involved in a ligand- independent interaction with the corepressors and it contains a C-terminus AE-2 helix that is essential for ligand-dependent dissociation of the corepressor. We have demonstrated that overexpression of SMRT enhances transcriptional repression of nature RA-responsive promoters. In addition, a novel SMRT isoform termed SMRTe has been isolated. SMRTe is very similar in structure and function to N-CoR. Analysis of SMRTe expression in breast cancer cells suggests that cancerous cells contain higher levels of SMRTe than normal breast cells. Taken together, these results suggest that SMRTe may be involved in regulation of breast cancer cell growth and proliferation.
DTIC
Mammary Glands; Cancer; Receptors (Physiology)

20010041049 Princeton Univ., NJ USA
Identification of Protein Components of Yeast Telomerase ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Teng, Shu-chun; Sep. 2000; 55p; In English
Contract(s)/Grant(s): DAMD17-97-1-7242
Report No.(s): AD-A387899; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Telomere length is tightly regulated in Saccharoinyces. This lengthening is dependent on TLcl, which encodes the RNA component of telomerase hut independent of RAD52, which encodes a protein required for most recombination events in mitotic yeast cells. Most cells lacking yeast telomerase die but survivors arise by RAD52 dependent events: the majority of these survivors have tandem duplications of the sub-telomeric y' element. However, about 10% of the survivors have a different telomeric structure, very long tracts of C(1-3)A/TG(1-3) DNA, with some telomeres being as much as 12 kb longer than telomeres in wild type cells. This pattern of exceptionally long telomeres is similar to that seen in human cell lines and tumors that maintain telomeric DNA without expressing telomerase. The maintenance of these long telomeres requires the continuous presence of Rad52p. However, even in the presence of Rad52p, these long telomeres steadily shorten, suggesting that even in cells that maintain their telomeres by telomere-telomere recombination, recombinational mediated telomere lengthening is relatively rare.
DTIC
Mammary Glands; Cancer

20010041050 Michigan Univ., Ann Arbor, MI USA
Automated Spot Mammography for Improved Imaging of Dense Breasts ***Annual Report, 15 Sep. 1999-14 Sep. 2000***
Goodsitt, Mitchell M.; Oct. 2000; 72p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9294
Report No.(s): AD-A387901; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We are developing an automated spot mammography technique to improve imaging of lesions within dense breast tissue. During the first year of this project, computer programs have been developed to identify large dense regions in digitized mammograms. The programs also determine the minimum sized rectangle that bounds a dense region. Prototype devices have been designed and built to: collimate the x-ray beam to the desired region, restrain the breast during changeover to a spot compression paddle, and manually translate the spot paddle to the desired location. Preliminary tests were also performed on a commercial full-field digital mammography (FFDM) system. Sophisticated exposure control and technique factor selection on the FFDM improved the penetration of simulated dense regions in a breast phantom. Combined spot collimation and compression were found to increase lesion conspicuity with the FFDM. Rather than pursue research with our laboratory system, we have decided to build an add-on system for the FFDM, which has superior imaging properties. Initial experience with the prototype devices has indicated the need for design improvements. These will be implemented during the second year. Finally another improvement, the addition of stereo mammography to the auto spot procedure will be investigated.
DTIC
Digital Systems; Mammary Glands; Cancer

20010041081 State Univ. of New York, Stony Brook, NY USA

Peptide-Based Inhibitors of Neu Tyrosine Kinase ***Final Report, 1 Jun. 1997-30 Nov. 2000***

Miller, W. T.; Dec. 2000; 14p; In English

Contract(s)/Grant(s): DAMD17-97-1-7216

Report No.(s): AD-A387606; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project focuses on the product of the HER2/Neu oncogene, a receptor tyrosine kinase that is amplified in 25-30% of human primary breast tumors. The overall goal of the project is to characterize the substrate specificity 0 one HER2/Neu kinase. In previous years, we expressed and purified HER2/Neu using the SfO,baculovirus system. We then used peptide library technology to isolate novel peptide substrates for HER/Neu. One of them, AAEEIYAARRG, is the best synthetic peptide substrate reported to date for HER2/Neu. In the final year of the project, we produced several potential peptide-based inhibitors for HER2/Neu by replacing the tyrosine residue in the substrate peptide with the following amino acid analogs: (1) p-L-carboxy-Phe; (2) p-D-carboxy-Phe; (3) tetrafluoro-L-Phe; (4) tetrafluoro-D-Phe; (5) 3,5-diiodo-L-Phe. We produced an additional peptide inhibitor by introducing p-L-carboxy-Phe into another peptide isolated from the library (EDKVDYRMHRRG) The inhibitory potencies of these compounds against purified HER2/Neu were in the millimolar range; these values were too high for in vivo Inhibition of HER2/Neu. Instead, we used a microinjection technique to measure the ability of the parent peptide AAEEIYAARRG to block EGF-induced membrane ruffling in a fibroblast model system. The peptide showed significant inhibition of the EGF effect.

DTIC

Mammary Glands; Cancer; Tyrosine; Peptides; Receptors (Physiology); Inhibitors

20010041082 Cold Spring Harbor Lab., New York, NY USA

Complementation Screening in Mammalian Cells: Application to Cell Immortalization ***Final Report, 1 Sep. 1996-1 Sep. 2000***

Hannon, Gregory J.; Oct. 2000; 59p; In English

Contract(s)/Grant(s): DAMD17-96-1-6053

Report No.(s): AD-A387607; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The transformation of a normal cell into a cancer cell occurs through a series of genetic and epigenetic alterations that release a cell from controls that restrain its proliferation. The purpose of the research supported by this new investigator award was, broadly, two-fold. The primary goal was to increase our understanding of the transformation process by focusing on one aspect of neoplastic cells, their ability to proliferate indefinitely. The secondary goal which served as a means to the principal end was to develop a vector system that would allow complementation screening in cultured mammalian cells. During the tenure of this award, both goals were largely achieved. We have developed a series of retroviral vectors that allow the introduction of complex libraries into a broad range of cell types. We have validated these vectors for complementation screens and have pursued several findings that are cancer- relevant. Finally, we have taken a step toward understanding the ability of tumor cells to proliferate indefinitely by linking a commonly activated oncogene, c-myc, to the activity of the telomerase enzyme.

DTIC

Cancer; Cells (Biology); Genetics; Mammary Glands

20010041106 Albany Medical Coll., NY USA

99MTC Alpha-Fetoprotein: A Novel, Specific Agent for the Detection of Human Breast Cancer ***Final Report, 15 Jun. 1997-14 Jun. 2000***

Line, Bruce R.; Jul. 2000; 38p; In English

Contract(s)/Grant(s): DAMD17-97-1-7145

Report No.(s): AD-A388040; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Because adenocarcinoma of the breast expresses receptors for alpha-fetoprotein (AFP), we studied Tc-99m radiolabeled AFP and its sub domains as agents to detect breast cancer. The biodistribution of Tc-99m radiolabeled natural (full length) and recombinant domain III (DIII) of human AFP was compared to the clinical agents Tc-99m sestamibi and Tl-20l in a murine model of human breast cancer. Estrogen receptor positive (MCF-T, T47, MTW9A) and estrogen receptor negative (MDA MB-23l, BT2O) human breast cancer xenografts were grown subcutaneously in the lateral thorax region of immunosuppressed mice (CB-17 SCID) Quantitative comparisons of percent-injected dose per gram of tissue (%ID/gram) and tumor to thigh ratio (T/Th) were performed at 0-60 minutes and at 24 hours following injection. For most tumors, T/Th for AFP and DIII was significantly greater than T/Th for Tc-99m sestamibi and Tl-201. DIII and AFP had significantly higher ID/gram than either Tl-20l or Tc-99m sestamibi when considered across all tumor types (BT2O, MCF7, MDA, MTW9A, T4T) at both 60 minutes and 24 hours. In the final year of the work we showed similar properties for a 12 amino acid peptide derived from AFP. The data suggests that

localization of Tc-99m AFP in human breast cancer xenografts is initially rapid, increases with time, and is superior to Tc-99m sestamibi and Tl-201. Given its high uptake by breast cancer cells, its low non-tumor localization and its rapid renal excretion, these Tc-99m AFP preparations should be useful agents to detect human breast carcinoma.
DTIC
Mammary Glands; Radiology; Radiobiology; Cancer

20010041110 Duke Univ., Durham, NC USA
Computer Aid for the Decision to Biopsy Breast Lesions ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Floyd, Carey; Jul. 2000; 21p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9174
Report No.(s): AD-A388047; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A case based reasoning (CBR) computer algorithm is under development as a computer aid for the decision to biopsy a breast lesion that is suspected to be cancer. The CBR stores the results of many previous cases along with the results of their biopsies. New cases are evaluated by searching these previous cases and selecting those that are similar to the new cases. A prediction of the results of biopsy is based on the results of the similar known cases. In this report, the algorithm has been implemented on computer and a search has been conducted to optimize the set of image features that are used to compare the new images to the known images. An accuracy of better than 83% is reported and the best performing set of features is described.
DTIC
Algorithms; Cancer; Mammary Glands; Lesions

20010041160 New York Univ. Medical Center, New York, NY USA
IGF-I and Growth Hormone in Prostate Development and Prostate Cancer ***Annual Report, 1 Dec. 1998-30 Nov. 1999***
Kleinberg, David L.; Dec. 1999; 13p; In English
Contract(s)/Grant(s): DAMD17-99-1-9017
Report No.(s): AD-A387807; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Significant progress has been made within the first year of this DOD award. We did experiments and published a paper providing evidence that insulin-like growth factor I (IGF-I) and growth hormone are both required for prostate gland development (Endocrinology 140:1984-1989, 1999). IOP-I has been implicated as a factor that may predispose one to prostate cancer. However, no specific relationship between IOF-I and prostate development or cancer in vivo has been previously established. to determine whether IGF-I was important in prostate development, we examined prostate architecture in lOP-I (*) null mice and wild-type littermates. Glands from 44 day old IGF-I-deficient animals were not only smaller than those from wild-type mice, but also had fewer terminal duct tips and branch points and deficits in tertiary and quatemary branching (P<0.001), indicating a specific impairment in gland structure. Administration of des (1-3)-IOF-I for 7 days partially reversed the deficit by increasing those parameters of prostate development (P<0.006). That IOF-I production probably mediates an effect of OH in this process was indicated by the observations that OH antagonist transgenic mice also had significantly impaired prostate development (P<O.00002) and that bovine OH had no independent effect on stimulating prostate development in IOF-I null animals. These data indicate that IOF-I deficiency is the proximate cause of impaired prostate development and give credence to the idea that, like testosterone, OH and lOP-I may be involved in prostate cancer growth as an extension of a normal process.
DTIC
Cancer; Endocrinology; Prostate Gland

20010041161 Vanderbilt Univ., Medical Center, Nashville, TN USA
The Role of NF-kB in Normal and Transformed Mammary Epithelium ***Final Report, 1 Jun 1997-31 May 2000***
Brantley, Dana; Kerr, Lawrence D.; Jun. 2000; 62p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7017
Report No.(s): AD-A387806; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Rel/NF-kB family of transcription factors has been implicated in such diverse cellular processes as proliferation, differentiation, and apoptosis. These processes occur during mammary gland morphogenesis, and we previously demonstrated that NF-kB factors are expressed and active in the mammary gland during pregnancy and involution, when the epithelium is proliferating and undergoing apoptosis, respectively. Moreover, NF-kB activity is upregulated in breast cancer derived cell lines and primary adenocarcinomas. to address the function of NF-kB activity during early post-natal morphogenesis, the development of ikba-deficient mammary epithelium in a wild-type stromal environment was examined. Removal of this major inhibitor NF-kB transcriptional activity in the mammary gland. The ikba-deficient mammary epithelium displayed disorganization and pervasive intraductal hyperplasia, with a 2 to 3 fold increase in epithelial cell number and proliferation in virgin animals. No change in the

level of apoptosis in ikba-deficient mammary epithelium, relative to controls, was detected. The extracellular matrix adjacent to ikba-deficient epithelium was greatly reduced, and epithelial adherins junctions were disrupted. These data demonstrate that NF-kB positively regulates proliferation of the mammary epithelium, and suggest that NF-kB may contribute to mammary epithelial tumorigenesis.
DTIC
Cancer; Epithelium; Mammary Glands

20010041166 Howard Univ., Washington, DC USA
Characterization of Sigma Receptor Mediated Apoptosis in Breast Tumor Cells ***Annual Report, 1 May 1999-30 Apr 2000***
Crawford, Keith W.; May 2000; 33p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7083
Report No.(s): AD-A387795; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have shown that chronic exposure of tumor cells to sigma-2 agonists produces apoptosis and that these compounds potentiate effects of anti-neoplastic agents. to determine if this effect is mediated by ceramides, breast tumors (MCF-7/Adr-, T47D) were incubated with 3Hpalmitic acid to label sphingolipids. Cells were then incubated with or without sigma-2 agonists (CB 184, BD737) for 24hr.. Treatment with sigma-2 agonists increased labeled ceramide 2-4 fold over control, and in most experiments, a concomitant decrease in labeled sphingomyelin was observed from TLC analysis. These effects were diminished by the sigma-2 receptor antagonist AC927. When analyzed by reverse phase-HPLC coupled with atmospheric pressure chemical ionization-mass spectrometry, the ratio of C-16 ceramide to other sphingolipids is significantly increased in treated-cells compared with controls, in a dose-dependent manner. To determine the mechanism of sigma-2 receptor control of sphingolipid metabolism, assays for sphingomyelinase and sphingolipid ceramide N- deacylase (SCDase) were developed using tumor cell detergent-extracts (T47D, SKBr3 breast tumors cells). Our current findings suggest that sigma-2 receptors may modulate SCDase activity producing sphingosylphosphorylcholine. SCDase also posseses an acylase activity and can generate ceramide from sphingosine. Studies are underway to determine if sigma-2 receptor activation of SCDase is the source of increased ceramide that we have observed in numerous cell lines.
DTIC
Mammary Glands; Apoptosis; Assaying; Cancer; Cells (Biology); Liquid Chromatography

20010041167 California Univ., Riverside, CA USA
Characterization of a p53 Regulatory Domain ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Liu, Xuan; Abela, Brian C.; Jul. 2000; 19p; In English
Contract(s)/Grant(s): DAMD17-97-1-7033
Report No.(s): AD-A387794; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We purposed to characterize a regulatory domain on p53 and identify kinase(s) that may be involved in the regulation. Since 7/1/97, we constructed a set of deletions to disrupt the potential regulatory domains of p53 on Gal4-p53(1-160) and on full-length p53. Using these mutants we have obtained the following results: 1. Mutants Gal4-p53N(Delta92- 109), Gal4-p53N (Al17-128) and Gal4-p53N (Ser117/l27Ala) had little effect on the putative inhibitory effect. 2. TPA stimulation inhibited the transcriptional activities of Gal4-p53N (DELTA92-109) and (Ga14-p53N (Delta117-128), but did not affect Gal4-p53(1-92). 3. Mutants p53(DELTA92-109), p53(Deltas117-128), p53(Sl17/127A) and p53(S117/127D) significantly lost their ability to activate transcription in vivo. 4. Mutants p53(DELTA92-109), p53(DELTA117-128) and p53(S117/127A) retained their abilities to bind to DNA, but p53(S1 17/127D) not. 5. MAP-kinase is involved in the degradation of mutant p53 protein. In conclusion, we have shown that two serine residues 117 and 127 may play a role in stabilization of p53 protein levels. Further experiments will be conducted to confirm these results. We have also showed that MAP-kinase is involved in the degradation of mutant p53 protein. Our findings suggest a role for MAPK in the degradation of mutated form of p53 protein and in cell differentiation. These results were published as a JBC paper
DTIC
Degradation; Deoxyribonucleic Acid; Mutations; Proteins; Cancer; Genes; Genetics

20010041174 Columbia Univ., New York, NY USA
The Functional Role of the Ataxia Telangiectasia Gene ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Gautier, Jean; Sep. 2000; 35p; In English
Contract(s)/Grant(s): DAMD17-97-1-7071
Report No.(s): AD-A387765; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ataxia Telangiectasia (A-T) is an autosomal recessive disease characterized by a progressive cerebellar ataxia, severe immune deficiencies, gonadal atrophy, telangiectases, increased risk for cancer, particularly lymphomas, and radiation sensitivity. Additionally, carriers are suspected to be prone to other cancers including breast cancer. We are studying the biochemical function of ATM the product of the gene mutated in A-T in Xenopus, a simple model system suitable for cell cycle and checkpoint studies. We have previously cloned Xenopus ATM (X-ATM), and characterized the protein. We have described the pattern of expression of both X-ATM mRNA and protein throughout early development in Xenopus, a model system for vertebrate development. We have established a cell-free system derived from Xenopus extracts that recapitulates A DNA damage checkpoint in vitro. Under these conditions, we have demonstrated that double strand breaks (DSBs), the most harmful type of DNA damage can activate a checkpoint. The checkpoint is ATM-dependent and leads to the inactivation of cdk2 by phosphorylation on tyrosine 15. Inhibition of cdk2 prevents the loading of cdc45 on the origin of replication, thus inhibiting initiation of DNA replication. We also demonstrated that the checkpoint is independent of p53 activity.
DTIC
Ataxia; Cancer; Genes

20010041175 British Columbia Univ., Vancouver, British Columbia Canada
Analysis of Phenotypic Variability in Neurofibromatosis, Type 1 ***Annual Report, 30 Sep. 1999-29 Sep. 2000***
Friedman, Jan M.; Oct. 2000; 55p; In English
Contract(s)/Grant(s): DAMD17-97-1-7347
Report No.(s): AD-A387760; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This project is designed to characterize the sources of phenotypic variability in neurofibromatosis 1 (NF1) by a combination of clinical, statistical, epidemiological, and molecular genetic methods. During the second year of the project, we analysed associations found in clinical and genetic data from the NNFF International Database with logistic regression, generalized estimating equations. During the third year, the results of these methods were extended to use multivariate probit models on familial data. These are novel statistical techniques that have not been used in this way before and they yielded interesting results about the sources of phenotypic variability in NF1. We were able to determine that the presence of some features of NF1 are more influenced by variability in the NF1 allele, others by the normal NF1 allele and still others by unlinked modifying genes. We have asked for and have received a fourth year, no cost extension to complete the analysis of NF1 allele-phenotype associations and to continue to explore some other possible sources of variability, such as imprinting.
DTIC
Genetics; Nervous System; Molecular Biology; Clinical Medicine; Mathematical Models

20010041176 Duke Univ., Medical Center, Durham, NC USA
Genomic Imprinting of the M6P/IGF2 Receptor: A Novel Breast Cancer Susceptibility Mechanism ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Jirtle, Randy; Jul. 2000; 7p; In English
Contract(s)/Grant(s): DAMD17-98-1-8305
Report No.(s): AD-A387758; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Genomic imprinting is an epigenetic phenomenon in mammals that results in the differential expression of the paternally and maternally inherited alleles of a gene. Imprinted genes normally function to control embryonic growth and development. They also are involved in cancer because their functional haploid state makes them vulnerable to being either inactivated or overexpressed. The M6P/IGF2R has been shown to suppress cancer cell growth and is mutated in a number of human cancers, including those that develop in the lung, liver, colon, and breast. These findings are consistent with the M6P/IGF2R functioning normally as a tumor suppressor. We have shown that M6P/IGF2R imprinting and receptor IGF2 binding evolved in an ancestor common to marsupials and eutherian mammals. Although M6P/IGF2R is imprinted in lower eutherian mammals, it is not imprinted in humans, as has been proposed in the literature. Our results with breast cancer and Wilms tumor suggest that a mutational event within intron 10 of the M6P/IGF2R, and not disregulation of imprinting, may have resulted in the aberrant monoallelic expression observed in some humans. Therefore, although our evidence strongly indicates that M6P/IGF2R functions as a tumor suppressor in lung, liver, colon, and breast cancer, genomic imprinting at this locus is likely not involved in the etiology of tumorigenesis.
DTIC
Cancer; Suppressors; Tumors; Genes; Cells (Biology); Growth

20010041177 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA

Roles of BRCA2 Gene in Homologous Recombination and Genomic Stability ***Annual Report, 1 Sep. 1999 - 31 Aug. 2000***

Chen, David; Sep. 2000; 12p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-99-1-9170

Report No.(s): AD-A387755; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Primary and spontaneously immortalized mouse embryonic fibroblasts (MEF) were derived from embryonal stem cells in which both alleles of the BRCA2 gene have been mutated by gene targeting. The mutation deletes an extreme carboxy-terminal domain of the BRCA2 protein encoded by exon 27, one of two regions known to mediate binding with RAD51 protein. BRCA2-mutant MEF were markedly hypersensitive to the DNA crosslinking drug mitomycin-C, and showed evidence of severe chromosomal instability. While immortal wild-type MEF approximated tetraploidy, immortal BRCA2-mutant MEF showed subtetraploid chromosome numbers and one to several abnormally small chromosomes or ”minichromosomes” in every metaphase. The majority of minichromosomes either lacked telomeres or lacked a centromere detectable by fluorescence in-situ hybridization. Primary MEF were then examined for chromosomal changes over the first few passages after dissociation from embryos. BRCA2-mutant primary MEF showed sharply elevated numbers of chromatid and chromosome aberrations, including breaks, deletions and exchanges. by the third passage, approximately half the metaphase cells in BRCA2-mutant populations had one or more chromosome abnormalities. This marked chromosomal instability in BRCA2-mutant cells, and their hypersensitivity to DNA interstrand crosslinks, may reflect a deficiency in DNA repair by homologous recombination.

DTIC

Genes; Fibroblasts; Mutations; Mammary Glands; Medical Science

20010041179 Burnham Inst., La Jolla, CA USA

Characterization of Bcl-2, Bcl-XL, and Bax Pore Formation and Their Role in Apoptosis Regulation ***Annual Report, 1 Jul. 1999-30 Jun. 2000***

Schendel, Sharon; Jul. 2000; 9p; In English

Contract(s)/Grant(s): DAMD17-98-1-8167

Report No.(s): AD-A387743; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Bcl-2 protein family plays an important role in governing a cell’s decision to live or die. Dysregulation of these proteins is observed in many breast cancer cases and thus it is important to understand their mechanism in order to develop new treatments. The Bcl-X(L) protein structure showed a strong similarity to pore-forming bacterial toxins, suggesting that Bcl-2 protein family protein may regulate apoptosis by pore formation or membrane insertion. Single cysteine mutants of Bcl-X(L) have been generated to probe the topology of the membrane-inserted state. Preliminary results show that the BH3 domain is present on the membrane surface but it is unclear as to whether this portion of the protein is actually membrane-inserted. Labeling of these cysteine mutants with thiol- specific probes such as BODIPY also yielded results suggesting that residues in both the putative pore-forming fifth a-helix and the BH3 domain were still solvent accessible, as indicated by the ability of a fluorescence-quenching anti-BODIPY antibody to quench fluorescence in the presence and absence of lipid vesicles on which the proteins display channel-forming capability.

DTIC

Apoptosis; Proteins; Mammary Glands; Cancer; Cells (Biology)

20010041180 Georgetown Univ., Medical Center, Washington, DC USA

DNA Binding of the Prostate Homeobox Protein NKX3.1 ***Annual Report, 1 Sep. 1999-31 Aug. 2000***

Steadman, David J., Georgetown Univ., USA; Sep. 2000; 47p; In English

Contract(s)/Grant(s): DAMD17-99-1-9519

Report No.(s): AD-A387742; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NKX3.1 is a prostate-specific homeobox gene that maps to chromosome 8p21, a locus frequently deleted in prostate cancer. In the mouse, Nkx3.1 controls differentiated functions and limits growth of prostate epithelial cells. Although NKX3.1 may be a tumor suppressor in humans, no cancer specific mutations have been identified in human prostate cancer. Previously, a C to T polymorphism at nucleotide 154 of NKX3.J was identified, resulting in alteration of codon 52 from Arg to Cys in 10-14% of the population. The effects of the NKX3.1 polymorphism were examined by identifying the consensus DNA binding sites for wild-type (WT) and polymorphic (R52C) NKX3.1. Binding specificity was confirmed by gel mobility shift. Both WT and R52C NKX3.1 specifically repressed transcription from a reporter gene downstream from multiple copies of the NKX3.1 binding site. Amino acid 52 is adjacent to a putative PKC phosphorylation site at serine 48 of NKX3.1. In vivo analysis of NKX3.1 indicated that the protein is phosphorylated at serine. In vivo and in vitro phosphorylation studies indicated that R52C NKX3.1 phosphorylation was reduced relative to WT NKX3.1. Phosphorylation of WT NKX3.1 resulted in decreased DNA binding

affinity, while R52C NKX3.1 binding affinity appeared unaltered, presumably due to repressed phosphorylation of the mutant protein. The data suggested that polymorphism at position 52 may alter kinase regulation of NKX3.1.
DTIC
Deoxyribonucleic Acid; Cancer; Phosphorylation; Polymorphism; Proteins; Prostate Gland

20010041181 Rochester Univ., NY USA
An Adenovirus Mediated Non-Opiated Strategy for Cancer Pain Management ***Annual Report, 1 Oct. 1999-30 Sep. 2000***
Yang, Jay, Rochester Univ., USA; Oct. 2000; 9p; In English
Contract(s)/Grant(s): DAMD17-98-1-8332
Report No.(s): AD-A387740; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Increased awareness and systematic screening for breast cancer has resulted in early detection of this disease. However, 20 - 30% of node negative breast carcinoma patients will develop recurrent tumors and given the highly metastatic nature of breast cancer, many of these patients progress to disseminated disease. Although developments in experimental therapies for the treatment of advanced breast cancer is promising, much of the existing treatment for advanced metastatic cancer is palliative. Among the numerous symptoms of advanced cancer, pain remains the most significant determinant of quality of life. Despite pain being the most feared symptom of advanced cancer, clinical management of cancer pain remains inadequate. Limitation in the clinical management of advanced cancer pain appears multifactorial ranging from the nature of pain itself to the irrational fear of prescribing large quantities of opiates among the treating physicians. The goal of this investigation is to develop a novel non-opioid approach to pain management. Our present focus is on antisense-oligonucleotide-mediated knock down of an intracellular signal transduction molecule protein kinase C-y known to play a critical role in the development of pathological pain. if successful, a new therapeutic modality will have wide spread applications in the management of terminal cancer pain and other intractable pain syndromes.
DTIC
Cancer; Mammary Glands; Pain; Proteins; Therapy

20010041183 Beth Israel Deaconess Medical Center, Boston, MA USA
An Experimental System to Evaluate LOH in Prostate Cancer ***Annual Report, 1 Jan.-31 Dec. 1999***
Strauss, William M., Beth Israel Deaconess Medical Center, USA; Jan. 2000; 24p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9032
Report No.(s): AD-A387738; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this grant is to establish a new biological system for studying the progression of prostate cancer. We propose a technology we have previously developed to help define X-chromosome inactivation to increase our understanding of the molecular biology of prostrate cancer. Using a mouse model, our goal is to induce functional Loss of Heterozygosity (LOH) on a particular chromosome at various specified times during development or life span. Specifically, we plan to induce LOH only in mouse prostatic tissues. We are particularly interested in evaluating sites of allelic loss previously identified to be associated with prostate cancer (7q, 8p, lop, loq, 13q, 16q, 18q) in humans and understanding the effect of LOH on syntenic mouse chromosomes. We believe this approach has the potential to increase our knowledge of the acquisition and progression of prostate cancer. A systematic experimental approach for creating LOH can help define new prostate specific tumor suppressor genes. As human chromosome 8p is most frequently associated with prostate cancer (80% of primary and metastatic prostate cancers show this chromosomal variant, our mouse model system will initially focus on the development of those mouse chromosomes syntenic with human chromosome 8p. This technology would augment the positional cytogenetic approach to understanding the genetic complexity of prostate cancer.
DTIC
Cancer; Chromosomes; Genetics; Prostate Gland

20010041184 California Univ., Los Angeles, CA USA
Latina Breast Cancer Patients and Their Informal Support System ***Annual Report, 1 Sep. 1999 - 31 Aug. 2000***
Hayes-Bautista, David E.; Sep. 2000; 27p; In English
Contract(s)/Grant(s): DAMD17-99-1-9107
Report No.(s): AD-A387736; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To understand the influence of Latino culture in breast cancer treatment, by developing a conceptual model of the informal support system utilized by 60 triads consisting of Latina cancer patients, their spouses/significant others and family/friends. Participants are drawn from the Breast Cancer Treatment fund, which provides payment for services for uninsured women. The project has allowed a view into the role and function of the psycho-social support system. Not only does the support ”team” assist

with the diagnosis, treatment and consequences of breast cancer, it also helps the patient ”connect the dots” of a disjointed system by negotiating, supplementing and extending services. Another key area of finding is that the supporting the spouse/partner has been neglected by the medical world. The loss of a breast does not seem to be as significant as the potential loss of a person key in creating a family. A better understanding of how the psychosocial team functions to assist the patient in ”connecting the dots” allows an understanding of where and how the services system does not reach into this population. Programs and policy at the individual and system level can emanate from the emerging conceptual model.
DTIC
Mammary Glands; Support Systems; Cancer

20010041185 Dana Farber Cancer Inst., Boston, MA USA
Regulation of the Tumor Suppressor Protein PTEN by Phosphorylation ***Annual Report***
Vazquez, Francisca; Jul. 2000; 33p; In English
Contract(s)/Grant(s): DAMD17-99-1-9517
Report No.(s): AD-A387735; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of the research project of this grant is to study the role of phosphorylation on the regulation of PTEN, a tumor suppressor localized on a chromosome region frequently deleted in various cancers including prostate cancer. Preliminary data presented in the research proposal indicated that PTEN is a phosphoprotein. In this year the major phosphorylation sites of PTEN have been mapped in the C-terminus domain (the tail). It has been demonstrated that the phosphorylation of the PTEN tail regulates its protein stability and its activity. This results made us propose a model in which the PTEN can be found in two different states, in a more inactive but more stable state when is phosphorylated on the tail or in more active but more unstable when is unphosphorylated. In the next year we hope to identify the signaling that results in phosphorylation of the PTEN tail. The tail kinases by regulating PTEN can also be implicated in cancer. As stated on the grant proposal, 17% of prostate tumors have lost PTEN protein, however PTEN may be deregulated in those tumors which still retain PTEN protein. A certain percentage of tumors may have deregulation of PTEN tail kinases.
DTIC
Tumors; Suppressors; Phosphorylation; Proteins; Medical Science

20010041186 Massachusetts General Hospital, Boston, MA USA
Tomosynthesis Breast Imaging Early Detection and Characterization of Breast Cancer ***Final Report, 1 Jul. 1997 - 30 Jun. 2000***
Hamberg, Leena; Jul. 2000; 20p; In English
Contract(s)/Grant(s): DAMD17-97-1-7244
Report No.(s): AD-A387731; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A digital tomosynthesis mammography method was developed with which to obtain tomographic images of the breast by acquiring a series of low radiation dose images as the x-ray tube moves in an arc above the breast. Reconstruction algorithms were developed and implemented for rapid reconstruction of breast tomograms. A tomosynthesis study producing tomograms through the whole breast can be performed with a total dose that is equivalent to one conventional mammogram. The optimum number of views is seven to nine and optimum tomographic angle 30 to 40 degrees. MTF or spatial resolution for tomosynthesis was similar to that of 2 dimensional images and SNR is approximately equal to conventional mammograms even with equivalent total radiation dose. A reader study using the developed complex background phantom indicate improved lesion detection with tomosynthesis, for both round and spiculated masses, a mastectomy specimen reader study showed that the lesion margins can be better assessed with tomosynthesis as compared to film-screen mammography.
DTIC
Mammary Glands; Tomography; Imaging Techniques; Detection

20010041187 New York Univ. Medical Center, New York, NY USA
Genetic Susceptibility to Prostate Cancer Among Ashkenazi Jews ***Annual Report, 15 Sep. 1989-14 Sep. 1999***
Ostrer, Marry; Oddoux, Carole; Oct. 1999; 19p; In English
Contract(s)/Grant(s): DAMD17-98-1-8535
Report No.(s): AD-A387730; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project will test the basic hypothesis that a given microsatellite marker allele occurs with greater frequency among the individuals affected with prostate cancer than among the controls. These studies will take advantage of the fact that two populations of Ashkenazi Jewish men are readily available for a case-control study. The first is a group of men at high heritable risk based on their having early-onset prostate cancer. The second is a group of men at low heritable risk who have no personal

or family history of prostate cancer. Thus, we expect to observe predisposition alleles in the men at high risk that are not present in the men at low risk. The predisposition genes are likely to be within chromosomal regions in which loss of heterozygosity has occurred. Because these regions have remained identical by descent since the high-risk mutations occurred, they can be recognized by the presence of specific alleles of microsatellite markers in the high-risk group that are not present in the low-risk group.
DTIC
Cancer; Genetics; Prostate Gland; Males

20010041188 Baylor Coll. of Medicine, Houston, TX USA
Novel Mechanism of Mammary Oncogenesis by Human Adenovirus Type 9 ***Annual Report, 14 Jun. 1999-13 Jun. 2000***
Javier, Ronald; Jul. 2000; 133p; In English
Contract(s)/Grant(s): DAMD17-97-1-7082
Report No.(s): AD-A387726; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The adenovirus E4 region-encoded open reading frame 1 (9ORFl) transforming protein is the major oncogenic determinant of human adenovirus type 9 (Ad9), a virus that generates exclusively estrogen-dependent mammary tumors in rats. We have found that 9ORFl complexes with four different cellular PDZ-domain proteins (MUPP1, MAGI-1, ZO-2, and DLG) and that these interactions are essential for its transforming activity. The fact that three of these 9ORFl-associated PDZ-domain proteins also complex with high-risk papillomavirus E6 oncoproteins provides further evidence that these cellular factors are relevant to transformation. Prompted by the knowledge that PDZ domain-containing proteins generally function in cell signaling, we recently showed that 9ORFl transforms cells, in part, by activating the phosphoinositide 3-kinase (PI3-K)/protein kinase B (PKB) signaling pathway and, in addition, that this activity depends on the ability of 9ORFl to complex with its cellular PDZ-domain protein targets. We report here that the 9ORFl-associated protein MAGI-1 complexes with the tumor suppressor protein PTEN, a lipid phosphatase that antagonizes PI3-K/PKB signaling in cells. We postulate that MAGI-1 may be an essential co-factor for PTEN and that activation of PI3-K/PKB signaling by E4-ORF 1 may be due in part to its ability to inactivate this PDZ protein in cells.
DTIC
Adenoviruses; Mammary Glands; Carcinogens; Proteins; Cells (Biology)

20010041190 Johns Hopkins Univ., Baltimore, MD USA
DNA Repair and Breast Cancer Risk ***Annual Report, 1 Oct. 1999-30 Sep. 2000***
Helzlsouer, Kathy J.; Oct. 2000; 15p; In English
Contract(s)/Grant(s): DAMD17-97-1-7072
Report No.(s): AD-A387719; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Investigations of potential gene-environment interactions may improve our understanding of the etiology of breast cancer, a disease where less than 40% of cases can be attributed to known risk factors. The objectives of this proposal are to examine the association between DNA repair proficiency and breast cancer risk, and the contribution of this factor to the familial clustering of breast cancer. We hypothesize that mechanisms leading to suboptimal repair of DNA damage are susceptibility factors predisposing women to breast cancer through increased sensitivity to carcinogenic damage from environmental exposures such as ionizing radiation. to evaluate this hypothesis a case-control study and a family study are being conducted. Women with a personal history of breast cancer and women at increased breast cancer risk will be compared to control women for the presence of Lys/Lys 751 XPD genotype. We observed a strong association between presence of the LysLys 751 XPD genotype and higher number of chromatid aberrations. Thus, we plan to assess the XPD genotype, in place of the DNA repair proficiency cytogenetic assay which we originally planned to do. We will also evaluate the possible interaction between Lys/Lys 751 XPD genotype and ionizing radiation exposure, by stratifying the case-control data on exposure status, and assessing the relation between breast cancer risk and the genotype. The family study will be used to confirm the results of the case-control study.
DTIC
Cancer; Deoxyribonucleic Acid; Mammary Glands; Genes; Polymorphism

20010041191 Chicago Univ., Chicago, IL USA
Demonstration Project on Mammographic Computer-Aided Diagnosis for Breast Cancer Detection ***Annual Report, 26 Sep. 1999-25 Sep. 2000***
Doi, Kunio; Oct. 2000; 37p; In English
Contract(s)/Grant(s): DAMD17-96-1-6228
Report No.(s): AD-A387716; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project is to demonstrate the clinical usefulness of computer-aided diagnosis (CAD) in mammographic detection of breast cancer. Our plan is to develop advanced CAD schemes for detection and characterization of clustered microcalcifications and masses by incorporating artificial neural networks and various image processing techniques. Clinical mammography workstations for automated detection of suspicious lesions in mammograms will be developed by integration of laser digitizer, high-speed computer and advanced CAD software. The prototype workstations will be used as a ”second opinion in interpreting mammograms by reducing observational errors. The outcomes of radiologists’ image readings in the detection of breast cancer will be evaluated by examining radiologists’ performance when reading films only and when reading film with the computer results. We believe that the outcomes of this demonstration project will lead to large-scale clinical trials and will result in commercial products for practical routine use in breast imaging.
DTIC
Computer Techniques; Diagnosis; Mammary Glands; Cancer

20010041309 California Univ., San Francisco, CA USA
Therapeutic and Biologic Studies in a Murine Model of NF1 ***Annual Report, 23 Sep. 1999-22 Sep. 2000***
Shannon, Kevin; Oct. 2000; 33p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8608
Report No.(s): AD-A387816; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes progress made during the second year of support for a translational research project involving Nfl mutant mice with myeloid leukemia. Progress made during the first year is also reviewed to provide essential background. This study has two Technical Objectives. First, examining the therapeutic efficacy of two agents: (1) mycophenolate mofetiel (MM); and (2) a fusion toxin that targets the GM-CSF receptor. These compounds represent rational new approaches for treating NF1-associated tumors. MM has been tested in the mouse model and our preliminary data indicate that it is unlikely to provide benefit to NF1 patients. We are continuing correlative biochemical studies to elucidate the effects of these therapeutics on cellular GTP levels and Ras signaling. We produced and purified a GM-CSF immunotoxin during year 1 and have tested this in vitro. These studies surprisingly revealed agonist (rather than inhibitory effects) of the conjugate, and we have been working to discern the basis for this. In aim 2, we are utilizing Nfl mice to extend clinical observations suggesting that individuals with NFl are susceptible to the development of therapy-associated second cancers. These studies were initiated in year 1 and are progressing well. We are collecting tissues from mice with leukemia and will perform other correlative molecular studies over the next year. We anticipate that the proposed experiments will yield novel data that may be of practical value to patients with NFl and their physicians.
DTIC
Leukemias; Therapy

20010041310 Dana Farber Cancer Inst., Boston, MA USA
Functional and Clinical Analysis of the PTEN Tumor Suppressor Gene in Prostate Cancer ***Final Report, 1 Jul. 1998-30 Jun. 2000, phase 1***
Sellers, William; Jul. 2000; 84p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8596
Report No.(s): AD-A387814; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This grant application was focused on understanding the PTEN tumor suppressor gene, both at a functional level and with respect to the extent of PTEN loss in prostate tumors. The aims of this new investigator award were to develop antibody reagents to the protein product (PTEN), to characterize the function of PTEN through the identification of downstream targets, and to determine using immunohistochemistry, the extent to which the PTEN protein was lost in primary tumors. It is now recognized that PTEN is a lipid phosphatase that can antagonize signaling though the phosphoinositide-3 kinasi pathway. Our work, funded by the New Investigator mechanism, showed that PTEN can regulate cell-cycle progression by controlling the passage of cells through the G1 checkpoint. This function of PTEN requires its lipid phosphatase activity and requires that PTEN act upstream of the serine-threonine kinase Akt. This kinase, in the absence of PTEN is constitutively active and recent data in our lab further suggests that cell-cycle regulation is linked to the ability of PTEN to inhibit Akt thereby restoring the function of forkhead transcription factors such as FKHR and FKHRL1. Based on this data, in collaboration with a local biopharmaceutical company, we are working on developing inhibitors of the Akt kinase family. Here, our hypothesis is that PTEN null cells may be exquisitely dependent upon Akt for either proliferation or survival. In collaboration with Dr. Massimo Loda, we studied the expression of the PTEN protein in 127 primary prostate tumors obtained by radical prostatectomy. In these studies we found that loss of PTEN was highly associated with higher Gleason score and with more advanced stage tumors. In total these data highlight the importance

of PTEN loss to the development and progression 0 prostate cancer, and the hope that Akt inhibitors will be particularly beneficial in this group of tumors.
DTIC
Proteins; Clinical Medicine; Prostate Gland; Cancer

20010041311 University of Southern California, Los Angeles, CA USA
Characterization of BRCA1 Protein Product ***Final Report, 1 Aug. 1997-31 Jul. 2000***
Park, John J.; Press, Michael; Aug. 2000; 31p; In English
Contract(s)/Grant(s): DAMD17-97-1-7161
Report No.(s): AD-A387812; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Germline mutations in the BRCA1 tumor suppressor gene have been implicated in hereditary breast and ovarian cancers. As part of our ultimate goal to characterize novel interactions between BRCA1 and other proteins involved in well-defined pathways, we have pursued an area of research that is just beginning to receive a great deal of attention for BRCA1 function, transcriptional regulation. Since BRCA1-associated cancers typically involve steroid hormone responsive tissues, it is possible that BRCA1 plays a role in steroid receptor signaling. Using transient transfection assays, BRCA1 was found to enhance androgen signaling via activation function-l (AF-1) of the androgen receptor (AR) . Furthermore, coexpression of BRCA1 with p160 nuclear receptor coactivators SRC1a, GRIP1, or AIB1 resulted in synergistic potentiation of androgen receptor and estrogen receptor (ER-a) signaling in both breast and prostate cells. The N-terminal subdomain of BRCA1 physically interacted with both the N-terminal domain of the AR and the C-terminal domain of the p160 nuclear receptor coactivator, GRIP1, by in vitro protein binding and mapping assays. Though further in vivo studies are necessary to determine the physiological significance of these interactions, these results suggest that BRCA1 may play a role in hormone regulation by directly modulating nuclear receptor-p160 coactivator interactions. Therefore, in fulfillment of our ultimate goals, we demonstrate a novel role for BRCA1 in transcriptional regulation which may aid in our understanding of how loss of BRCA1 results in increased neoplastic transformation.
DTIC
Mammary Glands; Ovaries; Cancer; Deoxyribonucleic Acid; Gene Expression

20010041312 Georgetown Univ., Washington, DC USA
Role of Sphingosine Kinase in Radiation-Induced Apoptosis of Human Prostate Cancer Cells ***Annual Report***
Nava, Victor, Georgetown Univ., USA; Spiegel, Sarah, Georgetown Univ., USA; August 2000; 55p; In English
Contract(s)/Grant(s): DAMD17-99-1-9518
Report No.(s): AD-A387810; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Understanding the biological mechanisms that control cell growth and cell death is a mayor goal in cancer research since it could allow the design of anti-neoplasic therapies to specifically eliminate tumor cells. The effectiveness of radiotherapy and chemotherapy relies in pant in their ability to induce a genetic program of cell destruction know as apoptosis. Unfortunately, at present this conventional therapies induce cell death of both normal and cancer cells resulting in undesirable toxic effects. Furthermore, the signaling pathways that lead to apoptosis are often subverted in cancer cells resulting in resistance to radiation or chemotherapy. One mechanism by which cancer cells become resistant to radiation is by disrupting the sphigomyelin pathway that comprises a series of biochemical reactions generating lipid molecules called sphingolipids that are involved in controlling various cellular functions. The sphingolipid metabolites ceramide, sphingosine and sphingosine-phosphate (SPP) have recently emerged as a new class messengers that regulate cell growth and apoptosis. While intracellular accumulation of sphingosine or ceramide induces cell death, SPP promotes cell survival. Therefore, our laboratory has proposed that a dynamic balance in the level of intracellular sphingolipids serves as a signal to determine whether a cell survives or dies. In support of this hypothesis it has been found that the sensitivity of specific prostate cancer cell lines to radiation correlates with intracellular ceramide levels and with the activity of sphingosine kinase (SPHK), the enzyme that catalyzes the formation of SPP after adding a phosphate group to sphingosine. I propose to further investigate the role of sphingolipids in radiation-induced apoptosis in prostate cancer.
DTIC
Cancer; Cell Division; Cells (Biology); Chemotherapy; Genetics; Prostate Gland; Radiation Therapy

20010041313 Pittsburgh Univ., Pittsburgh, PA USA
Conversion of Non-Toxic Prodrugs to Active, Anti-Neoplastic Drugs Selectively in Breast Cancer Metastases ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Basse, Per H.; Sep. 2000; 11p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7020
Report No.(s): AD-A387809; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have evaluated the ability of tumor-seeking carrier-cells labeled with Thyl antibodies directly conjugated with AP. While many carriers were found in the tumor tissue at 12, 24 and 48 hours after injection, very little enzymatic activity was found in the malignant tissues. We conclude that although well retained on carrier-cell surfaces in vitro, even a directly conjugated antibody is ”stripped” from the cells in vivo. We have found evidence that this happens during the cell’s passage through the liver. We speculate that this might be due to macrophages, which are know to strip red blood cells for surface- attached immune complexes. Since this stripping is mediated via Ec-receptors on the macrophages, it is possible that F(ab’)2-fragments will not be stripped from the carrier- cell surface. We are now in the process of producing Ap-labeled F(ab’)2-fragments of the Thyl.2 antibody. In addition, a biotin-based method for attaching AP to the carrier-cells is being tested. We believe that we, using carrier-cell labeled by one or both of these methods, will be able to deliver prodrug-activating enzymes selectively to breast cancer metastases.
DTIC
Toxicity; Drugs; Chemotherapy; Mammary Glands; Cancer

20010041326 National Academy of Sciences - National Research Council, Washington, DC USA
A Strategy for Minimizing the Impact of Naturally Occurring Infectious Diseases of Military Importance: Vaccine Issues in the U.S. Military ***Final Report, 7 Dec. 1999-6 Dec. 2001***
Miller, Richard, National Academy of Sciences - National Research Council, USA; Feb. 2001; 39p; In English
Contract(s)/Grant(s): DAMD17-00-C-0003
Report No.(s): AD-A386427; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In April 1999, at the request of COL Charles Hoke, Jr., Director, Military Infectious Diseases Research Program, and MG John Parker, Commanding General, U.S. Army Medical Research and Materiel Command, the Institute of Medicine of the National Academies appointed an expert committee with staff support from the Medical Follow-up Agency. The committee’s name reflects USAMRMC’s concerns: Committee on a Strategy for Minimizing the Impact of Naturally Occurring Infectious Diseases of Military Importance: Vaccine Issues in the U.S. Military. Over the course of the project, the committee will meet approximately five times to gather information-from invited speakers and discussants representing DOD and other Federal agencies, and interested individuals active in academic research, clinical care, and the pharmaceutical and vaccine industry, as well as from peer-reviewed literature and reports. The charge to the committee derives from the work statement and accompanying material in the contract between DOD and IOM.
DTIC
Clinical Medicine; Infectious Diseases; Vaccines; Pharmacology; Medical Science

20010041327 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
Protein-Engineered Radiometal Chelates for Immunotherapy of Breast Cancer ***Final Report, 1 Apr. 1997-31 Mar. 1999***
Foote, Jefferson, Hutchinson (Fred) Cancer Research Center, USA; Apr. 1999; 19p; In English
Contract(s)/Grant(s): DAMD17-97-1-7124
Report No.(s): AD-A386430; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The objective of this project has been to genetically engineer a radiometal binding site in a human antibody constant region, for eventual use in tumor radioimmunotherapy. Our molecular model system was a humanized anti-lysozyme antibody Fab fragment expressed in E. coil. The engineered binding site,consisting of 5 point mutations in the interior of the human Ck domain, destabilized the recombinant protein, leading to proteolysis. We attempted to address this problem by modifying the binding site design, expressing the protein within protease-negative host strains, and subcloning disulfide oxido-reductases into our expression vector, but none of these strategies resulted in a workable yield of recombinant protein. In collateral experiments, we characterized the three-dimensional structure of the anti-lysozyme.
DTIC
Radiometers; Colic; Escherichia; Cancer; Mammary Glands; Immunology

20010041328 Kentucky Univ., Research Foundation, Lexington, KY USA
Transcription-Coupled Repair and Breast Cancer ***Annual Report, 1 Jun 1998-31 May 1999***
Mellon, Isabel, Kentucky Univ., USA; Jun. 1999; 7p; In English
Contract(s)/Grant(s): DAMD17-98-1-8201
Report No.(s): AD-A386432; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

We have focused on measuring the removal of ultraviolet (UV) light induced cyclobutane pyrimidine dimers (CPD) from the dyhydrofolate reductase gene (DHFR) in wild type and BRCA2 defective human cell lines to determine if BRCA2 gene defects impact transcription- coupled repair (TCR) in human cells. We have focused on characterizing TCR defects in human cells since other laboratories have focused on and documented TCR defects in mouse embryo fibroblast cell lines containing BRCA gene

defects (Gowan et al,1998). to extend these important findings we have investigated whether BRCA2 defects impact TCR in human cells by studying the Capan-1 cell line obtained from the American Type Culture Collection. Capan-1 contains a mutation in one allele of the BRCA2 gene and a deletion in the other allele (Abbott et al, 1998). We have optimized conditions to measure TCR in human cells using a probe for the DHFR gene. We find that the Capan-I cell line undergoes what appears to be a form of cellular senescence and interpretation of repair results are complicated by the senescence phenotype. Hence, we have chosen to establish systems where we can introduce mutant and wild type copies of BRCA genes using an inducible expression system.
DTIC
Genes; Ultraviolet Radiation; Cells (Biology); Cancer; Mammary Glands; Aging (Biology)

20010041329 Maine Medical Center Research Inst., South Portland, ME USA
The Role of Growth Hormone and Insulin-Like Growth Factor-1 in Human Breast Cancer Growth in a Mouse Xenograft Model ***Final Report, 15 Sep. 1997-14 Sep. 1999***
Weisberg, Tracey F., Maine Medical Center Research Inst., USA; Oct. 1999; 34p; In English
Contract(s)/Grant(s): DAMD17-97-1-7309
Report No.(s): AD-A386435; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The purpose of this research is to determine the role of human growth hormone (hGH) and insulin-like growth factor 1 (IGF-1) in the development of an immunodeficient mouse model for human breast cancer. Human GH and IGF1 may be critical to the initiation and progression of tumor growth in vivo. Results suggest that it is questionable whether rhGH alone or in addition to estrogen has a significant role in the development of a primary tumor or the progression of tumor growth in the animal model. In addition growth hormone may be semi-inhibitory to growth for tumors dependent upon estrogen Exogenous IGF 1 however, enhances the time to development of a palpable primary tumor and likely has a role in sustaining tumor growth and size over and above what has been achievable with estrogen alone. The effect of human rhGH and IGFl on tumor IGFl, IGF2 and IGFR is currently under evaluation in this laboratory on tumor specimens obtained from the experimental animals. Over the next year in this laboratory, primary tumors from patients under care at Maine Medical Center, will be place into the scid/scid mouse model and supplemented with IGF1 to establish if our preliminary results can be applied to the development of new xenograft models.
DTIC
Estrogens; Hormones; Medical Services; Growth; Cancer; Mammary Glands; In Vivo Methods and Tests

20010041330 Health Research, Inc., Rensselaer, NY USA
Cyclin E, A Potential Prognostic Marker in Breast Cancer ***Final Report, 1 Oct. 1994-30 Mar. 2000***
Keyomarsi, Khandan, Health Research, Inc., USA; Apr. 2000; 217p; In English
Contract(s)/Grant(s): DAMD17-94-J-4081
Report No.(s): AD-A386540; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

Cyclin E, a G1 cyclin essential for S phase entry with a profound role in oncogenesis, is overexpressed and present in lower molecular weight (LMW) isoforms in breast cancer cells and tumor tissues. Alteration and overexpression of cyclin E are linked to poor patient outcome. We have established the use of cyclin E as a prognostic marker for breast cancer. Tumor specimens from 400 breast cancer patients were examined; changes of cyclin E expression were compared with seven other established tumor markers to patient outcome. Altered expression of cyclin E was observed in 91% of all breast cancers with poor prognosis where patients either died of breast cancer or were still with cancer at the last contact date. Similarly in 93% of all breast cancer patients where cyclin E was either not altered, or its alteration was minimal, patients had a favorable prognosis. We have also deciphered the mechanism of deregulation of cyclin E in breast cancer cells giving rise to the LMW forms of cyclin E. Our studies show that the LMW forms of cyclin F detected at a much higher level in tumor cells, arise from post-translational action of a protease. We have been able to generate and knock out the tumor specific LMW pattern of cyclin E by transient transfection of FLAG-tagged cyclin E constant harboring these mutations in a breast cancer cell line. We have identified a novel elastase-type consensus sequence in the amino-terminus of cyclin E responsible for generating these tumor specific LMW isoforms. Lastly, studies using the drug Lovastatin demonstrated that this highly prescribed drug used to lower cholesterol levels is also capable of inducing all four cyclin dependent kinase inhibitors (CKIs) in a cell specific manner via cell cycle independent mechanism, through the inhibition of the proteasome. We have also devised a novel treatment strategy that protects normal cells against the toxic effects of chemotherapeutic agents.
DTIC
Proteins; Chemotherapy; Cancer; Mammary Glands; Molecular Weight

20010041332 North Carolina Univ., Chapel Hill, NC USA

Stimulating CTL Towards HER2/neu Overexpressing Breast Cancer ***Annual Report, 30 Sep. 1998-29 Sep. 1999***

Collins, Edward, North Carolina Univ., USA; Oct. 1999; 16p; In English

Contract(s)/Grant(s): DAMD17-97-1-7052

Report No.(s): AD-A386543; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We propose to establish an approach by which tumor cells are eradicated through selective induction of CD8(+) T cells specific for a protein overexpressed in many adenocarcinomas. A peptide derived from HER2/neu (HN654-662) stimulates cytotoxic T lymphocytes (CTL) that lyse primary tumors from ovarian or breast cancers. It has been proposed that the poor immunogenicity of HN654-662 is due to poor binding to HLA-A2.1. These data demonstrate HN654-662 is an extremely poor HLA-A2.1 binding peptide. Furthermore, modifications to anchor residues, predicted to improve binding, do not significantly increase affinity. We have determined the structure of A2/HN654-662 and show that the center of the peptide is disordered. Most substitutions designed to increase affinity do not do so. Individual substitutions at positions 3, 5, 6 and 7 do not significantly increase affinity. Multiple substitutions in the peptide, that individually increase affinity, actually decrease affinity to HLA-A2.1. A2K(super script b) mice do not generate a response to HN654-662 either as peptide or bound to dendritic cells. Some of the variants of HN654-662 do generate a CTL response. A2K(super script b) x neu mice generate spontaneous tumors around 5 months of age. These mice can be induced to generate a CTL response against peptides presented by the tumor.

DTIC

Cancer; Mammary Glands; Toxins and Antitoxins; Order-Disorder Transformations; Lymphocytes

20010041333 Texas Univ., Health Science Center, San Antonio, TX USA

Training in Support of a Research Project Entitled Regulation of BRCA1 Function by Physophorylation ***Annual Report, 1 Sep. 1997-31 Aug. 2000***

Ting, Nicholas S. Y., Jr., Texas Univ., USA; Sep. 1999; 8p; In English

Contract(s)/Grant(s): DAMD17-97-1-7205

Report No.(s): AD-A386546; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Mutations to the BRCAl gene are responsible for nearly 50% of inherited cases of breast cancer. However, the precise mechanism by which BRCAl contributes to the progression of tumor development remains to be elucidated. Recent evidence have suggested that BRCAl is important for cellular DNA damage repair and/or DNA damage response pathway REVIEWED IN 1, 2. First, mechanistic studies have shown that BRCAl associates with the DNA repair protein triplex, Mre11/Rad5O/NBSl to form distinct nuclear foci that correlates to sites of DNA damage in cells treated with genotoxic agents 3. Second, overexpression of BRCAl induces the expression of GADD45 and p21, two DNA-damage responsive genes 4,5. Based on these reports, it has been proposed that absence of functional BRCAl leads to aberrant repair of DNA, which in turn, can lead to genomic instability and ultimately, tumourigenesis.

DTIC

Mammary Glands; Cancer; Cells (Biology); Mutations; Education; Genes

20010041334 Georgetown Univ., Washington, DC USA

Cooperation of Bcl-xL and c-Myc in Mammary Tumorigenesis ***Annual Report, 1 Aug. 1998-31 Jul. 1999***

Jamerson, Matthew H., Georgetown Univ., USA; Aug. 1999; 32p; In English

Contract(s)/Grant(s): DAMD17-97-1-7110

Report No.(s): AD-A386550; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

c-Myc is amplified in 16%, rearranged in 5%, and overexpressed in nearly 70% of all human breast cancers and it regulates both proliferation and apoptosis. BC1-xL, known to inhibit apoptosis potentially by modulating mitochondrial permeability and caspase activation, is overexpressed in some breast tumors and derivative cell lines. Pro-apoptotic Bax has been shown to be significantly reduced or altogether absent in many breast tumors and cell lines. Evidence from c-Myc/TGF-a bitransgenic mice suggests that escape from c-Myc-induced apoptosis may be necessary for continued cell cycle progression and neoplastic development. The focus of this study is the resolution of the role of Bcl-xL overexpression and Bax loss in cooperation with c-Myc overexpression in mammary tumorigenesis; constitutive expression of Bcl-xL and loss of Bax likely disrupt the c-Myc-induce apoptotic pathways without significant alteration in c-Myc-mediated proliferation. c-Myc transgenic/Bax-knockout and c-Myc/Bcl-xL bitransgenic mice have been generated, genotyped, and shall be assessed for altered tumor onset, incidence, growth, and pathological /molecular characteristics once mammary tumors arise. Utilization of these models will aid in the dissection of the role of apoptosis in the development of breast cancer.

DTIC

Mammary Glands; Neoplasms; Cancer; Cells (Biology)

20010041349 North Carolina Univ., Chapel Hill, NC USA

Applications of a Novel Nucleic Acid Detection Method in Breast Cancer Analysis of Overexpression of HER-2/neu and FAK ***Annual Report, 1 Jul. 1998 - 30 Jun. 1999***

Thorp, Herbert H., North Carolina Univ., USA; July 1999; 11p; In English

Contract(s)/Grant(s): DAMD17-98-1-8224

Report No.(s): AD-A387803; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The proposal is aimed at utilizing new biosensors based on guanine electron transfer to quantitate messenger RNA for breast cancer genes. The biosensors are based on a scheme involving abstraction of electrons from the guanines of immobilized RNA to generate a signature current for a specific gene. The purpose of the proposed research is to demonstrate that the guanine electron transfer technology can be used to detect overexpressed RNAs in real biological samples. The scope involves detection of the mRNAs for HER-2/neu and FAK, which are both known markers of breast cancer, in samples generated by PCR amplification, reverse transcription, or direct RNA extraction. This report describes experiments that led to detection of the HER-2/neu gene from BT-474 cells using PCR amplification. The research has resulted in a new, more easily automated procedure involving direct adsorption of DNA from a novel combination of solvents. These electrodes allow for the detection of as little as 0.5 fmol of adsorbed DNA per square centimeter of electrode area.

DTIC

Genetics; Nucleic Acids; Detection; Cancer; Mammary Glands; Genes

20010041351 Case Western Reserve Univ., Detroit, MI USA

A Comparison of Breast Cancer Treatment Regimens by Demographic Characteristics ***Final Report, 5 Sep. 1997 - 4 Sep. 2000***

Yood, Marianne U., Case Western Reserve Univ., USA; Rothman, Kenneth, Case Western Reserve Univ., USA; October 2000; 20p; In English

Contract(s)/Grant(s): DAMD17-97-1-7302

Report No.(s): AD-A387793; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The purpose of this study was to measure ethnic differences in treatment and survival between African American (AA) and European American (EA) women with breast cancer. We abstracted data on cases of breast cancer diagnosed in members of an HMO in metropolitan Detroit between 1986-1996 (N=886) and followed these cases for survival through April 1997 (N=137 deaths). AA women were diagnosed at a later stage when compared with EA women. Five-year survival was 77% for AAs and 84% for EAs. The crude hazard for AAs relative to EAs was 1.6 (95% confidence interval (CI) 1.1, 2.2). Adjusting only for stage of disc at diagnosis, the hazard ratio was 1.3 (95% CI 0.9, 1.9). Adjusting only for sociodemographics (age, marital status an income), the hazard ratio was 1.2 (95% CI 0.8, 1.9). After adjusting for sociodemographics and stage, the hazard ratio 1.0 (95% CI 0.7, 1.5). We found no material racial differences in the surgical management of breast cancer. Among women with similar medical care access, we found ethnic differences in stage of breast cancer at diagnosis. Adjusting this difference and for income, age and marital status, eliminates the effect of race on survival. The methods used in this study as well as the cohort of women that was assembled for this study has also lead additional analyses contributing to the development of hypotheses that will be investigated in future studies. Preliminary results of one analysis examining ethnicity, stage of detection and mammography use show that among women age 40-49 AA ethnicity was strongly associated with later stage at diagnosis, even after adjustment for screening mammography (adjusted odds ratio= 2.8, 95% CI 1.2-6.8). These results indicate that factors other than mammography use may explain late stage at diagnosis in the subgroup of younger (age 40-49) African American women.

DTIC

Demography; Medical Services; Cancer; Diagnosis; Ethnic Factors; Females; Mammary Glands

20010041353 Georgetown Univ., Washington, DC USA

Ribozyme Targeting of Steroid Receptor Co-Activators: A Therapeutic Approach to Breast Cancer ***Annual Report, 15 Sep. 1999 - 14 Sep. 2000***

Riegel, Anna T., Georgetown Univ., USA; October 2000; 12p; In English

Contract(s)/Grant(s): DAMD17-99-1-9203

Report No.(s): AD-A387789; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The gene of the nuclear receptor co activator AIB 1 is amplified in breast cancer cell lines as well as in breast tumor tissue. AIB 1 mRNA is often highly expressed in primary breast tumors and is has been shown that AIB 1 enhances estrogen and progesterone dependent transcription in vitro. Therefore it has been postulated that AIB 1 contributes to the development of breast cancer. However, it is currently not known what the precise role of AIB 1 is in the development of breast cancer. Our strategy to address this question is to establish breast cancer cell lines in which we can regulate AIB 1 levels with ribozymes in order to

determine the impact of reduced AIB 1 gene expression on the phenotype and angiogenic or invasive properties of breast cancer cells. During the first year we developed MCF-7 breast cancer cells in which we are able to downregulate AIB 1 protein levels by up to 90%. Furthermore, downregulation of AIB 1 levels reduced the ability of the progesterone receptor to fully activate a progesterone regulated test promoter. We anticipate that our study will give valuable insights into the biological significance of AIB 1 as well as its potential role as a therapeutic target in breast cancer.
DTIC
Cancer; Mammary Glands; Tumors; Therapy

20010041354 North Shore Univ. Hospital, Manhasset, NY USA
The Use of a New Technique to Study DNA Methylation in Breast Cancer ***Final Report, 1 Oct. 1997 - 30 Sep. 2000***
Duffy, Hao, North Shore Univ. Hospital, USA; October 2000; 34p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7070
Report No.(s): AD-A387787; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The mechanisms of breast cancer development are incompletely understood. A reasonable hypothesis is that the evolution of this disease is caused by various genetic, and non-genetic factors. These may occur in multiple steps which eventually precipitate genetic lesions; such as mutations, or deletions. One causative factor may be imbalanced DNA methylation. A new technique, Methylation Differential Display (MDD), has been developed to explore DNA methylation patterns in breast cancer. BR5O was one of the hypomethylated DNA fragments isolated by MDD. Further study of BR5O has led to the discovery of a novel gene, TSP5O. The TSP5O gene product is homolog to several human serine proteases which indicates that it may encode a serine protease like protein. Northern analysis of sixteen different types of normal human tissues suggest that TSP5O was highly, and specifically expressed in human testes, which indicates that it might possess a unique biological function(s) in that organ. Methylation status analysis in normal human testes and other tissues showed a correlation between DNA methylation and gene expression. Most importantly, RT-PCR analysis of eighteen paired breast cancer tissues found that, in 28% of the cancer samples, the TSP5O gene was differentially expressed. In addition, the activation was located in the epithelia breast cancer cells.
DTIC
Testes; Mutations; Mammary Glands; Hypotheses; Genetics; Gene Expression; Cancer

20010041355 Colorado Univ., Health Science Center, Denver, CO USA
Signaling by ErbB Receptors in Breast Cancer: Regulation by Compartmentalization of Heterodimeric Receptor Complexes ***Annual Report***
Bild, Andrea H., Colorado Univ., USA; Johnson, Gary, Colorado Univ., USA; October 2000; 17p; In English
Contract(s)/Grant(s): DAMD17-98-1-8297
Report No.(s): AD-A387785; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

MEK kinase 1 (MEKKl) is a serine threonine kinase that induces apoptosis. Activation of specific apoptotic pathways leads to cleavage of MEKKl by caspase 3-like proteases into a 9lkDa fragment containing the kinase domain. Upon cleavage, MEKKl activates the caspase 3-like proteases in a feedback loop leading to apoptosis. MEKKl is also cleaved into the 9lkDa kinase domain in response to genotoxic agents such as etoposide or ultraviolet irradiation (Uv). Thus, overexpression of kinase inactive MEKKl inhibits both etoposide and UV-induced apoptosis. Akt is an anti-apoptotic serine threonine kinase that inhibits both etoposide and Uv- induced apoptosis. We show that Akt blocks MEKKl-induced apoptosis in HEK 293 cells. MEKKl-induced caspase 3-like protease activation is inhibited with expression of Akt. This inhibition by Akt prevents cleavage of endogenous MEKKI following exposure to etoposide and uV. Also, in an early signaling event, we show that MEKKl leads to activation of death receptor 4 (DR4) and death receptor 5 (DR5). Expression of either the decoy receptor 1 (DcRl) or FADD dominant negative protein (FADD DN) inhibits MEKKl-induced apoptosis. Akt, however, failed to block etoposide induced upregulation of DR4 and DRS expression and activation of caspase 8. In addition, Akt does not block MEKKl-induced JNK activation. Thus, we delineate that Akt inhibits MEKKl-induced apoptosis specifically through blocking caspase 3-like protease activation and amplification, resulting in inhibition of cleavage of MEKKl to its 91 kDa fragment.
DTIC
Cancer; Mammary Glands; Receptors (Physiology)

20010041368 Tulane Univ., Medical Center, New Orleans, LA USA
Genetic Damage Caused by ALU Repeats in Breast Cancer ***Annual Report, 1 Aug. 1999 - 31 Jul. 2001***
Deininger, Prescott, Tulane Univ., USA; August 2000; 84p; In English
Contract(s)/Grant(s): DAMD17-98-1-8119
Report No.(s): AD-A387783; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

Retrotransposition by Alu and Ll elements represents 0.2% of all human genetic disease and is likely to be stimulated in tumors. We hypothesize that retrotransposition may be stimulated sufficiently in breast tumors to allow these insertions to make a significant contribution to mutations that may lead to breast cancer progression. Our evolutionary analysis led us to define specific diagnostic sequence differences that differentiate the most recent 2000 Alu inserts from the 1,000,000 older elements. We have developed an anchored PCR strategy that allows us to
DTIC
Diseases; Cancer; Damage; Genetics

20010041370 Southeastern Center for Electrical Engineering Education, Inc., Saint Cloud, FL USA
Cardiorespiratory and Performance Responses to Sustained Pressure Breathing ***Final Report, 20 Dec. 1994 - 30 Sep. 1996***
Stolp, Bryant W., Southeastern Center for Electrical Engineering Education, Inc., USA; Dear, Guy de L., Southeastern Center for Electrical Engineering Education, Inc., USA; Lew, Natalie, Southeastern Center for Electrical Engineering Education, Inc., USA; Berbett, Katrun, Southeastern Center for Electrical Engineering Education, Inc., USA; Fritz, K. P., Southeastern Center for Electrical Engineering Education, Inc., USA; July 1997; 74p; In English
Contract(s)/Grant(s): FY7624-95-0-0327; AF Proj. 7930
Report No.(s): AD-A387781; AFRL-HE-BR-TR-2001-0010; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
Positive pressure breathing (PPB) is used to provide pilot life support during cockpit depressurization at altitudes at which the ambient pressure is insufficiently high to maintain adequate oxygen tension even when breathing 100% 02. Although pulmonary barotrauma and hypotension can usually be prevented by an external chest counterpressure jerking and a G-suit, involuntary hyperpnea, presumably caused by activation of an upper airway stretch receptor, can limit pilot performance, This phenomenon was investigated in 10 normal volunteers wearing the COMBAT EDGE, who were instrumented to obtain arterial blood samples while different forms of applying positive pressure breathing were applied. In order to study effects on cardiac output, four subjects were instrumented with pulmonary artery catheters while they breathed 34% O2
DTIC
Pressure Breathing; Hyperpnea; Pressure Chambers; Barotrauma

20010041372 Texas Univ., Houston, TX USA
C-ERBB-2 Receptor Signaling and Breast Cancer Metastasis ***Final Report, 1 Aug. 1997 - 11 Jul. 2000***
Tan, Ming, Texas Univ., USA; August 2000; 19p; In English
Contract(s)/Grant(s): DAMD17-97-1-7259
Report No.(s): AD-A387767; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
In this study, we investigated the structural requirements of erbB2 for erbB2 mediated higher metastatic potential in human breast cancer cells. We found that the kinase domain of erbB2 receptor is required for erbB2 to enhance metastatic potential of human breast cancer cells. The C-terminal tyrosine of erbE2 may also play roles in erbB2 mediated higher metastatic potential of breast cancer cells. We also provided the evidence that HRG/egf can promote the metastatic potential of MDA-MB-435 cell erbB2 transfectants in vivo. In addition, we investigated the signaling mechanism of heregulin enhanced MCF-7 and SKBR-3 cell aggregation. We found that HRG-beta 1-induced PI3-kinase activation is required in HRG enhanced MCF-7 and SKBR-3 breast cancer cell aggregation. Our studies have generated important information about the molecular basis of breast cancer invasion and metastasis. Ultimately we may use the information to develop new prognostic indicators and novel therapies for breast cancer metastasis.
DTIC
Cancer; Mammary Glands; Tyrosine

20010041375 Charles R. Drew Univ. of Medicine and Science, Los Angeles, CA USA
Characterization of the Mechanisms of IGF-I-Mediated Stress-Activated Protein Kinase Activation in Human Breast Cancer Cell MCF-7 ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Liu, Wei; Vadgama, Javdutt; Jul. 2000; 14p; In English
Contract(s)/Grant(s): DAMD17-98-1-8066
Report No.(s): AD-A387725; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Cumulative evidence shows that insulin-like growth factor (IGF-I) plays an important role in the mitogenesis of breast cancer cells. IGF-I stimulates cell division by regulating events during the early G1 phase, but little is known about the signal transduction pathways involved in these events. The purposes for this proposal are: 1) what is the role of protein kinase C in the IGF-I-induced

SAPK/JNK activation in human breast cancer cells MCF-7.2). what is the relationship between IGF-I-induced SAPK/JNK signaling pathway and cyclic AMP-dependent protein kinase A signaling pathway. Our specific aims in this proposal are 1).
DTIC
Mammary Glands; Cancer; Genetics

20010041376 Mount Sinai Hospital, Toronto, Ontario Canada
Are p53 Mutations Associated With Increased Risk of Developing Breast Cancer? A Molecular Epidermiological Study ***Annual Report, 1 Sep. 1999-1 Sep. 2000***
Kandel, Rita A.; Oct. 2000; 13p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9301
Report No.(s): AD-A387674; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In a case-control study, nested within a cohort of 4,888 women with BBD, we demonstrated that p53 protein accumulation detected by immunohistochemistry was associated with a 2.5-fold increase in the risk of subsequent breast. However, by using immunohistochemistry alone, we may have underestimated the true risk of developing breast cancer. We hypothesized that p53 mutations in benign breast tissue are associated with increased risk of subsequent breast cancer. We are testing our hypothesis by: (1) analyzing benign breast tissue from 138 cases and 556 controls for the presence of p53 mutations using PCR-SSCP and PCR-direct DNA sequencing; and 2) estimating the risk of breast cancer in relation to: (a) the presence of p53 mutations in BBD; and (b) the presence of both p53 mutations and p53 protein accumulation in BBD. We also propose to compare mutations detected in the cancers with those detected in their preceeding benign breast tissue samples. In the first year of the grant, we have established the conditions for the PCR-SSCP for exons 2 to 11. 126 subjects have had sections cut, epithelium enriched tissue microdissected out, and DNA extracted. The DNA has undergone PCR-SSCP under two conditions and those with abnormal gel patterns have undergone repeat PCR-SSCP. Abnormal migrating bands have been cut from the gel .These will be sequenced. We have determined that manual sequencing rather than automated sequencing is more appropriate to analyze the p53 gene in these small paraffin embedded benign lesions.
DTIC
Mutations; Epidemiology; Epidermis; Mammary Glands; Cancer

20010041377 Chicago Association for Research and Education in Science, Hines, IL USA
Molecular Mechanisms of Schwann Cell Proliferation in NF1 ***Annual Report, 1 Aug. 1999-1 Aug. 2000***
DeVries, George H.; Sep. 2000; 66p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8607
Report No.(s): AD-A387668; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Further studies documenting the molecular mechanisms responsible for Schwann cell proliferation in NFl- derived Schwann cell lines have been carried out. We have documented that the absence of neurofibromin leads to the presence of the tyrosine kinase receptors cKit and PDGF receptor in these Schwann cell lines. C-Kit is expressed early in normal Schwann cell development, where it does not play a role in proliferation, differentiation, or acting as a co-mitogen. Ongoing studies have shown that the c-Kit receptor acts to prevent apoptosis. Activation of cKit in normal Schwann cells leads to the activation of the transduction molecule Akt. In contrast, activation of NFl-derived Schwann cells leads to the activation of both Akt and MAP kinase. It was documented that transformed Schwann cells expressed additional isoforms of adenylyl cyclase and additional prostaglandin receptors relative to normal human Schwann cells. The cKit mediated pathways, which lead to the prevention of apoptosis in NF1-derived Schwann cells are under investigation.. In summary, these studies have further documented some of the molecular mechanisms responsible for the proliferation of Schwann cell NF1 tumors.
DTIC
Cells (Biology); Genetics; Apoptosis; Regeneration (Physiology); Fibrosis

20010041378 Princeton Univ., Dept. of Computer Science, NJ USA
DNA Computation: The Search for the ”Killer” Application, ***1 Apr. 1997-31 Mar. 2000***
Lipton, R. J.; Mar. 2000; 2p; In English
Contract(s)/Grant(s): F49620-97-1-0190
Report No.(s): AD-A387666; AFRL-SR-BL-TR-01-0171; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We successfully expanded the field of DNA Computers to RNA to develop and execute a general approach for the solution of Satisfiability problems. A challenge to this field has been the need for a design that is scalable to more difficult computations.
DTIC
Deoxyribonucleic Acid; Ribonucleic Acids; Computer Programs; Computer Techniques

20010041380 North Carolina Univ., Chapel Hill, NC USA

Correlative Study of Tumor Hypoxia and Metastatic Potential in Breast Cancer ***Annual Report, 1 Sep. 1999-31 Aug. 2000***

Varia, Mahesh A., North Carolina Univ., USA; Sep. 2000; 18p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-97-1-7279

Report No.(s): AD-A387656; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The objective of this research was to study if tumor hypoxia is associated with metastatic potential in breast carcinoma. Breast cancer patients enrolled in an IRB approved study receive hypoxia marker pimonidazole intravenously. Tumor biopsy specimens are examined for pimonidazole binding (hypoxia) and for the bimolecular markers. Regional node metastases data are recorded. to date, 19 patients have been enrolled on the study. Tumor hypoxia detected by pimonidazole ranges from 0-33% by an image analysis system. A semi-quantitative grading scale of 0-4 (0 = no hypoxia, 4 = highest amount of hypoxia) developed in cervix cancer studies and validated with the image analysis method is also useful in breast cancer hypoxia assessments. There have been no pimonidazole toxicities. This is the first demonstration of tumor hypoxia detection in human breast cancer using pimonidazole. These data suggest a valuable role for correlative studies of tumor hypoxia with both clinical and bimolecular markers of tumor aggressiveness. It is early to perform correlative studies of tumor hypoxia, axillary node metastases and other bimolecular markers, pending further accrual of patients on the study.

DTIC

Cancer; Hypoxia; Image Analysis; Mammary Glands; Tumors

20010041381 Maryland Univ., Baltimore, MD USA

Tumor-Specific Immunotherapy of Mammary Cancer ***Final Report***

Ostrand-Rosenberg, Suzanne, Maryland Univ., USA; Apr. 2000; 84p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-94-J-4323

Report No.(s): AD-A387654; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

For many patients with mammary cancer the primary tumor can be successfully treated by surgical removal, however the long-term prognosis is not favorable because of the high frequency of metastatic disease, which is not treatable by current approaches. Our goal is to develop vaccination strategies to minimize metastatic disease. We postulate that an improvement in the generation of mammary carcinoma-specific CD4+ T lymphocytes will facilitate development of CD8+ T cell mediated immunity. We have generated vaccines consisting of mouse mammary tumor cells transfected with MHC class II, costimulatory (B7. 1 or CD8O), and superantigen (SEB) genes, and have shown that the vaccines directly present tumor encoded antigens to CD4+ T cells. to test vaccine efficacy, we have developed a mouse mammary carcinoma model that closely parallels human breast cancer. The BALBic-derived 4T1 tumor spontaneously metastasizes throughout the body following inoculation into the mammary gland. Metastases are well established within 2-3 weeks of inoculation, and removal of primary tumor does not alter metastatic disease progression. Treatment with the vaccines significantly decreases the number of metastatic cells and increases survival time following surgical removal of primary tumor. Therapy with the class II/CD8O vaccine plus 1L-12 also reduces metastatic disease, and probably involves chemokines in addition to T lymphocytes.

DTIC

Antigens; Cancer; Mammary Glands; Therapy; Tumors; Vaccines; Immunology

20010041386 Department of Health and Human Services, National Toxicology Program, Research Triangle Park, NC USA

Toxicology and Carcinogenesis Studies of Naphthalene (CAS No. 91-20-3) in F344/N Rats (Inhalation Studies)

May 2000; 186p; In English

Report No.(s): PB2001-103699; TR-500; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

Under the conditions of this 2-year inhalation study, there was clear evidence of carcinogenic activity of naphthalene in male and female F344/N rats based on increased incidences of respiratory epithelial adenoma and olfactory epithelial neutoblastoma of the nose. In male and female rats, exposure to naphthalene cuased significant increases in the incidences of nonneoplastic lesions of the nose.

NTIS

Toxicology; Carcinogens; Naphthalene; Exposure

20010041389 Department of Health and Human Services, National Toxicology Program, Research Triangle Park, NC USA
Developmental Toxicity Screen for Diethanolamine (CAS No. 111-42-2) Administered by Gavage to Sprague-Dawley (CD (Trade Name)) Rats on Gestational Days 6 through 19: Evaluation of Dams and Pups through Postnatal Day 21 ***Final Report***
December 1999; 78p; In English
Report No.(s): PB2001-103718; TER-96-001; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

Diethanolamine (DEA) is a surfactant used in industrial processing and as a constituent of consumer products. In this screening study, DEA was administered orally to rats throughout the embryo/fetal period. Maternal and developmental endpoints were monitored through the end of lactation.

NTIS
Toxicity; Diethyl Compounds; Amines; Surfactants

20010042200 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA
P/CAF Function in Transcriptional Activation by Steroid Hormone Receptors and Mammary Cell Proliferation ***Final Report, 1 Jul. 1997-30 Jun. 2000***
Roth, Sharon Y., Texas Univ., USA; Jul. 2000; 39p; In English
Contract(s)/Grant(s): DAMD17-97-1-7206
Report No.(s): AD-A387761; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this research is to investigate the role of histone acetyltransferases in the estrogen responses and the development and progression of breast tumors. Experiments were initially focused on one of these enzymes, PCAF. We have completed the major goals outlined in our original Statement of Work. Our studies have revealed that another acetylase, GCN5, is very highly related in both structure in and function to PCAF. However, loss of these two enzymes has dramatically different effects in mice. PCAF null mice are viable, fertile, and exhibit no defects in estrogen dependent processes. However loss of GCN5 leads to embryonic lethality due to loss of increased programmed cell death of mesodermal tissues. Moreover, GCN5 is genetically linked to BRCAl and provides a candidate for a tumor suppressor gene associated with spontaneous breast and ovarian cancers. Combined mutations in PCAF and GCN5 have even more severe effects on mouse development. These results suggest that both GCN5 and PCAF are important to embryogenesis. GCN5 is also important to the regulation of apoptosis and may play a role in tumor development.

DTIC
Steroids; Hormones; Mammary Glands; Regeneration (Physiology); Cancer; Receptors (Physiology); Clinical Medicine

20010042201 Stanford Univ., School of Medicine, Palo Alto, CA USA
DNA Replication Initiator Proteins and Genetic Instability: Creating a Mouse Model for Prostate Cancer ***Annual Report, 15 Aug. 1998-14 Aug. 1999***
Jackson, Peter K., Stanford Univ., USA; Sep. 1999; 6p; In English
Contract(s)/Grant(s): DAMD17-98-1-8557
Report No.(s): AD-A387756; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

We have suggested that limiting hyperploidy by rereplication control may be important for controlling cancer progression. The SCF ubiquitin ligases are a very broad class of enzymes that mediate ubiquitin-dependent destruction of specific proteins. Examples of SCF and related complexes have now been implicated in several tumors including renal cell carcinoma by mutations in the Von Hippel Lindau (VHL) gene. In the fission yeast Schizosaccharomyces pombe, the Pop1 and Pop2 proteins are associated with SCF ubiquitin ligases and are critical for limiting re-replication in yeast. We had identified a close homolog of Pop1 in humans, called hPOP1. Mapping the chromosomal location of the gene by radiation hybrid analysis and FISH, we found the gene to be associated with a region of chromosome 9q34, which has been suggested to contain a tumor suppressor gene for bladder cancer. We sought to explore the connection between human Popi and bladder cancer by looking for alterations in human Popi expression in bladder tumors.

DTIC
Deoxyribonucleic Acid; Proteins; Prostate Gland; Enzymes; Clinical Medicine

20010042202 General Hospital Corp., Boston, MA USA

Development and Clinical Evaluation of Tomosynthesis for Digital Mammography ***Annual Report, 30 Sep. 1999-29 Sep. 2000***

Kopans, Daniel B., General Hospital Corp., USA; Oct. 2000; 91p; In English

Contract(s)/Grant(s): DAMD17-98-1-8309

Report No.(s): AD-A387722; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Tomosynthesis holds the promise of detecting breast cancer earlier, at a smaller size, with fewer false-positive outcomes. Progress toward this goal has been steady. It has been slowed by the unanticipated need to include an articulating collimator for X-ray beam control. GECRD interpreted recent FDA guidance as requiring the design and installation of an articulating collimator. GECRD has designed and installed this subsystem. The feasibility automatic motorized tomosynthesis system has been delivered, installed and acceptance tested at MGH. A physics report on the imaging characteristics is complete. We are now in position to evaluate tomosynthesis in the clinical setting. This will permit an understanding of it's clinical potential, and if warranted, the design of a clinical trial.

DTIC

Digital Systems; Imaging Techniques; Mammary Glands; Cancer

20010042206 Harvard Coll. Observatory, Cambridge, MA USA

Novel Antiangiogenic/Cytotoxic Therapies for Advanced Breast Cancer ***Final Report, 1 Sep. 1996-31 Aug. 2000***

Fett, James W., Harvard Coll. Observatory, USA; Sep. 2000; 26p; In English

Contract(s)/Grant(s): DAMD17-96-1-6025

Report No.(s): AD-A387707; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Incontrovertible evidence now exists that the growth of primary and metastatic breast cancer depends on new blood vessel growth, or angiogenesis. Therefore, inhibition of blood vessel in growth into breast tumors should be therapeutically useful. We have detected an angiogenic mediator, named angiogenin (Ang), in human breast cancer cells and are developing inhibitors of its functions. In order to evaluate whether these inhibitors may be useful for treating breast cancer, we have during the grant period developed mouse models for both primary and metastatic growth of human breast cancer cells. Using these models we have shown that Ang antagonists (including monoclonal antibodies and antisense reagents) potently interfere with the establishment and metastatic spread of breast cancer cells. Further generation drugs, which include small molecule inhibitors, humanized antibodies and peptide mimetic drugs, are under development for eventual testing. In addition, multimodal therapies combining antiAng agents with conventional chemotherapeutic drugs will be evaluated in the future. Importantly, interest in this therapeutic approach has generated an intent to form a biotechnology company dedicated to translating these preclinical findings into treatment and prevention trials in patients.

DTIC

Mammary Glands; Toxins and Antitoxins; Cancer; Blood Vessels; Clinical Medicine

20010042207 Fox Chase Cancer Center, Philadelphia, PA USA

Genetic Determinants of Breast Cancer Metastasis ***Annual Report, 15 May 1999-14 May 2000***

Kruger, Warren, Fox Chase Cancer Center, USA; Jun. 2000; 10p; In English

Contract(s)/Grant(s): DAMD17-97-1-7077

Report No.(s): AD-A387704; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Methylthioadenosine phosphorylase (MTAP) is a key enzyme in the pathway which converts methylthioadenosine (MTA) into methionine and adenine. The MTAP gene is frequently deleted in a variety of different cancers. Our lab has found a link between loss of MTAP expression and the phenomena of methionine dependent growth, defined as the inability to grow on media containing methionine's metabolic precursor homocysteine. Thus, cells lacking MTAP seem to require excess methionine for growth. Other labs have shown that cells lacking MTAP have increased sensitivity to purine biosynthetic inhibitors such as methotrexate and 5, 10-dideazatetrahydrofolate. These observations suggest that an effective two-pronged strategy could be used to eliminate MTAP negative breast cancer cells in vivo. Over the past year we have created isogenic breast cancer derived cell lines, one that is deleted for MTAP and one that has had it reintroduced. We have discovered that the cell line with MTAP reintroduced can now use MTA to make methionine, but is still unable to grow on media lacking homocysteine. This result suggests that MTAP deletion is not the primary cause of methionine dependent growth. These cell lines will be vital tools in our experiments over the next twelve months.

DTIC

Mammary Glands; Clinical Medicine; Genetics

20010042208 Baylor Coll. of Medicine, Houston, TX USA

Roles of ER, SRC-1, and CBP Phosphorylation in Estrogen Receptor-Regulated Gene Expression ***Final Report, 15 May 1997-14 May 2000***

Lonard, David, Baylor Coll. of Medicine, USA; OMalley, B., Baylor Coll. of Medicine, USA; Jun. 2000; 37p; In English

Contract(s)/Grant(s): DAMD17-97-1-7186

Report No.(s): AD-A387698; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Breast cancer patients who possess cancers that are estrogen-dependent usually respond well initially to the antiestrogen, tamoxifen. However, the cancer subsequently becomes resistant to tamoxifen, possibly through increases in cAMP and protein kinase A or through stimulation of the MAP kinase pathway, which have been associated with the conversion of the tamoxifen metabolite, 4-hydroxytamoxifen (4HT), into an estrogen receptor-alpha (ER) agonist. Tamoxifen resistance may also occur through cellular alterations in the balance of coactivators and corepressors whose protein levels may be regulated by the ubiquitin-proteasome protein degradation pathway. The relationship between phosphorylation of ER, its response to 4HT and its proteasome-mediated degradation was examined in transiently transfected immortalized cell lines. An inhibitor of the proteasome, MGl32, interferes with ER-mediated transcription and blocks the agonist activity of 4HT. MG132 also stabilizes ER and prevents its ligand-mediated down-regulation. Phosphorylan-defective ER mutants were found to be more stable than the wild-type receptor suggesting that receptor phosphorylation plays a role in regulating its stability which has been observed for other transcription factors. Mutation of coactivator-binding surfaces in the AF-2 of the receptor also influenced the stability of the receptor, suggesting that a coactivator(s) promotes ER degradation through their association with the liganded receptor. These results provide evidence that the ubiquitin-proteasome protein degradation pathway plays an important role in ER function and its response to tamoxifen.

DTIC

Phosphorylation; Estrogens; Gene Expression; Mammary Glands; Receptors (Physiology); Clinical Medicine

20010042209 Texas Univ. Health Science Center, San Antonio, TX USA

Role of PTH Receptor in Breast Cancer Metastasis to Bone ***Annual Report, 1 Sep. 1999-31 Aug. 2000***

Kakonen, Sanna-Maria, Texas Univ. Health Science Center, USA; Sep. 2000; 15p; In English

Contract(s)/Grant(s): DAMD17-99-1-9403

Report No.(s): AD-A387681; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Breast cancer metastasizes to bone more frequently than any other tumor hut the mechanisms responsible remain unclear. Parathyroid hormone-related protein (PTRrP) is an established tumor product which produces hypercalcemia by stimulating osteoclastic bone resorption. Recently, a role for PTHrP in the establishment of breast cancer metastases in bone has been proposed. PTHrP acts via the common parathyroid hormone/PTHrP receptor (PTHR), which has been demonstrated in breast cancer cell lines and metastatic breast tumors. These findings suggest that an autocrine and/or paracrine loop between PTHrP and its receptor is involved in the establishment of breast cancer metastases in bone. The proposed work will test the hypothesis that an autocrine/paracrine loop between PTHrP and the PTHR is involved in the establishment of breast cancer metastases in bone. Enhancement of this loop, by either increasing receptor expression, constitutive activation of the receptor or by TGF beta stimulation, should increase the metastasis formation. Conversely, interruption of this loop, by overexpression of a signaling-deficient receptor, should reduce metastasis. Breast cancer lines will be produced which stably express wild-type, constitutively active or signaling- deficient PTHR. Cell lines will be characterized in vitro for growth and PTHrP production and in vivo for the development of bone metastases. The first year of this three-year award has resulted in significant training and research accomplishments in 1) laboratory molecular biology techniques as well construction of stable cell lines which will facilitate the study of breast cancer metastases to bone; 2) data analysis and public presentation skills; 3) mechanisms of cancer metastases with respect to bone metastases. My research accomplishments have exceeded the original statement of work in that I have accomplished that proposed for year one in addition to studies which determine

DTIC

Parathyroid Gland; Hormones; Molecular Biology; Bones; Mammary Glands; Receptors (Physiology); Clinical Medicine

20010042782 National Inst. of Health, Bethesda, MD USA

Review of NIAAA's Neuroscience and Behavioral Research Portfolio ***Final Report***

Noronha, Antonio, Editor, National Inst. of Health, USA; Eckardt, Michael, Editor, National Inst. of Health, USA; Warren, Kenneth, Editor, National Inst. of Health, USA; 2000; 590p; In English

Report No.(s): PB2001-104260; NIAAA RESEARCH MONO-34; NIH/PUB-00-4520; No Copyright; Avail: CASI; A06, Microfiche; A25, Hardcopy

The research covered in this monograph ranges from molecular aspects of neuronal communication to the integrated activity of brain regions. Sections discuss acute ethanol actions on specific neural targets; molecular and cellular responses to chronic ethanol exposure; addiction and other behaviors in animal models; studies of acute and chronic effects of alcohol in humans; and studies of cognitive/behavioral/structural deficits in humans. The monograph concludes with a report of a Subcommittee of the National Advisory Council on Alcohol Abuse and Alcoholism on the Review of the Extramural Research Portfolio for Neuroscience and Behavior.
NTIS
Brain; Neurology; Neurophysiology

20010042787 Georgetown Univ., Medical Center, Washington, DC USA
Pericellular Hyaluronan and Prostate Cancer ***Annual Report, 1 Jan. 1999 - 31 Dec. 1999***
Underhill, Charles B., Georgetown Univ., USA; January 2000; 17p; In English
Contract(s)/Grant(s): DAMD17-99-1-9031
Report No.(s): AD-A387733; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The working hypothesis of the present project is that hyaluronan (HA) is responsible for maintaining pericellular spaces between nests of prostate tumor cells that are vital for the diffusion of nutrients required for tumor growth. To test this hypothesis, the cDNA for human HA synthase 3 (HAS3) was cloned and transfected into TSU cells which then over-express HA. These transfected cells were found to differ from their vector transfected counterparts with respect to the following: 1) they grew at a faster rate in high (but not low) density cultures; 2) conditioned media from these cells stimulated the proliferation and migration of endothelial cells; 3) when placed on the chorioallantoic membrane of chicken embryos, these cells formed large, dispersed xenografts while the control transfectants formed compact masses; and 4) when injected subcutaneously into nude mice, the xenografts formed by HAS3 transfectants were bigger than those formed by control transfectants. Histological examination of these xenografts indicated that the HAS3 transfectants had increased intercellular space rich in HA, and a greater number of blood vessels. These results support our working hypothesis that expression of HA promotes tumor cell growth.
DTIC
Prostate Gland; Clinical Medicine; Tumors; Histology

20010042788 State Univ. of New York, Buffalo, NY USA
Risk Factors for Osteoporosis and Oral Bone Loss in Postmenopausal Women ***Annual Report, 16 Sep. 1999 - 15 Sep. 2000***
Wactawski-Wende, Jean; Oct. 2000; 15p; In English
Contract(s)/Grant(s): DAMD17-96-1-6319
Report No.(s): AD-A387819; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The overall purpose of this study is to determine the relationship between skeletal and oral bone density, identify factors influencing bone loss, and determine the relationship between osteoporosis and oral bone loss, periodontal disease and tooth loss. We hypothesize that reduction in bone density leading to osteoporosis, plays a significant role in increasing susceptibility to destructive periodontitis and tooth loss. Sensitive and accurate measures of skeletal and oral bone mineral density, periodontal disease and tooth loss will be used. A wide variety of other risk factors for both osteopenia and periodontal disease will be assessed. Over 1300 subjects are being recruited from an ongoing NIH funded study cohort, the Women's Health Initiative (WHI). This year preliminary findings were presented at the World Congress of Osteoporosis (June, 2000; Chicago). Data were presented for the first 608 study participants enrolled from the larger study of over 1400 women. These analyses found that lower skeletal bone mineral density (BMD) is related to poorer alveolar crest height. In addition, in a second analysis we found moderate alcohol intake to be associated with higher BMD.
DTIC
Risk; Osteoporosis; Bone Demineralization; Musculoskeletal System

20010042790 Pittsburgh Univ., Pittsburgh, PA USA
Development of an Integrated Program of Health-Related Quality-of-Life Research for the National Surgical Adjuvant Breast and Bowel Project ***Annual Report, 1 Sep. 1999 - 31 Aug. 2000***
Day, Richard D.; Sep. 2000; 97p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-97-1-7058
Report No.(s): AD-A387961; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This Career Development Award (CDA) was specifically intended to support Dr. Day in the development of a Health-Related Quality of Life Program (HPQL) for the National Surgical Adjuvant Breast and Bowel Project (NSABP) . There are now a total of five ongoing NSABP HRQL studies in the process of data collection (P-2, B-30, B-32, B-33, C-07) and one in the planning

stage (STAR-COG) . %) . The result of this work has been that after 36 months, there is a solid HRQL program of at NSABP which encompasses both treatment and prevention trials. For the final 12 months of the CDA, Dr. Day has been given relief from all day-to-day monitoring responsibilities for ongoing protocols and will serve as a consultant for study development. This will permit him to devote all of his time in the next 12 months to the completion of manuscripts currently in preparation.
DTIC
Mammary Glands; Clinical Medicine; Health; Surgical Instruments

20010042791 State Univ. of New York, Buffalo, NY USA
Lifetime Alcohol Exposure and Breast Cancer Risk ***Annual Report, 15 Sep. 1999 - 14 Sep. 2000***
Freudenheim, Jo. L.; Oct. 2000; 220p; In English
Contract(s)/Grant(s): DAMD17-96-1-6202
Report No.(s): AD-A387962; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This case-control study examines breast cancer risk in relation to lifetime alcohol consumption. Subjects will be 1120 pre-and post-menopausal women, age 35-79, from Erie and Niagara counties in New York State, with incident, pathologically confirmed breast cancer. A total of 2275 controls will be interviewed; controls are randomly selected and frequency matched to cases on age, race and county of residence. Participants complete a computerized interview, which focuses on in-depth lifetime alcohol consumption history. Potential confounding factors are also assessed. A specimen bank is used to store biological samples for future research of serum and urinary markers of hormones, hormone metabolites, vitamins, genetic polymorphisms and blood levels of antioxidants and oxidative stress. This study provides an important opportunity for an efficient examination of alcohol and other risk factors, particularly genetic variability, in relation to breast cancer risk, with potential for clarification of a significant public health problem. Since the inception of the study, 971 breast cancer cases and 2,048 controls have been interviewed and blood samples stored for 795 cases and 1,890 controls. Data collection is still underway, therefore there are no conclusions to report at this time.
DTIC
Exposure; Alcohols; Public Health; Mammary Glands; Cancer; Life Span

20010043346 Tufts Univ., Boston, MA USA
Genes Controlling Susceptibility to Mammary Cancer ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Lipman, Ruth; Jul. 2000; 66p; In English
Contract(s)/Grant(s): DAMD17-97-1-7123
Report No.(s): AD-A387989; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Oral gavage with the carcinogen 7,l2-dimethylbenzAanthracene (DMBA) is reported to specifically cause mammary tumors in rats. This work examined the response of different genotypes of mice to this carcinogen. Mice demonstrate a genotypic specificity for the particular tumors that they develop; DMBA increase the incidence of and decreases the average age at which these tumors are manifest. It does not appear that the genetic instability of the sort associated with the Werner syndrome in humans appreciably enhances the predilection of mice to develop mammary cancer, even in mice dosed with the carcinogen DMBA. Increased adiposity is a risk factor for postmenopausal breast cancer in humans. Presented is work demonstrating that the dietary intervention of calorie restriction reduces the incidence of mammary tumors following carcinogen administration in genotypes predisposed to its development. It does not appear, however, that adiposity augmented beyond that obtained with ad libitum feeding increases mammary tumor incidence in mice. This work illustrates an aspect of mammary tumor carcinogenesis deserving of further investigation, namely, the fact that tumor incidence in genetically identical individuals maintained under identical environmental conditions is not 100% is strongly suggestive that there is a stochastic component involved in tumor development.
DTIC
Mammary Glands; Genes; Carcinogens

20010043373 Armed Forces Inst. of Pathology, Washington, DC USA
Retrotransposons as Mutagens in Human Breast Cancer. Addendume, ***30 Sep. 1994-29 Oct. 1999***
Fanning, Thomas G.; Aug. 2000; 4p; In English
Contract(s)/Grant(s): DAMD17-94-J-4331
Report No.(s): AD-A387660; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

It is known that the human LINE-1 retrotransposon (L1Hs) is transcriptionally active in many breast cancer cells. The original goal of the project was to test the possibility that L1Hs retrotransposition events result in the inactivation of tumor suppressor genes by insertional mutagenesis. A tagged L1Hs element was to be stably integrated into a nonmalignant breast cell line (MCF10A)

and allowed to retrotranspose. Malignant cells would then be identified and the genes into which the L1Hs element had integrated could be isolated using the tag.
DTIC
Cancer; Mammary Glands; Mutagenesis; Genes; Mutagens

20010043374 Johns Hopkins Univ., Baltimore, MD USA
Vascular Functional Imaging and Physiological Environment of Hyperplasia, Non-Metastatic and Metastatic Breast Cancer ***Annual Report, 1 Oct. 1999-30 Sep. 2000***
Bhujwalla, Zaver; Oct. 2000; 21p; In English
Contract(s)/Grant(s): DAMD17-96-1-6131
Report No.(s): AD-A387669; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our goals were to understand the role of vascularization and physiological and metabolic properties in breast cancer metastasis using magnetic resonance (MR) imaging (I) and MR spectroscopy (S) of human breast cancer models. Key findings were: MR spectra of tumors revealed a significant differences in phospholipid composition and in intra- and extracellular pH, between control and transgene tumors formed by MDA-ME-435 human breast carcinoma cells transfected with nm23 constructs. These data demonstrate the potential of noninvasive MRS to detect forms of gene therapy which may involve transfection of cells with nm23. Choline phospholipid metabolite levels progressively increased in cultured human mammary epithelial cells (HMECs) as cells became more malignant. This work is relevant to diagnosis of breast cancer and provides a rationale for selective pharmacological intervention. Lactate levels increased significantly in cultured HMEC following malignant transformation and may promote invasive behavior and contribute to metastasis. 3-dimensional analysis of vascular volume and permeability and histological morphology demonstrated that areas of low vascular volume were associated with cell death and increasingly permeable vasculature. The more metastatic cell lines were characterized by higher vascular volume and permeability. These results indicate a potential use of MRI and MRS for evaluating
DTIC
Cancer; Mammary Glands; Physiological Effects; Magnetic Resonance; Diagnosis; Imaging Techniques; Pharmacology

20010043375 Temple Univ., School of Medicine, Philadelphia, PA USA
The Identification of Genes Mediating Chemo-Sensitivity in Human Mammary Cells ***Final Report, 1 Jun. 1997-1 Jun. 2000***
Haines, Dale; Jul. 2000; 34p; In English
Contract(s)/Grant(s): DAMD17-97-1-7169
Report No.(s): AD-A387670; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our working hypothesis is that loss of function of a number of diverse checkpoint molecules will lead to the proliferation of chemo-resistance tumor bells. Besides the p53 pathway, relatively little is known regarding other checkpoint molecules whose loss of function results in chemo-resistance. This is probably due to the fact that loss of function of these molecules occurs through very subtle genetic alterations which are not easily detected by any current molecular techniques. Research being performed under this award is focusing on the identification of genes whose loss of function results in the proliferation of malignant epithelial cells that are resistant to the cytotoxic action of taxol, a microtubule formation inhibitor that is used in the treatment of breast cancer. This is being performed with a novel system based on a recently described technique (8) that allows for the isolation of genes encoding selectable recessive phenotypes. Identifying molecular pathways that are altered in chemo-resistance tumor cells will be critical for the future design of novel therapeutic strategies restoring chemo-sensitivity to chemo-resistant breast tumor cells.
DTIC
Chemotherapy; Genes; Mammary Glands; Cancer; Genetics

20010043376 Mount Sinai School of Medicine, New York, NY USA
A Randomized Prospective Trial Comparing Paravertebral Block and General Anesthesia for Operative Treatment of Breast Cancer ***Annual Report, 1 Feb. 1999-1 Feb. 2000***
Weltz, Christina R.; Mar. 2000; 56p; In English
Contract(s)/Grant(s): DAMD17-98-1-8128
Report No.(s): AD-A387671; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The goals of the study are to evaluate the role of paravertebral block regional anesthesia in patients undergoing operative treatment of breast cancer. Experience to date has shown that this anesthetic modality is safe and effective, and associated with excellent postoperative pain control and minimization of nausea and vomiting associated with general anesthesia. Using a prospective randomized trial carried out at three institutions, we propose to measure quality of life variables including pain,

postoperative nausea and vomiting, mood, and functional status in patients undergoing breast surgery with the traditional techniques of general anesthesia versus the regional technique of paravertebral block. The preliminary phase of this trial, which establishes safety and efficacy in performing the block technique, is ongoing. Once adequate experience in performing the paravertebral block is obtained, we will initiate the study portion of the trial by randomizing patients undergoing surgery to either general anesthesia or paravertebral block. Outcomes will be assessed using validated study instruments, which are included with the report.
DTIC
Cancer; Mammary Glands; Anesthesia; Surgery; Vertebrates; Nausea

20010043377 Kansas Univ., Medical Center, Kansas City, KS USA
Estrogens, Microtubules, and Aneuploidy: Mechanisms of Mammary Gland Tumorigenesis ***Annual Report, 15 Jun. 1999 - 14 Jun. 2000***
Reed, Gregory; Jul. 2000; 9p; In English
Contract(s)/Grant(s): DAMD17-97-1-7155
Report No.(s): AD-A387982; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The remaining studies for this project were to be performed in primary and secondary cultures of rat mammary epithelial cells (RMEC) prepared from ACI and Sprague-Dawley rats. Eight attempts were made to grow these cells, either from freshly prepared cell suspensions or from cryopreserved cells. None of these attempts were successful. Cells began to exhibit an epithelial morphology but within 24-48 hours they ceased growth and detached from the collagen substratum. None of the cells were acceptable for studies either of estradiol metabolism or of the effects of estrogens on mitotic microtubules. This failure to grow these cells prevented the performance of the remaining studies. We recently have acquired spontaneously immortalized lines of RMEC from the estrogen-sensitive ACI hybrid strain and from the estrogen-resistant Copenhagen strain, one of the parental strains of the ACI. Our plan for the remaining funding period is to pursue our aims related to mitotic microtubules and the induction of aneuploidy using these cell lines. Although they are presumed to no longer express cytochrome P450s, and thus cannot metabolize estradiol itself, we nonetheless can treat these cells with estradiol and various metabolites, particularly the catechol estrogens, to determine the ability of these compounds to alter mitosis.
DTIC
Mammary Glands; Estrogens; Cells (Biology)

20010043644 New York Univ. Medical Center, New York, NY USA
A Nested Case-Control Study of Luteinizing Hormone Variants and Risk of Breast Cancer ***Final Report, 15 Sep. 1997-14 Sep. 2000***
Toniolo, Paolo G.; Oct. 2000; 12p; In English
Contract(s)/Grant(s): DAMD17-97-1-7226
Report No.(s): AD-A387729; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We hypothesized that genetic variant of the luteinizing hormone beta-subunit, characterized by two point mutations in codons 8 and 15, may increase risk of breast cancer. to test this hypothesis, we conducted a case-control study nested within a prospective cohort that included 270 breast cancer cases diagnosed at age 50 or older and 150 cases diagnosed before age 50. Two controls per case were randomly selected among cohort members who were alive and free of disease and who matched the case on menopausal status, age, date of enrollment, and phase and day of menstrual cycle for premenopausal women. Presence of the variant LH status (heterozygotes plus homozygotes) was not associated with an apparent increase in breast cancer risk in postmenopausal women (OR = 1.07, 95% CI 0.68 - 1.69). The risk estimate did not change after adjustment for potential confounders (OR = 1.11; 95% CI = 0.69-1.78). In premenopausal women, adjusted risk estimate was (OR = 1.68, 95% CI = 0.89 - 3.17). The results do not appear to support the hypothesis that the variant LH is associated with a significantly increased risk of breast cancer, although they suggest a moderate increase of breast cancer risk among younger women.
DTIC
Cancer; Hormones; Mammary Glands; Genetics

20010043656 Pacific Northwest Research Foundation, Seattle, WA USA
A New Structural Analysis of DNA using Statistical Models of Infrared Spectra
Malins, Donald C., Pacific Northwest Research Foundation, USA; Polissar, Nayak L., Washington Univ., USA; Su, Yingzhong; Gardner, Henry S.; Gunselman, Sandra J.; Nature Medicine; August 1997; Volume 3, No. 8, pp. 927-930; In English
Report No.(s): AD-A386992; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

DNA is continually being modified by microenvironmental factors, thus creating vast numbers of modified structures, for example, the progression of primary breast cancer to the metastatic state was estimated to involve as many as several billion new DNA forms, many of which likely result from hydroxyl radical (= OH)-induced structural alterations. Progress has been made in analyzing low-mass oligonucleotide (is less than 1 x 10(exp 3) base pairs). however, the complexity and high masses of the cellular DNAs (= 6 x 10(exp 9) bp) have hindered their structural elucidation. Consequently, an understanding of these DNAs had to be obtained primarily by using destructive techniques (chemical or enzymatic) that provide little information on intact structures potentially having important biological properties.
DTIC
Structural Analysis; Deoxyribonucleic Acid; Genes; Genetic Code

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 Science. For the effects of space on animals and plants see 51 Life Sciences.

20010040817 Army Center for Health Promotion and Preventive Medicine (Provisional), Epidemiologyand Disease Surveillance, Aberdeen Proving Ground, MD USA
Investigation of an Acute Respiratory Disease Outbreak Due to Adenovirus Type 4 Among Recruits Fort Benning, Georgia ***Final Report***
DeVernoy, T. S.; Coldren, R. L.; Feighner, B. H.; Jordan, N. N.; Sanchez, J. L.; May 2000; 25p; In English
Report No.(s): AD-A388059; Rept-29-HE-5711-00; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An epidemiological consultation (EPICON) was conducted to investigate an outbreak of acute respiratory disease (ARD) among U.S. Army Infantry trainees at Fort Benning, GA that resulted in the hospitalization of 194 recruits to Martin Army Community Hospital (MACH) between April 23 and May 6, 2000. This outbreak resulted in a ARD admission rate of 2.9% for the week ending April 29, 2000, a six-fold increase over baseline. The average length of stay for all admitted recruits was 2.1 days. All recruits recovered without sequelae; there were no deaths or serious injuries. A case-control study was performed to develop hypotheses regarding the etiology of the outbreak. One unit was chosen for the company. A case was defined as any Infantry trainee who visited a medical facility with a documented fever greater than or equal to 100.4 deg F (38 deg C) and at least on ARD symptom. The case-control study group included 288 individuals; all male. 54 trainees met our case definition and 234 individuals were considered controls. Univariate analysis indicated several variables associated with being an ARD case such as assignment to Company D, young age, white race, a history of smoking 6 months prior to training, 5th week of training, recruit crowding in the barracks, higher environmental temperature, and lack of soap in the barracks. Multivariate analysis revealed only sleeping density and white race with becoming an ARD case with a p is less than 0.05. Initially, nasal swab quick tests performed on ill recruits were positive for Influenza A/B but additional laboratory data confirmed that adenovirus (AdV) type 4 was the etiologic agent of the outbreak. Areas for improvement, particularly the ventilation systems, were documented. The most effective intervention for avoiding an AdV outbreak is the oral vaccine; unfortunately, the sole manufacturer ceased production in 1996. Until the vaccine is once again available, outbreaks due to AdV in basic training are inevitable.
DTIC
Adenoviruses; Epidemiology; Etiology; Respiratory Diseases; Multivariate Statistical Analysis

20010040879 State Univ. of New York, Buffalo, NY USA
Sex Difference in Susceptibility and Resistance to Noise-Induced Hearing Loss in Chinchillas ***Final Report, 23 Sep. 1996-22 Sep. 2000***
McFadden, Sandra L.; Oct. 2000; 119p; In English
Contract(s)/Grant(s): DAMD17-96-1-6330
Report No.(s): AD-A387676; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report summarizes research conducted during the grant period 9/23/96-9/22/00. The overarching aim of the project was to identify factors associated with sex/gender that could impact military assignments and hearing conservation programs. These factors included sex differences in basic auditory sensitivity and susceptibility to noise-induced hearing loss (NIHL), sex differences in the ability to benefit from ”sound conditioning” and pharmacologic treatment, and the effects of two endogenous steroid hormones, estradiol and progesterone, on susceptibility to NIHL. During the course of the project, we established the validity of the chinchilla as an animal model for investigating sex differences in hearing, and discovered several sex differences

in auditory sensitivity and susceptibility to NIHL that are independent of noise exposure history and other confounding factors. Most notably, female chinchillas consistently developed less low- frequency hearing loss than males, even after sound conditioning. In addition, we established a clear relationship between levels of endogenous steroid hormones and susceptibility to NIHL. Females had higher and more variable levels of serum estradiol than males, and animals pre-treated with estradiol developed significantly less NIHL than controls. The results of our experiments have important implications for women and men in all branches of the military who are exposed to potentially harmful levels of noise.
DTIC
Auditory Defects; Hormones; Hearing

20010040892 Air Force Research Lab., Human Effectiveness Directorate, Brooks AFB, TX USA
Variable Name Dictionary for the Air Force Health Study 1985 Physical Exam, Questionnaire and Analyses Diskette ***Interim Report, 1 Jun.-1 Nov. 2000***
Michalek, Joel E.; Nov. 2000; 106p; In English
Contract(s)/Grant(s): Proj-2767
Report No.(s): AD-A387644; AFRL-HE-BR-SR-2001-0003; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The Air Force Health Study is a 20-year comprehensive assessment of the health of Air Force Veterans of Operation Ranch Hand, the unit responsible for the aerial spraying of herbicides in Vietnam. The study contrasts the health and noncombat mortality of Ranch Hand veterans with a comparison group of Air Force veterans who also served in Southeast Asia but did not spray herbicides. This report contains data collected at the second Air Force Health Study physical examination.
DTIC
Dictionaries; Health; Herbicides; Armed Forces; Spraying

20010040916 Army Center for Health Promotion and Preventive Medicine (Provisional), Epidemiologyand Disease Surveillance, Aberdeen Proving Ground, MD USA
The Relationship Between Air Particulate Levels and Upper Respiratory Disease in Soldiers Deployed to Bosnia (1997-1998) ***Final Report***
Hastings, Deborah; Jardine, Suzanne; Feb. 2001; 24p; In English
Report No.(s): AD-A387927; USACHPPM/EDS-29-HE-3841-99; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This study had three objectives: to determine if there is a relationship between air particulate levels and upper respiratory disease in soldiers deployed to Bosnia between 1997-98, to establish a method for linking environmental and military medical data, and to determine ways to improve environmental data collection to improve the ability to analyze the data. Methods: Air particulate level data from the Deployment Environmental Surveillance Program at USACHPPM was linked with Disease Non-Battle Injury Data from the Bosnian theatre. The weekly maximum and weekly average PM 10 levels for each week were determined. The levels were divided into quartiles, and into upper and lower fiftieth percentiles of exposure. The upper respiratory disease (URD) rates were correlated with exposure groups. The exposure groups were also compared for differences in URD rates using the Kniskal-Wallis and Mann-Whitney tests. Results: When all camps were combined, there was a statistically significant association between the PM10 Weekly Maximum level and URD rates based on the Kruskal-Wallis and Mann-Whitney tests, and the Pearson correlation was statistically significant. Although the relationship was not statistically significant in the analysis conducted of the individual camps, the average URD rate increased with each quartile of PM10 Weekly Maximum exposure. There was no statistically significant association between PM10 Weekly Average exposure and URD rates, although the average URD rate increased with each quartile of PM10 Weekly Average exposure. Conclusion: While a causal link cannot be determined from this study, there does appear to be a relationship between PM 10 levels and URD rates in soldiers deployed to Bosnia in 1997-1998. This contradicts thinking that soldiers are not likely to suffer effects from short term exposure to air particulates. The effects of air particulates on soldiers should be investigated further as more environmental data becomes available.
DTIC
Particulates; Respiratory Diseases; Aerospace Medicine

20010040921 University of Southern California, Los Angeles, CA USA
An Innovative Assessment of Endogenous Activity in Persons with Different Habits of Exercise ***Annual Report, 1 Sep. 1999-30 Aug. 2000***
Hamilton, Ann S.; Sep. 2000; 30p; In English
Contract(s)/Grant(s): DAMD17-97-1-7081
Report No.(s): AD-A387922; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Evidence exists that women exercising have lower estrogen levels than sedentary women. These lower estrogen levels may be the mechanism behind their reduced breast cancer risk. Previous studies included athletes with high exercise levels, and estrogen measurements were based on a few serum samples from different times during a menstrual cycle. This study includes identical female twins who are discordant for moderate exercise. Estradiol is measured on a daily basis from saliva samples collected during a complete menstrual cycle. Procedures and questionnaires have been developed; enrollment of eligible pairs and laboratory assays are ongoing. Screening interviews have been conducted with 274 pairs. of these, 53 were initially eligible; however 10 declined to participate and 2 later became ineligible due to menopausal related reasons. Samples proved to be unusable for 3 pairs. Thus, sample collection is currently completed or underway for 38 pairs. Estradiol and progesterone assays have been completed for 25 pairs. An additional 30 pairs are being contacted to increase the sample size. Preliminary results, based on the first 15 pairs indicated that E2 during luteal phase was slightly higher in the inactive member of the twin pair, while follicular phase E2 was higher. In Year 4 (no-cost extension), we will continue to screen and enroll twins, complete data entry of questionnaires, conduct hormonal assays, integrate laboratory and questionnaire data sets, and complete analyses of the results.
DTIC
Cancer; Estrogens; Females; Mammary Glands; Physical Exercise

20010041019 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Energy Metabolism in Cold-Stressed Females: Implications for Predictive Modeling (95 Women) ***Final Report, 1 Oct. 1996 - 1 Oct. 1999***
Jacobs, Ira; Nov. 1999; 224p; In English
Contract(s)/Grant(s): DAMD17-96-C-6128
Report No.(s): AD-A388030; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Military operations in cold environments have resulted in life-threatening situations if personnel are ill-equipped or unprotected. Prediction of survival time in the cold (ST) is essential for search and rescue purposes, to forecast contingencies for operations in such environments, and to evaluate the potential benefits of innovative equipment/clothing designed to protect the soldier from cold. Mathematical models of ST are based on the magnitude and capacity for increasing metabolic heat production (M) by shivering, and the rate of heat loss from the body. Previous research on males showed that relationships among ST, M, and heat loss are affected by body composition, the muscle mass recruited, and the type and quantity of substrate oxidized during shivering. Gender-related physiological differences in responses to cold have not been considered in ST predictive models. The current research characterized M in females during cold stress by quantifying the relative muscle mass recruited during shivering, determining the quantity and quality of energy substrate utilization during shivering, and relating the findings to body temperature regulation. No gender differences were found for M and deep body cooling rates if variables such as stature and body adiposity were controlled. Current prediction models of ST can be considered gender-invariant.
DTIC
Metabolism; Energy Conservation; Military Operations; Physiological Effects; Cold Weather; Stress (Physiology)

20010041039 Armed Forces Research Inst. of Medical Sciences, Bangkok, Thailand
Studies into Militarily Relevent Infectious Diseases of interest to Both USA and Royal Thai Governments ***Final Report, 15 Oct. 1994 - 31 Dec. 2000***
Puavilai, Gobchoke; Nitayaphan, Sorachai; Jan. 2001; 44p; In English
Contract(s)/Grant(s): DAMD17-95-2-5001
Report No.(s): AD-A387876; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cooperative agreement # DAMDl7-95-2-5001 was implemented October 15, 1994 to provide funding support for Royal Thai Army at Armed Forces Research Institute of medical Sciences (AFRIMS) engaged in research activities in collaboration with US Army. The principal focus of research under the agreement is directed to activities to prepare for development and testing of vaccine(s) for prevention of HIV infection and /or disease. During the funding period, research activities were directed in 4 primary areas 1) active surveillance of RTA conscripts to determine the dynamics of HIV epidemic in Thailand; 2) studies of natural history of HIV infection/disease in Thais; 3) cohort development studies attempting to define an appropriate population(s) for phase III vaccine testing; 4) conduction of phase 1/11 vaccine studies to determine safety and immunogenicity of potential HIV vaccines in Thais. Other efforts under the Cooperative Agreement during the funding period included 1) animal care and handling in support of other ongoing research activities at AFRIMS, exclusive of HIV research; and 2) site maintenance activities in support of research activities including glassware and utilities support.
DTIC
Infectious Diseases; Medical Science

20010041117 Louisiana State Univ., Medical Center, Baton Rouge, LA USA

Myocardial Dysfunction Contributes to Irreversible Hemorrhagic Shock ***Final Report, 1 Sep. 1996 - 30 Sep. 2000***

McDonough, Kathleen H., Louisiana State Univ., USA; Miller, Harvey I., Louisiana State Univ., USA; Feb. 28, 2001; 8p; In English

Contract(s)/Grant(s): N00014-96-1-1274

Report No.(s): AD-A387293; Rept-410-22-4111; Rept-410-22-6121; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

We have performed a study of the effects of hemorrhagic shock and resuscitation on isolated heart function of guinea pigs. In vivo hemodynamics were monitored during hemorrhage, shock and resuscitation and then intrinsic function of the heart was assessed. Three time periods were studied - 1, 2 or three hours of shock. In some animals shock lasted for 1 hour and then guinea pigs were resuscitated with whole blood or dextran 70,000 MW (same volume as the blood that was removed). The data collected from the isolated heart indicated that hemorrhagic shock lasting 1, 2 or 3 hours by itself did not cause major dysfunction of the heart. The only change in heart function that seems to occur was in the 3 hour shock group in which the left ventricular compliance was slightly depressed. In animals that had been resuscitated with whole blood or with 6% dextran, ventricular performance was depressed compared to control hearts and compared to hearts from animals in hemorrhagic shock suggesting that reperfusion contributed significantly to myocardial dysfunction resulting from hemorrhagic shock. We have also demonstrated that resuscitation with Ringer's lactate improves cardiovascular status to the same extent as does dextran. Giving four times the shed blood volume vs a volume equal to the shed volume, however, it made little difference in the recovery noted. Finally, we have determined that alcohol, given 30 minutes prior to the hemorrhage, impairs the cardiovascular an respiratory compensation for severe blood loss and results in greater mortality.

DTIC

Shock (Physiology); Myocardium; Heart Function; Medical Science

20010041162 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA

A Comparison of Male and Female Acceleration Responses During Laboratory Frontal -Gx Axis Impact Tests ***Final Report, Aug. 1995-Apr. 1999***

Buhrman, John R.; Perry, Chris E.; Dec. 2000; 171p; In English

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

Report No.(s): AD-A387802; AFRL-HE-WP-TR-2001-0022; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The incorporation of women into combat aircraft is expected to result in greater numbers of cockpit ejections with female crewmembers. Current safe ejection criteria are based on injury models which were established and validated using predominantly male data, and therefore do not fully take into account differences in biodynamic response due to size and gender. Recently the Air Force Research Laboratory (AFRL) has been addressing this deficiency by conducting experiments to evaluate gender differences using a population of female test subjects. In this study, male and female subjects were exposed to frontal impact acceleration pulses using a horizontal impulse acceleration facility. Acceleration responses were measured on the upper back at a point approximately in line with the first thoracic vertebral body. Analytical techniques were developed and used to compute the undamped natural frequency and damping coefficient ratio of these responses for each subject assuming a linear second-order approximation of the transfer of acceleration to the measurement point. No significant differences were found between males and females in either of these two parameters, nor was there any significant difference in the mean peak magnitude or mean time-to-peak of the measured acceleration response.

DTIC

Emergencies; Flight Crews; Ejection Seats; Acceleration Measurement; Attack Aircraft; Pilots (Personnel); Females; Armed Forces

20010041182 House Ear Inst., Los Angeles, CA USA

Natural History of Vestibular Schwannomas in Neurofibramatosis Type 2 (NF2) ***Annual Report, 1 Oct. 1999-30 Sep. 2000***

Slattery, William H., III, House Ear Inst., USA; Oct. 2000; 15p; In English

Contract(s)/Grant(s): DAMD17-98-1-8612

Report No.(s): AD-A387739; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Neurofibromatosis 2 (NF2) is an autosomal disorder characterized by the development of multiple nervous system tumors such as vestibular schwannomas. The purpose of the study is to define the growth rate and clinical course of vestibular schwannomas in NF2- affected individuals. We will develop an international consortium of clinical centers with expertise in NF2, standardize the radiographic analysis of the vestibular schwannomas, assess the patients' audiological functioning, and analyze molecular, pathological, and clinical features of the disease over the course of 3 years. We have enrolled 97% of the target goal

of 100 study participants. The difficulty enrolling patients has stemmed from a protracted informed consent approval process and one co-Pi leaving a core site. Baseline audiological data and baseline MRI have been collected for 64% and 71% of enrolled subjects, respectively. We have made good progress toward completion of the study's goals and anticipate few problems with the collection of one-year follow-up data.
DTIC
Neoplasms; Nervous System; Radiography; Vestibules; Diseases

20010041315 RAND Corp., Santa Monica, CA USA
Putting Practice Guidelines to Work in the Department of Defense Medical System: A Guide for Action
Nicholas, Will, RAND Corp., USA; Farley, Donna O., RAND Corp., USA; Vaiana, Mary E., RAND Corp., USA; Cretin, Shan, RAND Corp., USA; January 2001; 101p; In English
Contract(s)/Grant(s): DASW01-96-C-0004
Report No.(s): AD-A387804; RAND/MR-1267-A; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

This guide describes a processes that will help your MTF successfully achieve evidence-based practice, a major priority of the DoD. The guide is designed as a resource for those key staff members charges with carrying out DoD/VA guide-line implementation effort within an MFT. These key staff members include the: (1) Guideline champion: the primary care clinical opinion leader with expertise in the content of the guide-line why acts as the primary clinical consultant and advocate for implementation. and (2) Implementation team facilitator: the clinical or administrative manager who coordinates the activities of the guide-line implementation team. Although the guide is not designed for use by the MTF command, the ultimate success of the guide-line implementation strategies it described will depend in large part on the strength of leadership support for the implementation effort. Key elements of this support are described in Appendix A, which "speaks to" the MTF Commander and his/her command team. to facilitate its use, Appendix A is also available as a separate document.
Author
Defense Program; Leadership; Effectiveness; Systems Health Monitoring

20010041337 New England Research Institutes, Watertown, MA USA
A Longitudinal Study of Bone Turnover, Menopause, Aging, and Ethnicity as Risk Factors for Osteoporosis ***Annual Report, 25 Sep. 1998-24 Sep. 1999***
McKinlay, Sonja M., New England Research Institutes, USA; Oct. 1999; 47p; In English
Contract(s)/Grant(s): DAMD17-96-C-6118
Report No.(s): AD-A386561; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This four-year study is a very cost-efficient and timely longitudinal study of bone turnover markers in an ethnically diverse sample of mid-aged women as they experience the menopause transition. Building on the multisite Study of Women's Health Across the Nation (SWAN), already funded by the National Institutes of Aging and Nursing Research at the National Institutes of Health, this study proposes to analyze already collected and stored specimens of serum to measure bone formation (using an immunoradiometric assay of osteocalcin) and stored urine specimens to measure bone resorption (using urinary N-telopeptide of type I collagen). These two measures will be combined with data from SWAN on bone density (spine, hip and total body), ovarian aging (endogenous sex hormones and menstrual bleeding), medications, medical history, social and psychological assessments, and life style factors (exercise, diet, smoking, body mass) to address four research aims. For each of these aims, specific hypotheses will be investigated using data collected at up to four annual visits as well as menstrual bleeding data collected annually from monthly calendars kept by the subjects. to date, major progress on the study includes completion of bone marker assays for two of the three planned study visits, specification of priority manuscripts and conduct of preliminary analyses of the relation of bone markers and bone density to ethnicity, menopause status, and the correlation of bone density to bone turnover markers.
DTIC
Bones; Osteoporosis; Menstruation; Females; Assaying; Aging (Biology); Bone Demineralization

20010041357 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France
Operational Colour Vision in the Modern Aviation Environment ***la Vision des Couleurs dans l'environnement Aeronautique Operationnel d'aujourd hui***
March 2001; 176p; In English
Report No.(s): RTO-TR-016; AC/323(HFM-012)TP/6; ISBN 92-837-1026-6; Copyright Waived; Avail: CASI; A09, Hardcopy; C01, CD-ROM

In the past, standards and procedures for the examination of colour vision were based on red, green and white colour signals, together with the beacons associated with traditional navigational aids, originally developed for maritime or rail transport and subsequently adapted to the aeronautical environment. Many of these systems are still in service today. The role of colour in the military environment has been considerably extended, with the whole of the spectrum sometimes being used, rather than just a few limited colours. The visual requirements associated with this proliferation of colours call into question not only operational or ergonomical colour choices but also the procedures used to test professional colour sense. This can no longer be based solely on red, green and white discrimination or on screening for congenital masculine defective colour vision. Colour deficiencies of various origins are frequent and affect men and women to an equal extent. They affect both red and green vision and blue and yellow vision, which can be problematic when using modern day electronic displays. Finally, multiple filters can be placed between the outside world and the operator's eyes so as to protect him from high intensity light, lasers etc. These protective devices can themselves cause modification of colour vision, thereby interfering with the task to be carried out. What, then, is the latest data available on colour perception? How, and with what equipment or procedures can we test professional colour sense rather than colour vision anomalies? These two questions illustrate in part the purpose of the explanations and the scientific and technical bases provided in this document.
Author
Color; Color Vision; Human Factors Engineering

20010041384 National Cancer Inst., Bethesda, MD USA
Report of the Brain Tumor Progress Review Group
November 2000; 116p; In English
Report No.(s): PB2001-103683; NIH/PUB-01-4902; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

Brain tumors represent a unique challenge in that they affect the organ that is the essence of the "self." Furthermore, because each area of the brain serves a different but vital function, the therapy that is most effective for other cancers, surgical removal of either the entire organ or the tumor with a generous surround of normal tissue, cannot be used to cure brain tumors. Unfortunately, most brain tumors are relatively insensitive to other cancer treatment, including radiation and chemotherapy.
NTIS
Brain; Cancer

20010041385 Department of Health and Human Services, Office on Women's Health, 2000, Washington, DC USA
Breastfeeding: HHS Blueprint for Action on Breastfeeding
2000; 36p; In English
Report No.(s): PB2001-103696; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Breastfeeding is one of the most important contributors to infant health. Breastfeeding provides a range of benefits for the infants growth, immunity, and development. In addition, breastfeeding improves maternal health and contributes economic benefits to the family, health care system, and workplace. Despite the many benefits of breastfeeding in the USA are low, especially at 6 months postpartum. In 1998, the year for which the most recent statistics are available, only 29% of all mothers breastfed at 6 months postpartum. Moreover, racial and ethnic disparities in breastfeeding rates are wide and reveal alarmingly low breastfeeding rates among African American women (19% at 6 months postpartum). The nation must address these low breastfeeding rates as a public health challenge and put in place national, culturally appropriate strategies to promote breastfeeding.
NTIS
Food Intake; Children; Birth; Ethnic Factors

20010041387 Mine Safety and Health Administration, USA
MSHA Handbook Series: Accident/Illness Investigations Procedures
November 2000; 178p; In English
Report No.(s): PB2001-103705; MSHA/HB/PH(00)-(1)-(5); No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

This handbook provides direction for the investigation of accidents and other occurrences involving health and safety in coal and metal and nonmetal mines pursuant to the Mine Act. MSHA's accident investigation procedures are designed to result in efficient and orderly collection of all information relevant to a mining accident and to provide guidance for investigators in determining accident causes. Upon conclusion of the investigation and review and analysis of all relevant information, MSHA

issues a report describing its findings and conclusions. The purpose of the report is to disseminate this information to the mining community and others for purposes of accident prevention.
NTIS
Handbooks; Accident Investigation; Accident Prevention; Health; Safety

20010041388 Department of Health and Human Services, Rockville, MD USA
National Directory of Drug and Alcohol Abuse Treatment Programs 2000
October 2000; 618p; In English
Contract(s)/Grant(s): 283-97-9001
Report No.(s): PB2001-103726; DHHS/PUB/SMA-01-3478; No Copyright; Avail: CASI; A06, Microfiche; A99, Hardcopy
The National Directory of Drug and Alcohol Abuse Treatment Programs - 2000 is a listing of Federal, State, local, and Private facilities that provide substance abuse treatment services. It includes only those treatment facilities that are licensed, certified, or otherwise approved by their State substance abuse agencies for inclusion in the Directory and that responded to the 1999 Uniform Facility Data Set (UFDS) survey.
NTIS
Directories; Therapy; Programs

20010042786 Air Force Research Lab., Human Effectiveness Directorate, Brooks AFB, TX USA
Variable Name Dictionary for the Air Force Health Study 1992 Questionnaire and Analyses Diskette ***Interim Report, 1 Apr. - 1 Sep. 2000***
Michalek, Joel E., Air Force Research Lab., USA; September 2000; 141p; In English
Contract(s)/Grant(s): Proj. 2767
Report No.(s): AD-A387728; AFRL-HE-BR-SR-2000-0008; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy
The Air Force Health Study is a 20-year comprehensive assessment of the health of Air Force Veterans of Operation Ranch Hand, the unit responsible to the aerial spraying of herbicides in Vietnam. The study contrasts the health and noncombat mortality of Ranch Hand veterans with a comparison group of Air Force veterans who also served in Southeast Asia but did not spray herbicides. This diskette contains data collected at the fourth Air Force Health Study physical examination.
DTIC
Health; Physical Examinations; Dictionaries

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20010040830 Ohio State Univ., Dept. of Psychology, Columbus, OH USA
Examining the Relationship Between Mental Workload and Situation Awareness in a Simulated Air Combat Task ***Interim Report, Jan.-Jun. 2000***
Alexander, Amy L.; Nygren, Thomas E.; Vidulich, Michael A.; Jun. 2000; 24p; In English
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A387928; AFRL-HE-WP-TR-2000-0094; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Seven pilots participated in an experiment designed to assess the relationship between mental workload and situation awareness. Participants flew simulated air intercepts against four bombers supported by two fighters. The experiment contrasted two cockpit designs. The conventional cockpit used traditional independent gauges for flight and tactical information. The virtually augmented candidate cockpit used advanced interface concepts. The task scenario consisted of four mission phases that were designed to influence pilot mental workload and situation awareness. An inverse relationship was observed between mental workload and situation awareness as influenced by cockpit design and phase of mission. This shows the importance of assessing both mental workload and situation awareness when assessing system effectiveness.
DTIC
Cockpits; Mental Performance; System Effectiveness; Workloads (Psychophysiology)

20010040995 Armstrong Lab., Williams AFB, AZ USA

A Tale of Two Test Batteries: A Comparison of the Air Force Officer Qualifying Test and the Multidimensional Aptitude Battery ***Interim Report, Jun - Aug. 1997***

Carretta, Thomas R., Armstrong Lab., USA; Retzlaff, Paul D., Armstrong Lab., USA; King, Raymond E., Armstrong Lab., USA; Dec. 1997; 18p; In English

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

Report No.(s): AD-A341174; AL/HR-TP-1997-0052; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Air Force Officer Qualifying Test (AFOQT) and the Multidimensional Aptitude Battery (MAB) were administered to 2,233 U.S. Air Force pilot candidates to investigate the common sources of variance in these batteries. The AFOQT was operationally administered as part of the officer commissioning and aircrew selection testing requirement. The MAB is a clinical test battery and was administered to provide an intellectual baseline to assist clinicians when it becomes necessary to evaluate pilots with cognitive referral questions. A joint factor analysis of the AFOQT and MAB revealed that each battery had a hierarchical structure. The higher-order factor in the AFOQT previously had been identified as general cognitive ability (g). The intercorrelation between the higher-order factors from the batteries was .981, indicating that both measured g. Although both batteries measured g and included verbal, spatial, and perceptual speed tests, the AFOQT also included tests of aviation knowledge not found in the MAE. Additional studies are required to evaluate the utility of the AFOQT for clinical assessment and the MAB for officer and aircrew selection.

DTIC

Abilities; Aptitude; Flight Crews; Mental Performance

20010043693 Civil Aeromedical Inst., Oklahoma City, OK USA

Latent Trait Theory Analysis of Changes in Item Response Anchors ***Final Report***

Farmer, W. L.; Thompson, R. C.; Heil, S. K. R.; Heil, M. C.; Feb. 2001; 24p; In English; Original contains color illustrations; Prepared in cooperation with Oklahoma Dept. of Mental Health and Substance Abuse Services, Oklahoma City, OK

Report No.(s): PB2001-104657; DOT/FAA/AM-01/4; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The purpose of this study was to evaluate the effect that modifications in item response anchors have on responses to survey items. Twenty-nine items were administered in 1993 and 1995 as part of more extensive attitude surveys to two random samples of Federal Aviation Administration employees. Changes in the response scales (5-point Likert) between the two survey administrations ranged from no change at all to extensive re-anchoring of the response categories. Item responses were modeled via two-parameter graded response models based on item response theory.

NTIS

Human Behavior; Psychology; Responses

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

20010040915 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA

Comparison of Hands-Free Versus Conventional Wearable Computer Control for Maintenance Applications ***Final Report, 15 Dec. 1998 - 30 Sep. 1999***

McMillan, Grant R.; Calhoun, Gloria L.; Masquelier, Barbara J.; Grigsby, Scott S.; Quill, Laurie L.; Oct. 1999; 9p; In English

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

Report No.(s): AD-A387933; AFRL-HE-WP-SR-2001-0005; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Past research on wearable computers for maintenance applications has focused on developing displays and presentation formats. This study emphasized wearable computer control technologies. Alternative control technologies were compared with standard and voice controls. Twelve subjects performed a synthetic maintenance task using three control device combinations for three different types of input. Time and error data were collected. The results show that for pointer movement, standard controls took significantly longer than voice. For discrete input, standard controls required significantly more time than voice and alternative controls. However, there were no significant time differences among controllers for text entry fill-in. Error results showed no significant differences. This research suggests that alternative and voice controls provide similar performance levels

and both are superior to standard controls. In environments with changing noise spectra and noise levels such as a flight line, the alternative control suite provides hands-free control that complements voice without sacrificing performance.
DTIC
Control Equipment; Flight Control; Maintenance; Display Devices; Computers

20010041029 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Development of Improved Performance Research Integration Tool (IMPRINT) Performance Degradation Factors for the Air Warrior Program ***Final Report***
Salvi, Lucia; Jan. 2001; 83p; In English
Report No.(s): AD-A387840; ARL-TR-2311; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Human Research & Engineering Directorate of the US Army Research Laboratory was asked by the Program Manager for Aircrew Integrated Systems (PM ACIS) to examine the effects of clothing and individual equipment (CIE) and aircrew life support equipment (ALSE) on the performance of Army aviators. These effects were quantified in terms of the additional time needed to perform certain types of tasks as a direct result of the equipment and ensembles. Through the completion of detailed questionnaires by subject matter experts, estimates of performance were collected and analyzed, and a set of performance degradation factors was developed. This methodology was developed in concert with the modeling tool, the Improved Performance Research Integration Tool (IMPRINT), in order to predict the effects of CIE and ALSE on mission- and system-level performance through detailed computer modeling. This methodology demonstrated success in converting otherwise subjective data into a quantifiable and generalizable modeling approach.
DTIC
Flight Crews; Computerized Simulation; Human Performance; Performance Prediction

20010041352 North Carolina Agricultural and Technical State Univ., Greensboro, NC USA
A Neural Network Model for Human Workload Simulation in Complex Human-Machine System ***Final Report, May 1998 - Oct. 1999***
Ntuen, Celestine A., North Carolina Agricultural and Technical State Univ., USA; Li, Robert, North Carolina Agricultural and Technical State Univ., USA; December 1999; 56p; In English
Contract(s)/Grant(s): F41624-98-1-0002; AF Proj. 7184
Report No.(s): AD-A387791; IHMS-99-003/USAF; AFRL-HE-WP-SR-2000-0009; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The overall goal of this study is to develop neural network models for analysis of electroencephalogram (EEG) data and use the results obtained to classify the level of mental workload experienced by humans during task processing. The study uses EEG data on piloting tasks from the STORM (Simulator for Tactical Operations Research and Measurement) experiments performed at the Cognitive Assessment Laboratory of the Human Effectiveness Directorate at Wright-Patterson AFB. Comparisons of classical backpropagation neural networks (CBNN) and resilient backpropagation neural networks (RBNN) were conducted. The RBNN performed 50% faster in deriving a model for cognitive load with a marginal decrease in classification accuracy over the CBNN. The results indicate that the neural network model can successfully classify mental workload states at an average rate of 83%. The results obtained indicate that neural network models can be used to automate the classification of human mental workload based on EEG signal data.
DTIC
Neural Nets; Accuracy; Man Machine Systems; Mental Performance; Network Analysis; Pilot Performance; Workloads (Psychophysiology)

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.

20010040828 University of Southern California, Information Sciences Inst., Marina del Rey, CA USA
Advanced Scalable Networking Technology ***Final Report, Oct. 1995-Sep. 1999***
Granacki, John; Jan. 2001; 59p; In English
Contract(s)/Grant(s): F30602-95-C-0296; DARPA ORDER-C929; AF Proj. C929
Report No.(s): AD-A387991; AFRL-IF-RS-TR-2000-170; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Advanced Scalable Network Technology (ASNT) effort was a very ambitious project with several significant research facts: the split network concept, the Trans-scalar Programming Model, subnet integration protocols and techniques identified in the initial goals along with the DES encryption VLSI. The results show the split network concept to be very powerful, providing a 50% increase in communication traffic before congestion and two orders of magnitude less variance in latency on a low-latency control network. The DES VLSI implementation proved the feasibility of real-time DES support which is essential for applications requiring security, high throughput and low latency. The Trans-scalar Programming Model effort produced a hierarchical framework to solve scalable programming problems and led to a parallel version of heapsort and a scale-invariant hardware architecture. Moreover, the ASNT hardware implementation is being used as a host and test bed for PIM (Processor in Memory devices on the DIVA (Data Intensive Architecture) project.
DTIC
Computer Programming; Very Large Scale Integration; Real Time Operation; Computer Networks; Parallel Processing (Computers); Architecture (Computers)

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.

20010040808 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
CMMI for Systems Engineering/Software Engineering/Integrated Product and Process Development, Version 1.02
Nov. 2000; 689p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A387881; CMU/SEI-2000-TR-030; ESC-TR-2000-095; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

A model is a simplified representation of the world. Capability Maturity Models (CMMs) contain the essential elements of effective processes for one or more disciplines. These elements are based on the concepts developed by Crosby, Deming, Juran, and Humphrey Crosby 79, Juran 88, Deming 86, Humphrey 89. Like other CMMs, Capability Maturity Model-Integrated (CMMI) models provide guidance to use when developing processes. CMMI models are not processes or process descriptions. The actual processes used in an organization depend on many factors, including application domain(s) and organization structure and size. In particular, the process areas of a CMMI model may not map one-to-one with the processes used in your organization.
DTIC
Models; Organizations; Project Management; Management Planning

20010040821 Army Engineer Research and Development Center, Vicksburg, MS USA
HyPAS User's Manual: A Hydraulic Processes Analysis System. An Extension for ArcView GIS, Version 4.0.1 ***Final Report***
Pratt, Thad C., Army Engineer Research and Development Center, USA; Cook, Daryl S., Digital Information and Mapping Co., USA; January 2001; 44p; In English; Prepared in collaboration with Digital Information and Mapping Company (DIMCO), Inc., Vicksburg, MS
Report No.(s): AD-A387601; ERDC/CHL-TR-01-1; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Modern electronic instrumentation produces large amounts of data. Often, this abundance of data is not fully utilized because the engineer or scientist does not have an effective way to visualize and analyze it within project time schedule. This problem can be minimized by a set of tools that provides ready capability to visualize, analyze, reduce, and efficiently plot data obtained from such instrumentation. Additionally, such a tool can take advantage of geographically referenced data of high spatial accuracy. HyPAS is designed to be a Geographic Information System (GIS) for hydraulic information. GIS, a computer system capable of managing, storing, manipulating, and displaying geographically referenced data, is the logical solution to such a problem, in particular considering the combination of spatial accuracy needs and database management needs. A mapping system alone lacks database management capabilities. A spreadsheet or database management system contains little or no accurate mapping capabilities. GIS software provides both applications with a robust set of tools capable of manipulating large amounts of data with high spatial accuracy; however, typically a substantial learning investment is required to become proficient with GIS software.
DTIC
Hydraulic Equipment; Data Base Management Systems; Geographic Information Systems; Schedules

20010040854 National Inst. of Standards and Technology, Center for Manufacturing Engineering, Gaithersburg, MD USA
Systems Integration for Manufacturing Applications, Biennial Report, Fiscal Years 1999-2000
Fowler, J. E.; Carlisle, M.; Feb. 2001; 98p; In English
Report No.(s): PB2001-102889; NISTIR-6721; Copyright; Avail: National Technical Information Service (NTIS)

The Systems Integration for Manufacturing Applications (SIMA) Program is an intramural effort being undertaken at the National Institute of Standards and Technology (NIST) to support the application of information technologies to the manufacturing domain. Initiated in 1994, the Program works with industry to develop technology solutions enabling integration of the systems used in the engineering and manufacturing of various kinds of products. NISTs SIMA Program is the agency's coordinating focus for its activities addressing the information interface needs of the U.S. manufacturing community. Specifically, the SIMA Program performs the following activities: Develops standards and tests for information exchange and interface protocols addressing lack of interoperability in manufacturing systems and Provides online access to NIST-resident Capabilities supporting engineering and manufacturing technologies.
NTIS
Manufacturing; Systems Integration; Data Bases

20010040881 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
CMMI for Systems Engineering/Software Engineering, Version 1.02
Ahern, Dennis; Bate, Roger; Konrad, Mike; Nov. 2000; 606p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A387673; CMU/SEI-2000-TR-019; ESC-TR-2000-019; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

Like other CMMs, Capability Maturity Model-Integrated (CMMI) models provide guidance to use when developing processes. CMMI models are not processes or process descriptions. The actual processes used in an organization depend on many factors, including application domain(s) and organization structure and size. In particular, the process areas of a CMMI model may not map one-to-one with the processes used in your organization. The CMM IntegrationSM3 project was formed to sort out the problem of using multiple CMMs. Our project's mission was to combine three source models-(1) Capability Maturity Model for Software (SW-CMM) v2.0 draft C, (2) Electronic Industries Alliance/Interim Standard (EIA/IS) 731, and (3) Integrated Product Development Capability Maturity Model (IPD-CMM) v0.98-into a single model for use by organizations pursuing enterprise-wide process improvement.
DTIC
Quality Control; Project Management; Product Development; Computer Programming

20010040911 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA
A Technology Investigation Supporting Software Architecture and Analysis for Evolution ***Final Report, Feb. 1997 - Sep. 2000***
Garlan, David; Shaw, Mary; Wing, Jeannette; Feb. 2001; 37p; In English
Contract(s)/Grant(s): F30602-97-2-0031; DARPA ORDER-E095; AF Proj. E095
Report No.(s): AD-A387984; AFRL-IF-RS-TR-2001-14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report we summarize the approaches and result of the project "A Technology Investigation Supporting Software Architecture and Analysis for Evolution," carried out at Carnegie Mellon University under funding from the DARPA Evolutionary Design of Complex Systems Program. in this project we addressed problems in managing the evolution of complex software by providing new technology to describe and analyze a system's software architecture. This report summarizes our efforts in two areas: (1) understanding an existing systems in preparation for making changes, and (2) actually making the changes to the system correctly. We also describe the application of our techniques and tools to industrial and defense architecture.
DTIC
Computer Systems Programs; Software Engineering; Architecture (Computers); Project Management; Technology Assessment

20010040912 Naval Postgraduate School, Monterey, CA USA
Analysis, Design and Implementation of a Web Database With Oracle 8I
Demiryurek, Ugur; Mar. 2001; 109p; In English
Report No.(s): AD-A387957; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis represents a model of web-database analysis, design and implementation. An electronic bulletin board for the Naval Postgraduate School is implemented for demonstration. The model includes Oracle8i DBMS as the database, Java (Java Server Pages, Java Script Enterprise Java Beans, Java Servlets) as the programming language. Apache HTTP Server v.1.3 Tomcat

v.1.2 is used as the Web server and JSP engine. Windows NT4.O served as the OS environment From the technical aspect, Database Management Systems, Web-Database Architectures, Server Extension Programs, Oracle8i as well as several other software and hardware components are reviewed, and some are recommended.
DTIC
Data Bases; Data Base Management Systems; Data Management; Information Systems

20010040997 North Carolina State Univ., Raleigh, NC USA
OmniDesk and OmniFlows: Platform-Independent Executable and User-Reconfigurable Desktops and Workflows on the Internet
Lavana, H.; Brglez, F.; October 1997; 9p; In English
Contract(s)/Grant(s): DAAH04-94-G-0280
Report No.(s): AD-A344503; ARO-33616.6-EL; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Today, web browsers provide a convenient access to the Internet while (1) increasing the number of useful desktop functions, and, (2) reducing the platform dependence on the operating system of the host. This paper introduces OmniDesk, implemented as an applet, that creates a user configurable desktop within the web browser window. The user can place any number of objects onto the OmniDesk, ranging from windows that display the contents of a directory or a file on a remote host, to OmniFlow applets that can execute any sequence of user defined and data dependent tasks. Identical versions of OmniDesk and a variety of OmniFlow class libraries can be mirrored on several web sites or can be installed locally for faster access and execution. An OmniFlow is a user created directed dependency graph of data, program, decision, and OmniFlow nodes. Data and program nodes may reside anywhere on the Internet. The proposed approach has a number of advantages over the current html form based execution of CGI programs and applets. Most significantly, the OmniFlow captures, hierarchically, any number of user defined and data dependent task sequences, including ones that have cycles; a feature that would be impractical to implement with current html form based approaches. The data and program node configurations consist of one time only form entries which can be used and re-used in any number of OmniFlows.
DTIC
Document Markup Languages; Graph Theory; Graphs (Charts)

20010041035 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
CMMI for Systems Engineering/Software Engineering, Version 1.02 (CMMI-SE/SW, V1.02)
Nov. 2000; 598p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A387848; CMU/SEI-2000-TR-018; ESC-TR-2000-018; No Copyright; Avail: CASI; A25, Hardcopy; A06, Microfiche

A model is a simplified representation of the world. Capability Maturity Models (CMMs) contain the essential elements of effective processes for one or more disciplines. These elements are based on the concepts developed by Crosby, Deming, Juran, and Humphrey Crosby 79, Juran 88, Deming 86, Humphrey 89. Like other CMMs, Capability Maturity Model-Integrated (CMMI) models provide guidance to use when developing processes. CMMI models are not processes or process descriptions. The actual processes used in an organization depend on many factors, including application domain(s) and organization structure and size. In particular, the process areas of a CMMI model may not map one-to-one with the processes used in your organization.
DTIC
Computer Programming; Models; Software Engineering; Systems Engineering; Project Management

20010041036 Czech Technical Univ., Dept. of Cybernetics, Prague, Czechoslovakia
Applications of Multi-Agent Systems in Communications *Final Report*
Pechoucek, Michal; Stepankova, Olga; Marik, Vladimir; Sep. 26, 2000; 43p; In English
Contract(s)/Grant(s): F61775-99-W-E099
Report No.(s): AD-A387853; EOARD-SPC-99-4099; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Czech Technical University of Prague as follows: The contractor will investigate and further develop the applications multi-agent systems can play within modern information and communication systems. Specifically, the contractor will investigate unique capabilities: data-mining techniques to enhance minimized communication between software-agents, as well as the capability to detect variances in transmitted data. The contractor will document these

developments in two interim reports, as well as deliver a conclusive final report and data models as detailed in the technical proposal.
DTIC
Telecommunication; Artificial Intelligence; Data Management; Data Mining

20010041115 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Third DoD Product Line Practice Workshop Report ***Final Report***
Cohen, Sholom; Gallagher, Brian; Fisher, Matthew; Jones, Lawrence; Krut, Robert; Jul. 2000; 81p; In English
Contract(s)/Grant(s): F19628-95-C-0003
Report No.(s): AD-A387259; CMU/SEI-2000-TR-024; ESC-TR-2000-024; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Software Engineering Institute (SEI) held the Third Department of Defense (DoD) Product Line Practice Workshop in March 2000. The workshop was a hands-on meeting to identify industry-wide best practices in software product lines; to share DoD product line practices, experience, and issues; and to discuss ways in which the current gap between commercial best practice and DoD practice can be bridged. This report synthesizes the workshop presentations and discussions.
DTIC
Defense Program; Software Engineering; Product Development

20010041173 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
CMMI for Systems Engineering/Software Engineering/Integrated Product and Process Development, Version 1.02
Nov. 2000; 696p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A387769; CMU/SEI-2000-TR-031; ESC-TR-2000-096; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

A model is a simplified representation of the world. Capability Maturity Models (CMMs) contain the essential elements of effective processes for one or more disciplines. These elements are based on the concepts developed by Crosby, Deming, Juran, and Humphrey Crosby 79, Juran 88, Deming 86, Humphrey 89. Like other CMMs, Capability Maturity Model-Integrated (CMMI) models provide guidance to use when developing processes. CMMI models are not processes or process descriptions. The actual processes used in an organization depend on many factors, including application domain(s) and organization structure and size. In particular, the process areas of a CMMI model may not map one-to-one with the processes used in your organization.
DTIC
Computer Programming; Models; Product Development; Software Engineering; Systems Engineering

20010041301 Carnegie-Mellon Univ., Graduate School of Industrial Administration, Pittsburgh, PA USA
Combining AI and OR in Heuristics and Optimization ***Final Report, 1 Aug. 1996-1 Dec. 1997***
Hooker, John N.; Dec. 01, 1997; 17p; In English
Contract(s)/Grant(s): F49620-96-1-0412
Report No.(s): AD-A388049; AFRL-SR-BL-TR-01-0193; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Mixed logical/linear programming (MLLP) was developed as an extension of mixed integer/linear programming. What appears to be the first practical method of sensitivity analysis for mixed integer/linear programming was developed and applied to a Proctor and Gamble supply chain problem. Consistency-achieving methods of constraint programming were linked with constraint generation methods in operations research. Continuous relaxations were identified for mixed discrete/continuous optimization problems that can accelerate their solution within a logic-based approach. A research monograph, Logic-Eased Methods for Optimization, was written.
DTIC
Linear Programming; Mathematical Logic; Sensitivity Analysis; Operations Research; Integers

20010041302 Florida Univ., Dept. of Computer and Information Sciences, Gainesville, FL USA
On Web-Based Models and Repositories ***Final Report, Sep. 1998 - Aug. 2000***
Fishwick, Paul A.; Hopkins, John F.; Lee, Kangsun; Jan. 2001; 169p; In English
Contract(s)/Grant(s): F30602-98-C-0269; AF Proj. 4600
Report No.(s): AD-A387988; AFRL-IF-RS-TR-2001-3; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This document contains a description of research performed at the University of Florida on the concept and implementation of web-based models and repositories. The document is divided into three sections. The first section briefly presents an overview

of the contract; what was accomplished, why certain areas were pursued, and how those efforts contribute to the field of modeling, in particular, and computer simulation, more generally. The second section represents papers published by the research group; while the final section is comprised of classic readings that bear a relation to this project and to the philosophical foundations behind it.
DTIC
Software Engineering; Object-Oriented Programming

20010041306 Massachusetts Inst. of Tech., Cambridge, MA USA
Decomposing Large, Complex, Concurrent Systems into Manageable Building Blocks ***Final Report, 1 May 1997 - 31 Oct. 1999***
Lynch, Nancy; Feb. 21, 2001; 36p; In English
Contract(s)/Grant(s): F49620-97-1-0337
Report No.(s): AD-A387959; AFRL-SR-BL-TR-01-0163; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This project produced many techniques to assist developers in decomposing large, complex, concurrent systems into manageable building blocks. (1) Foundations: A new mathematical modeling framework was developed for hybrid (discrete/continuous) systems. Also, new methods for using small finite-state abstractions in verifying complex distributed algorithms were developed. (2) Distributed systems (2a) Compositional modeling and analysis methods were utilized in the design of several services for group-oriented computation in fault-prone distributed networks. In particular, group communication services supporting a changing set of participating clients, and a group membership service suitable for WANs, were designed and developed. The methods were also used to validate (and find an error in) the Ensemble group communication system. (2b) Substantial progress was made on a mathematical framework for analyzing weakly coherent multiprocessor memories and the programs that use them. (2c) The modeling and analysis methods were also used to develop a new weakly coherent (eventually serializable) data service for distributed networks, and to analyze standard communication protocols, security protocols, and operating systems. (3) Automated transportation systems: The new hybrid system modeling framework was applied to the task of analyzing the behavior of automated multi-vehicle transportation systems. This work included analysis of both ground and air transportation systems. (4) Programming language development: The IOA specification and programming language was defined. A high-level design was produced for a toolset including validation and code generation tools, and substantial progress was made on detailed design and implementation of the toolset.
DTIC
Systems Engineering; Data Management; Complex Systems; Decomposition

20010041561 NASA Ames Research Center, Moffett Field, CA USA
Computational Analysis of Forebody Tangential Slot Blowing on the F/A-18
Gee, Ken, MCAT Inst., USA; Rizk, Yehia M., NASA Ames Research Center, USA; Schiff, Lewis B., NASA Ames Research Center, USA; [1994]; 1p; In English; 4th; NASA High Alpha Conference/Workshop, 12-14 Jul. 1994, Edwards, CA, USA
Contract(s)/Grant(s): RTOP 505-68-00; No Copyright; Avail: Issuing Activity; Abstract Only
An overview of the computational effort to analyze forebody tangential slot blowing for use on the F/A-18 aircraft is presented. Tangential slot blowing generates side force and yawing moment which may be used to control the aircraft flying at high angle of attack. Computations using the isolated forebody are obtained at full-scale wind tunnel test conditions for direct comparison with available experimental data. The effects of jet exit conditions, jet length, and jet location are also studied using the isolated forebody. In addition, these computations are used to predict the effect of slot blowing at transonic maneuvering flight conditions. The effects of over- and under-blowing on force and moment production are analyzed. Non-time-accurate solutions are obtained to determine the steady-state side force and yawing moments generated by tangential slot blowing. Time-accurate solutions are obtained to study the force onset time lag of tangential slot blowing. The effect of blowing on the burst point location are then analyzed by obtaining computations using the aircraft geometry, which includes the wing, empennage, and faired-over inlets. The effect of blowing on the buffet loads on the vertical tails are analyzed using time-accurate computations. Comparison with available experimental data from full-scale wind tunnel and sub-scale wind tunnel tests are made. This computational analysis compliments the experimental results and provides a detailed understanding of the effects of tangential slot blowing on the flow field about the F/A-18.
Author
Tangential Blowing; Slots; Forebodies; Wind Tunnel Tests; Flow Distribution

20010042797 Naval Postgraduate School, Monterey, CA USA

JAVA-Based Implementation of Monterey-Miami Parabolic Equation (MMPE) Model with Enhanced Visualization and Improved Method of Environmental Definition

Ha, Yonghoon; Dec. 2000; 81p; In English; Original contains color plates

Report No.(s): AD-A387980; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Monterey-Miami Parabolic Equation (MMPE) Model is a full-wave underwater acoustic propagation model that utilizes the split-step Fourier marching algorithm. Previously the MMPE model was implemented in FORTRAN language and ran with a simple command line interface either in a UNIX or DOS command window. After the FORTRAN code was run, the resulting binary data output file was post-processed using Matlab routines to extract specific field data and present the results in graphical form. This approach requires the user to have installed both Matlab and FORTRAN compilers. The MMPE model and associated acoustic processing tools are now rewritten in the object-oriented language Java. This new version of the MMPE model built within a Windows framework is called WinMMPE. Integrating the model, the post-processing calculations and the graphics generation together with a graphic user interface has produced a more attractive tool for users. A user-friendly, efficient, and accurate full-wave acoustic propagation model with enhanced visualization can make it easier to assess the spatial transmission loss in the underwater acoustic environment.

DTIC

Java (Programming Language); Underwater Acoustics; Acoustic Propagation; Applications Programs (Computers); Wave Equations

20010042798 Cincinnati Univ., OH USA

Reconfigurable and Adaptive Computing Environments ***Final Report, 7 Aug. 1996 - 8 Aug. 1999***

Bhatia, Dinesh; Mar. 2000; 85p; In English

Contract(s)/Grant(s): F33615-96-C-1912; AF Proj. 6096

Report No.(s): AD-A387981; AFRL-IF-WP-TR-2001-1511; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This Reconfigurable Computing (RC) or Adaptive Computing System (ACS) program focused on the development of both reconfigurable computing platforms and the associated programming support environments to demonstrate the viability of RC. This was demonstrated by exploring the ability to program RCs in a main/integrated C application program and by investigating new, partially reconfigurable technology. A Xilinx 4000 Field Programmable Gate Array (FPGA) series board and a Xilinx 6200 FPGA-based board were developed as pant of this effort. The C compiler technology was developed more for a hardware pragma-based implementation, which leveraged hardware macro libraries and worked quite effectively. The Xilinx 6200 board was interesting from the standpoint that the 6200 FPGAs are partially reconfigurable. The shortfalls of this product family include poor chip design/manufacture, resulting in the inability to utilize a good portion of the FPGA logic resources. Another shortfall is a lack of functional programming tools. In spite of these problems, the team was able to exercise the partial reconfigurability of the devices by developing programming tools of their own.

DTIC

Computer Programming; Software Development Tools; Programming Environments

20010043649 General Accounting Office, Washington, DC USA

FAA Computer Security: Concerns Remain due to Personnel and Other Continuing Weakness.

August 2000; 17p; In English

Report No.(s): PB2001-104177; GAO/AIMD-00-252; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The purpose of this report is to provide an interim update on the status of FAA's computer security efforts. Specifically, our objectives are to discuss (1) FAA's history of computer security weakness, as described in our May 1998 and December 1999 reports, and our prior recommendations to address those weaknesses, (2) FAA's progress in implementing our recommendations and its own personnel security policy, including our assessment of the adequacy of those actions, and (3) the preliminary results of our ongoing work.

NTIS

Computer Information Security; Selective Dissemination of Information; Information Flow

20010043659 South Carolina Univ., Dept. of Mathematics, Columbia, SC USA

Data Compression and Harmonic Analysis

Donocho, David L., Stanford Univ., USA; Vetterli, Marin, California Univ., USA; DeVore, R. A., South Carolina Univ., USA; Daubechies, Ingrid, Princeton Univ., USA; Apr. 02, 2001; 44p; In English

Contract(s)/Grant(s): DAAG55-97-I-0002; F49620-96-I-0228; N00014-91-J1343; N00014-97-0806; F49620-98-I-0044; N00014-96-I-0367; NSF-DMS-95-05151; NSF-MIP-93-213002; NSF-20-52347.97; NSF-DMS-97-06753
Report No.(s): AD-A386770; ARO-37772.9-MA-DPS; Copyright; Avail: Defense Technical Information Center (DTIC)

In this paper we review some recent interactions between harmonic analysis and data compression. The story goes back of course to Shannon's R(D) theory in the case of Gaussian stationary processes, which says that transforming into a Fourier basis followed by block coding gives an optimal lossy compression technique; practical developments like transform-based image compression have been inspired by this result. In this paper we also discuss connections perhaps less familiar to the Information Theory community, growing out of the field of harmonic analysis. Recent harmonic analysis constructions, such as wavelet transforms and Gabor transforms, are essentially optimal transforms for transform coding in certain settings. Some of these transforms are under consideration for future compression standards.
DTIC
Data Compression; Harmonic Analysis; Fourier Analysis

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.

20010040895 Alabama Univ., Huntsville, AL USA
Computer Network Security and Directory Services Architecture ***Final Report***
Johannes, James D.; Fanning, Andrew; Hoover, Kyle; Lewis, Tim; Robinson, Marsha; Mar. 2000; 17p; In English
Contract(s)/Grant(s): DAAH01-97-D-R005
Report No.(s): AD-A387623; ENGR00-J03.1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The University of Alabama in Huntsville appreciates the opportunity to support the development and expansion of the local area network (LAN) for the U.S. Army's Software Engineering Directorate (SED). Our involvement in the earlier development of the LAN provides us with a unique insight into the SED LAN and its users. The team assembled to work on this effort was thus able to provide a historical perspective on technology growth that few others could have. Part of the analysis of a computer network like that at SED involves planning for long term use. This includes planning for new equipment, growth in services, and smooth transitions to new technologies. Planning for new technologies involves ensuring that they can be migrated from the center of the network (high- speed communication between parts of the network) to end user technology (connection to the desktop) as the core of the network is upgraded over time. This process is not unlike the strategy auto manufacturers use, adding a new top of the line model every few years, dropping the lowest end model at the same time. Our recommendations for high-speed networking stem from an analysis of the long-term growth potential of new technologies and the (in) appropriateness of upgrading end user connectivity in the short term.
DTIC
Computer Programming; Local Area Networks; Software Engineering; Electronic Mail

20010040910 Missouri Univ., Kansas City, MO USA
COSMOS: Multi-Layered Network Survivability Project ***Final Report, Jun. 1997 - Jun. 2000***
Medhi, Deep; Tipper, David; Feb. 2001; 25p; In English
Contract(s)/Grant(s): F30602-97-1-0257; DARPA ORDER-F450; AF Proj. F450
Report No.(s): AD-A387986; AFRL-IF-RS-TR-2001-16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A major attack can significantly reduce the capability to deliver services in large scale networked information systems. In this project, we have addressed the survivability of large-scale heterogeneous information systems which consist of various services provided over multiple interconnected networks with different technologies. The communications network portions of such systems are referred to as multi-networks. We specifically address the issue of survivability due to physical attacks that destroy links and nodes in multi-networks. The end goal is to support critical services in the face of a major attack by making optimum use of network resources while minimizing network congestion. This is an area which is little studied, especially for large-scale heterogeneous systems. In this report, we present an overview of our contribution in this area.
DTIC
Communication Networks; Information Systems; Computer Networks

20010041034 Naval Postgraduate School, Monterey, CA USA
Enhancing Traditional Classroom Instruction Through Computer Mediated Communications
Ruppert, Michele L.; Mar. 2001; 88p; In English
Report No.(s): AD-A387847; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This thesis examines the enhancement of traditional classroom instruction through the use of computer mediated communications (CMC). It explores student and instructor involvement with the use of CMC technology. Students must interact with fellow students and the teaching faculty to learn and CMC technology will facilitate this interaction. Previous research on CMC is surveyed. The CMC climate in a graduate level course is examined. The findings indicate that CMC may improve the pedagogical course framework. Recommendations include a policy stating traditional courses will be taught with CMC technologies, traditional courses should be structured properly with both course materials and CMC technologies and a training program must be implemented for both the teaching faculty and students.
DTIC
Group Dynamics; Computer Networks; Education; Interprocessor Communication

20010042792 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Mobile IP LAN for ARL Mobile Communications/Networking Testbed ***Final Report***
Luu, Brian B.; Feb. 2001; 18p; In English
Report No.(s): AD-A387971; ARL-TR-758; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the protocol and implementation of a Mobile IP (Internet protocol) LAN (local area network) for the LAN of the U.S. Army Research Laboratory (ARL) Mobile Communications/Networking Testbed. Mobile IP LAN protocol is developed to allow a LAN to be mobile with IP mobility. The mobility of a LAN provides mobility for its nodes, which are fixed relative to the LAN and are not mobile IP in nature. This report includes discussions and comparisons of Mobile IP LAN versus Mobile IP for mobile nodes.
DTIC
Mobile Communication Systems; Local Area Networks; Mobility

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.

20010040824 Rutgers - The State Univ., Dept. of Mathematics, New Brunswick, NJ USA
Mathematical Theory of Neural Networks ***Final Report, 1 Apr. 1997-30 Aug. 2000***
Sontag, Eduardo D.; Sussman, Hector J.; Sep. 01, 2000; 22p; In English
Contract(s)/Grant(s): F49620-97-1-0159; AF Proj. 2304
Report No.(s): AD-A387942; AFRL-SR-BL-TR-01-0177; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The work pursued under this grant dealt with artificial neural networks and other discrete/continuous models. New bounds were obtained for sample complexity for identification of static and dynamic concept classes defined by static and recurrent networks. Structural and system-theoretic properties were characterized, leading to effective tests for identifiability and other properties. Related models of hybrid systems were also studied; an equivalence problem for PL systems was shown to be decidable in polynomial time, and a general Maximum Principle was established for hybrid systems.
DTIC
Neural Nets; Polynomials; Linear Systems

20010041171 Rutgers - The State Univ., Dept. of Mathematics, New Brunswick, NJ USA
Control of Nonlinear Systems ***Final Report, 1 Jan. 1998-31 Dec. 2000***
Sontag, Eduardo D.; Dec. 2000; 31p; In English
Contract(s)/Grant(s): F49620-98-1-0242; AF Proj. 2304
Report No.(s): AD-A387778; AFRL-SR-BL-TR-01-0178; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Final Report summarizes accomplishments of the grant research. The work reported here deals with the mathematical foundations of nonlinear systems analysis and feedback control. It describes advances in input to state stability, which is a notion of stability with respect to input signals, loss, which a notion of well-posed detectability, and related concepts, resulting in necessary and sufficient characterizations in terms of dissipation inequalities. Other topics include control-Lyapunov functions,

the design of feedback controllers by means of nonsmooth analysis techniques including viscosity subgradients, and the introduction of new notions of stability with respect to finite-energy measures as well as their complete characterization.
DTIC
Feedback Control; Nonlinear Systems; Control Theory; Systems Analysis

20010041192 Electrotechnical Lab., Tsukuba, Japan
Summaries of Reports of the Electrotechnical Laboratory, No. 55
2000; ISSN 0388-080X; 90p; In English; See also 20010041193 through 20010041201; Copyright; Avail: Issuing Activity; Abstracts Only

Contents include the following: Performance of three-finger multisensory hand on space vehicle ”Hikoboshi”. Space experiment of sensor-fused telerobotics for high precision tasks. Direct observation of the formation process of silicalite films on various substrates.. Experiments on space robot arm path planning using the sensors database, part 2. Diagnosis of small satellites using multiple sensors and a robot. Experiments on space robot motion control using genetic algorithm. Moving method of space robot pushing walls. Development and space operation of advanced robotic hand system. Precise in-orbit servicing by multisensory hand connected with long arm.
CASI
Spaceborne Experiments; Trajectory Planning; Robot Dynamics; Data Bases

20010041193 Electrotechnical Lab., Tsukuba, Japan
Performance of Three-Finger Multisensory Hand on Spacevehicle ”Hikoboshi”
Machida, Kazuo, Electrotechnical Lab., Japan; Toda, Yoshitsugu, Electrotechnical Lab., Japan; Murase, Yuichi, Fujitsu Laboratories Ltd., Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55; 1p; Repr. from SICE, v. 35, no. 12, 1999 p 1583-1590; In English; See also 20010041192; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A hand with dexterity and local autonomy is one of the key components of a space robot to perform precise in-orbit servicing. This paper presents performance of the three-finger multisensory hand boarded on the unmanned spacevehicle ”Hikoboshi”. The hand comprises a newly devised three-finger module with grip force sensors and a wrist compliance device with displacement sensors, It also has a hand-eye camera and three range sensors for non-contact sensing. The contact sensors display fine performance owing to zero-gravity of space compared with the ground. The laser/PSD type proximity range sensors retain performance under the high intensity of sunlight in orbit. Although the hand-eye camera is useful for position measurement of objects through image processing in most case, some points are noticed to use it in satellite daytime owing to intensity and direction variations of sunlight. The robot performed high precision tasks in space utilizing these hand mechanisms and multisensors through sensor-fused telerobotics.
Author
Telerobotics; Image Processing; Weightlessness; Robots; Orbital Servicing

20010041194 Electrotechnical Lab., Tsukuba, Japan
Space Experiment of Sensor-Fused Teleribotics for High Precision Tasks
Machida, Kazuo, Electrotechnical Lab., Japan; Toda, Yoshitsugu, Fujitsu Ltd., Japan; Moriya, Masyoshi, Fujitsu Ltd., Japan; Akita, Kenzo, Institute for Unmanned Space Experiments Free Flyer, Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55, pp. 65; Repr. from Journal of RSJ, v. 18, no. 3, 2000 p 444-452; In English; See also 20010041192; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

This paper presents the space test of the ARH (Advanced Robotic Hand System), which is the world’s first precise extravehicular robot aboard the satellite ”Hikoboshi”. The telerobotic system has features of dexterity, autonomy and flexible operability, using a three-finger multisensory hand at a work site in space and a computer-graphics-based desktop interface at an operation site on the ground. The concept of sensor-fused telerobotics utilizing multisensory information is introduced, and the system is implemented to perform high precision tasks under the barrier of inter-satellite space communication. The robot system was launched into low earth orbit, and the capability of sensor-fused telerobotics was successfully demonstrated in precise in-orbit servicing.
Author
Telerobotics; Robot Arms; Robots; Spaceborne Experiments

20010041195 Electrotechnical Lab., Tsukuba, Japan

Direct Observation of the Formation Process of Silicalite Films on Various Substrates

Iwasaki, A., Electrotechnical Lab., Japan; Sano, T., Japan Advanced Inst. of Science and Technology Hokuriku, Japan; Kiyozumi, Y., National Inst. of Materials and Chemical Research, Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55, pp. 65; Repr. from Microporpus and Mesoporous Materials, v. 38, 2000 p 75-83; In English; See also 20010041192; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Silicalite crystals were synthesized on various kinds of substrates. It was found that crystals on a polymer substrate (poly (tetrafluoroethylene-perfluoroalkylvinyl ether)) with a smooth surface grew into zeolite films by sliding on the substrate surface, whereas those on a silica glass substrate grew by anchoring to certain positions, to examine the mechanical strength of the anchoring of zeolitic coatings, these crystals were calcinated together with the substrates, The crystals did not detach from the substrate surface, indicating strong interaction between the crystals and the substrate. The secondary growth of small crystals in the synthesis mixture was also investigated and the possibility of forming a compact zeolite film by promoting the nucleation of small crystals around seed crystals was confirmed.

Author

Crystals; Ethers; Silica Glass; Substrates; Zeolites; Crystal Growth

20010041196 Electrotechnical Lab., Tsukuba, Japan

Experiments on Space Robot Arm Path Planning Using the Sensors Database, Part 2

Iwata, Toshiaki, Electrotechnical Lab., Japan; Ueno, Seiya, Yokohama National Univ., Japan; Murkami, Hiroshi, Electrotechnical Lab., Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55, pp. 65-66; Repr. from Journal of Guidance, Control and Dynamics, v. 23, no. 4, 2000 p 739-742; In English; See also 20010041192; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Two sensor-based methods to simultaneously control the orientation and arm position of a space robot via only arm motion are proposed, using a database of the relationships among the current sensor outputs, the robot motion, and the change of sensor outputs. A genetic algorithm (GA) and optimal control techniques are used to determine the arm path. A ”gene” in the GA represents one motion, and the ”chromosome” expresses the total motion. The GA yielded the shortest path after 2,436 generations. Since the GA planned a temporary path in the early stage, we consider that the GA is better than breadth-first search or A* search. In order to deal with continuous joint angle values, the inputs are calculated using optimal control theory with the approximated database. The criterion to be minimized is the energy of inputs, a quadratic form of joint velocities. The penalty function of the joint angles is also minimized to satisfy the admissive joint range. We confirmed the validity of our method experimentally using a drop shaft which provides ten seconds of microgravity during free fall.

Author

Control Systems Design; Microgravity; Optimal Control; Robot Arms; Robot Dynamics; Robot Sensors

20010041197 Electrotechnical Lab., Tsukuba, Japan

Experiments on Space Robot Motion Control Using Genetic Algorithm

Iwata, Toshiaki, Electrotechnical Lab., Japan; Murakami, Hiroshi, Electrotechnical Lab., Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55, pp. 66; Repr. from Space Forum, v. 6, no. 1-4, 2000 p 381-388; In English; See also 20010041192; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We proposed a sensor-based method to simultaneously control the orientation and the arm position of a space robot via only arm motion, using a database of the relationships among the current sensor outputs, the robot action, and the change of sensor outputs. A genetic algorithm (GA) is used to determine the arm path. A ”gene” in the GA represents one motion, and the ”chromosome” expresses the total motion. The GA yielded the shortest path after 2,436 generations. One of the advantages of the GA is planning a temporary path in the early stage. We confirmed the validity of our method in experiments using a drop shaft which provides ten seconds of microgravity during free fall.

Author

Robot Dynamics; Robot Sensors; Automatic Control; Position (Location)

20010041198 Electrotechnical Lab., Tsukuba, Japan

Moving Method of Space Robot Pushing Walls

Iwata, Toshiaki, Electrotechnical Lab., Japan; Murakami, Hiroshi, Electrotechnical Lab., Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55, pp. 66; Repr. from Journal of Robotics and Mechanics, v. 12, no. 4, 2000 p 334-342; In English; See also 20010041192; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A method of motion wherein a space robot pushes against walls is proposed. This method is commonly used by astronauts during intravehicular activity (IVA). In the case of extravehicular activity (EVA), the method can be applied by pushing, for example, the trusses of a space station instead of walls. The proposed method does not require the use of thrusters, so that efficient motion is realized. to select experimental methods, it is noted that training on the ground is effective for astronauts so that they can carry out activities in an actual microgravity field. The robots were first trained in virtual microgravity, and the training effect was verified in real microgravity. As the virtual microgravity method, two-dimensional microgravity experiments using an air table was adopted. The robot was levitated above the flat table by compressed air. As the real microgravity method, three-dimensional microgravity experiments using a drop shaft were adopted. to train the robot, the relationships between motions and sensory changes and neural network techniques, rather than a computational model of the robot, were used.
Author
Extravehicular Activity; Gravitational Effects; Intravehicular Activity; Robot Dynamics; Robots; Walls

20010041199 Electrotechnical Lab., Tsukuba, Japan
Development and Space Operation of Advanced Robotic Hand System
Machida, Kazuo, Electrotechnical Lab., Japan; Nishida, Hirotaka, Fujikura Ltd., Japan; Akita, Kenzo, Institute for Unmanned Space Experiments Free Flyer, Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55, pp. 66; Repr. from Journal of Robotics and Mechatronics, v. 12, no. 4, 2000; In English; See also 20010041192; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In this paper we present the development and space test of the world's first precise telerobotic system boarded on an unmanned spacevehicle, ETS-VII (Engineering Test Satellite VII). The robotic system has features of skill and autonomy using a three-finger multisensory hand at a work site in space and a computer graphics-based desktop telerobotic system at a control site on the ground. We developed a compact robotic system with space environment adaptability and satellite system compatibility as well as dexterity and flexible operability. The robotic system was launched in November, 1997. The space test reveals that the system works well in orbit.
Author
Autonomy; Engineering Test Satellites; Robot Arms; Telerobotics; Performance Tests

20010041200 Electrotechnical Lab., Tsukuba, Japan
Precise In-Orbit Servicing by Multisensory Hand Connected with Long Arm
Machida, Kazuo, Electrotechnical Lab., Japan; Toda, Yoshitsugu, Electrotechnical Lab., Japan; Oda, Mitsushige, National Space Development Agency, Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55, pp. 66; Repr. from Journal of Robotics and Mechatronics, v. 12, no. 4, 2000 p 371-377; In English; See also 20010041192; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

This paper presents the space experiment of in-orbit servicing from a chaser satellite to a target satellite, using a multisensory hand connected with a long arm. The experiment is carried out to acquire the technology that enables a long robot arm to perform high precision tasks through the smart hand. A three-finger multisensory hand, ARH (Advanced Robotic Hand), is connected to the 2.4m length manipulator arm, ERA (ETS Robot Arm), in orbit, and sample retrieving from "Orihime" to "Hikoboshi" is achieved in this configuration. The work environment is measured by sensor fusion of the range sensors, hand-eye camera and contact sensors, and the world model is precisely calibrated before the task. The sample retrieving is successfully performed due to the position/force hybrid control of the arm and fine compensation by the hand mechanism under multisensory monitoring.
Author
Calibrating; Fingers; Manipulators; Robot Arms

20010041201 Electrotechnical Lab., Tsukuba, Japan
Diagnosis of Small Satellites using Multiple Sensors and a Robot
Iwata, Toshiaki, Electrotechnical Lab., Japan; Machida, Kazuo, Electrotechnical Lab., Japan; Summaries of Reports of the Electrotechnical Laboratory; 2000, No. 55, pp. 66; In English; 2000 AIAA Guidance, Navigation and Control Conference, 2000, Unknown; See also 20010041192
Report No.(s): A00-37177; Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Four diagnostic methods for small satellite malfunction using several types of sensors and a robot are proposed and tested experimentally, The four methods are: (1) averaging method of probability, (2) small probability deleting method, (3) Bayesian network method and (4) correlation matrix method. The reasoning method of the malfunction essentially has a probabilistic property. We limit the malfunction of the solar paddle to five kinds and use symptom parameters to identify the malfunction by inference. In our experiment, all four methods are effective, In particular, Bayesian network method produces excellent results;

however, in this case a single failure may cause total failure. The averaging method and correlation matrix method generate rather ambiguous results; however, they are hardly affected by failure. In many cases, the small probability deleting method works well, however, a single failure may cause total failure.
Author
Correlation; Diagnosis; Malfunctions; Robot Sensors; Robots

20010043372 National Inst. of Standards and Technology, Manufacturing Engineering Lab., Gaithersburg, MD USA
Visualizing Terrain and Navigation data
Tsai, T. M.; Coombs, D.; Yoshimi, B.; Kent, E.; Mar. 2001; 14p; In English
Report No.(s): PB2001-104282; NISTIR-6720; Copyright; Avail: National Technical Information Service (NTIS)

Terrain and Navigation data have been collected from sensors mounted on an autonomous off-road vehicle. Data include range images from scanning laser range from Global Positioning System (GPS) and inertial devices, and color images registered with the laser range data. These data have been visualized as static models with interactive displays and as 3D movies (sequences of 3D range images) displayed nominally from the sensor's viewpoint but also with some interactive control of the vantage point. Display technologies have ranged from VRML (Virtual Reality Modeling Language) alone to immersive stereo displays. Design choices in the display of the data and their effect on the visual impact are discussed. The ability to rapidly and interactively visualize these data has enabled critical insights into the data that would otherwise have been difficult to achieve.
NTIS
Terrain; Navigation

20010043702 Duke Univ., Medical Center, Durham, NC USA
Breast Ultrasound: Computer-Aided Diagnosis Approach to Improving Specificity and Decreasing Observer Variability ***Annual Report, 1 Jan. - 31 Dec. 1997***
Baker, Jay A.; Jan. 1998; 22p; In English
Contract(s)/Grant(s): DAMD17-96-1-6145
Report No.(s): AD-A344495; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this grant is to construct an artificial neural network (ANN) to assist radiologists in differentiating benign from malignant solid breast lesions. The ultrasound (US) examinations and mammograms of sixty-four solid breast lesions that subsequently underwent histologic confirmation were evaluated in a blinded manner. Descriptive terms were chosen to characterize the ultrasonographic and mammographic appearance of the lesions from a pre-defined lexicon. In addition, patient age was recorded. These descriptive terms and patient age were used as inputs to train an artificial neural network to differentiate benign from malignant breast ma%ses. An ANN using only seven US descriptive terms as inputs performed better than a similar ANN previously constructed using mammographic descriptive terms and patient medical history as inputs. In addition, neural networks using combinations of inputs including US and mammogram descriptors and patient age all performed well for training an ANN. Further work includes constructing similar ANNs using more training cases, as well as testing these ANNs using prospective data. Significant interobserver variability in radiologists' descriptions and assessment of breast US exams was also demonstrated. The ANN may help decrease the variability in lesion assessment.
DTIC
Computer Techniques; Diagnosis; Mammary Glands; Ultrasonics

20010043704 Research Development Corp., Herndon, VA USA
The Virtual Schoolhouse ***Final Report, Sep. 1996 - Jun. 1997***
Leddo, John; Kolodziej, James; Zhang, Zhixiong; Beary, Sean; Mar. 1998; 32p; In English
Contract(s)/Grant(s): DASW01-96-C-0069; Proj-M861
Report No.(s): AD-A341362; ARI-RN-98-05; No Copyright; Avail: Defense Technical Information Center (DTIC)

The report describes a project in which a Distributed Interactive Intelligent Tutoring Simulation (DIITS) was developed to train Army Infantry squad and fire team leaders the skills they need to cooperatively perform military operations in urban terrain (MOUT). The intelligent tutoring system technology allowed trainees to receive feedback and remediation regardless of whether or not a human instructor was present. The DIITS included intelligent agent technology to play the role of scenario agents when a human was not available to fill in. This gave the technology added power as it could be used for training regardless of the number of trainees available at the time. A scenario editor was also created to allow training scenarios to be developed by users. The intention of this was to increase the customizability of the technology to individual user needs. Finally, the technology was constructed to be generic and modular to support extension and reuse as training requirements evolve. These characteristics were

demonstrated in several ways including the transfer of technologies across projects, the substitutability of modules across systems and the ability of the technology to respond to user defined scenarios without further modification.
DTIC
Virtual Reality; Armed Forces; Computer Aided Design; Distributed Interactive Simulation; Education

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20010040809 College of William and Mary, Dept. of Physics, Williamsburg, VA USA
Modeling and Diagnosing Nonlinear Systems ***Final Report, 1 Jan. 1998-30 Nov. 2000***
Tracy, E. R.; Feb. 23, 2001; 13p; In English
Contract(s)/Grant(s): F49620-98-1-0144
Report No.(s): AD-A387880; AFRL-SR-BL-TR-01-0166; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This three-year program of research concerned the development of new techniques for diagnosing, modeling and controlling nonlinear systems. The primary focus was on low-dimensional systems and the detection of bifurcation precursors in noisy environments. The major objective of the research was to extend our previous work on symbolic time series analysis to weakly non-stationary systems which are undergoing a qualitative change in their behavior. The aim is to develop a general, practical and robust detection scheme to provide early warning of impending instabilities.
DTIC
Nonlinear Systems; Noise (Sound); Models; Change Detection

20010040874 Air Force Research Lab., Propulsion Directorate, Wright-Patterson AFB, OH USA
An Investigation in Finite Element Theory of Shear Locked Elements ***Final Report, Oct. 1999-Feb. 2000***
Beachkofski, Brian; Jun. 2000; 43p; In English
Contract(s)/Grant(s): Proj-3066
Report No.(s): AD-A387700; AFRL-PR-WP-TR-2000-2066; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report shows the theoretical background for some of the problems associated with shear loaded beams using the finite element method. The report develops the theory behind both shell and brick elements on a reduced order by using beam and membrane elements. The cause of the shear-locking phenomenon is presented, as are common methods of avoiding these effects. The two presented methods of defeating shear locking are adding a bubble mode to an element, and creating the stiffness matrix with reduced order Gaussian integration. The reasoning behind each solution to the locking problem is explained and demonstrated both mathematically and through solutions to an example problem. After the validity of the particular elements is verified, general guidelines for which element type should be used are given.
DTIC
Finite Element Method; Structural Analysis; Stress-Strain Relationships; Shells (Structural Forms); Structural Members

20010041111 Washington Univ., Dept. of Mathematics, Saint Louis, MO USA
Spatio-Temporal Wavelets for Motion Detection and Target Tracking ***Final Report, 1 Nov. 1998-1 Nov. 2000***
Leduc, Jean-Pierre; Wickerhauser, Victor; Feb. 02, 2001; 13p; In English
Contract(s)/Grant(s): F49620-99-1-0068
Report No.(s): AD-A388050; 3; AFRL-SR-BL-TR-01-0179; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project has developed a group-theoretic approach to generate new tools of signal processing in order to analyze and track motion. For that purpose, external motion is projected on a sensor array and captured as a spatiotemporal signal to analyze. This research takes into account differential manifolds on which motion takes place and on which the sensor array is deployed. The research has derived the means to generate all the observable kinematics in a spatiotemporal signals. Each particular kinematic is defined by a specific Lie algebra. Each algebra leads to a Lie group, and to the appropriate group representations in the functional space of the signals. These representations lead to the related harmonic analysis. This motion analysis deals with translational, rotational, and deformational motion and all the temporal derivatives. This research has derived the optimal tools to estimate motion, to track moving patterns, to study diffusion and optical flow along motion trajectories. This group-theoretic framework covers determinist and stochastic calculus with Kalman filters, PDE's, ODE's and integral transforms. New algorithms to analyze

and track motion have been defined from this theoretical framework and lead to parallelizable implementations based on FFT and dynamic programming.
DTIC
Wavelet Analysis; Kinematics; Translational Motion; Algorithms

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

20010040818 Texas Univ., San Antonio, TX USA
Statistics: Reflections on the Past and Visions for the Future ***Final Report, 1 Jan. - 30 Nov. 2000***
Kannan, Nandini; Feb. 26, 2001; 5p; In English
Contract(s)/Grant(s): F49620-00-1-0087; AF Proj. 2304
Report No.(s): AD-A388071; AFRL-SR-BL-TR-01-0180; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

An International Conference ”Statistics: Reflections on the Past and Visions for the Future” was held March 16-19, 2000 at the University of Texas at San Antonio. The primary focus of the conference was to highlight the changing face of statistical research and recognize the contributions of the eminent statistician Professor C. R. Rao. The conference attracted more than 200 participants. There were Plenary and Invited sessions on a variety of topics in Statistical Theory and Applications including Multivariate Analysis, Data Mining, Signal Processing, Genetics, Linear Models etc. The Plenary Speakers were researchers recognized worldwide for their significant contributions in these areas. The conference provided a wonderful opportunity for researchers to discuss the directions of Statistical Research in the next decades and exchange ideas. The proceedings of the conference will be published in peer reviewed journals. The AFOSR grant made it possible to provide funds for the Plenary Speakers to participate in this Conference.
DTIC
Conferences; Statistical Analysis

20010040873 Pittsburgh Univ., Pittsburgh, PA USA
Innovative Statistical Approaches to Modeling Multiple Outcome Data from the NSABP BCPT ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Weissfeld, Lisa; Berhane, Kiros; Sep. 2000; 21p; In English
Contract(s)/Grant(s): DAMD17-99-1-9356
Report No.(s): AD-A387701; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals of this IDEA award are two fold, namely, to develop and refine statistical methodology for the analysis of a data set where multiple outcomes or disease incidence endpoints are of interest and to apply these methods to the analysis of a data set in prevention such as the National Surgical Adjuvant Breast and Bowel Project’s Breast Cancer Prevention Trial. The software for the fitting of the B-spline models, the first type of model that was proposed in this study, is currently being tested. Software development for the pseudospline approach is well underway. The needed software to conduct simulation studies is being tested for generating data from a bivariate exponential distribution and a second routine is under development.
DTIC
Statistical Analysis; Computerized Simulation; Diseases; Cancer; Mammary Glands; Prevention; Computer Programs

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20010041045 Johns Hopkins Univ., Columbia, MD USA
JANNAF 25th Airbreathing Propulsion Subcommittee, 37th Combustion Subcommittee and 1st Modeling and Simulation Subcommittee Joint Meeting, Volume 1
Fry, Ronald S., Johns Hopkins Univ., USA; Becker, Dorothy L., Johns Hopkins Univ., USA; November 2000; 376p; In English; JANNAF 25th Airbreathing Propulsion Subcommittee, 13 Nov. 2000, Monterey, CA, Monterey, CA, Monterey, CA, USA, USA, USA; Sponsored by NASA, USA

Contract(s)/Grant(s): SPO700-97-D-4004
Report No.(s): AD-A387890; CPIA-PUB-703-VOL-1; No Copyright; Avail: CASI; A03, Microfiche; A17, Hardcopy

Volume I, the first of three volumes, is a compilation of 24 unclassified/unlimited-distribution technical papers presented at the Joint Army-Navy-NASA-Air Force (JANNAF) 25th Airbreathing Propulsion Subcommittee, 37th Combustion Subcommittee and 1st Modeling and Simulation Subcommittee (MSS) meeting held jointly with the 19th Propulsion Systems Hazards Subcommittee. The meeting was held 13-17 November 2000 at the Naval Postgraduate School and Hyatt Regency Hotel, Monterey, California. Topics covered include: a Keynote Address on Future Combat Systems, a review of the new JANNAF Modeling and Simulation Subcommittee, and technical papers on Hyper-X propulsion development and verification; GTX airbreathing launch vehicles; Hypersonic technology development, including program overviews, fuels for advanced propulsion, ramjet and scramjet research, hypersonic test medium effects; and RBCC engine design and performance, and PDE and UCAV advanced and combined cycle engine technologies.
DTIC
Combustion Chemistry; Air Breathing Engines; Propulsion System Configurations; Propulsion System Performance; Wind Tunnel Tests

20010043703 Military Operations Research Society, Alexandria, VA USA
A Journal of the Military Operations Research Society, Military Operations Research
Jan. 1997; Volume 3, No. 2; 87p; In English
Report No.(s): AD-A341365; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Military Operations Research Society is a professional society incorporated under the laws of Virginia. The Society conducts a classified symposium and several other meetings annually. It publishes proceedings, monographs, a quarterly bulletin, PHALANX, and a quarterly journal, Military Operations Research, for professional exchange and peer criticism among students, theoreticians, practitioners and users of military operations research. The Society does not make or advocate official policy nor does it attempt to influence the formation of policy. Matters discussed or statements made in the course of MORS symposia or printed in its publications represent the opinions of the authors - and not the Society. The table of Contents are An Integer Solution Heuristic for the Arsenal Exchange Model (AEM), On the Principle of ”False Ranging” in Weaponry, RiskNav(TM): A Decision Aid for Prioritizing, Displaying, and Tracking Program Risk, The Probabilistic Multiple-Travelling-Salesmen Facility- Location Problem: Space-Filling Curves and Asymptotic Euclidean Analyses, Application and Extension of the Thruput II Optimization Model for Airlift Mobility, Erratum: Benchmarking and Efficient Program Delivery for the Department of Defense’s Business-Like Activities.
DTIC
Military Operations; Operations Research; Documents; Policies

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 Propulsion and Power.

20010040807 Boston Univ., Dept. of Cognitive and Neural Systems, Boston, MA USA
Near-Field and Distance Cues in Auditory Spatial Displays ***Final Report, 1 Dec. 1998-30 Nov. 2000***
Shinn-Cunningham, Barbara G.; Brungart, Douglas; Feb. 20, 2001; 12p; In English
Contract(s)/Grant(s): F49620-98-1-0108
Report No.(s): AD-A387883; AFRL-SR-BL-TR-01-0160; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Analysis showed that, when sources are within a meter of the listener, binaural differences resolve source location to within a torus of space. Localization studies demonstrated that despite the fact that the direct sound reaching the ears is relatively intense for nearby sources, the reverberation dramatically improves distance perception. In fact, it also causes minor degradations in directional localization accuracy; however, these effects are relatively minor. Results also suggest that in a room listener’s accuracy at judging source distance and direction improved gradually with time, even in the absence of direct feedback about localization performance. Headphone studies confirmed that reverberation is a dominant cue for source distance, even for nearby sources in which the reverberant energy is low and binaural cues provide distance information. Results suggest that distance is computed primarily from the signal reaching the nearer ear and is a primarily monaural cue. Thus, in order to simulate distance in a spatial auditory display, including realistic reverberation is critical. Acoustical measurements demonstrate that many features

of the signals reaching a listener's ears change with distance and with reverberation. Further work must be performed in order to determine which of these features is critical in the perception of source distance.
DTIC
Cues; Ear; Position (Location); Reverberation; Auditory Perception; Acoustics; Auditory Signals

20010041112 Washington Univ., Applied Physics Lab., Seattle, WA USA
An Experiment in High-Frequency Sediment Acoustics: SAX99 ***Final Report, 15 Sep. 1998-31 Dec. 2000***
Thorsos, Eric I.; Williams, Kevin L.; Jackson, Darrell R.; Richardson, Michael D.; Briggs, Kevin B.; Apr. 2001; 11p; In English; Report will be published in the proceedings of a conference, Acoustical Oceanography, sponsored by the Underwater Acoustics Group, Institute of Acoustics, and held at Southampton University, Southampton, UK, 9-12 April 2001.
Contract(s)/Grant(s): N00014-98-1-0891
Report No.(s): AD-A388055; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A major high-frequency sediment acoustics experiment was conducted in shallow waters of the northeastern Gulf of Mexico. The experiment addressed high-frequency acoustic backscattering from the seafloor, acoustic penetration into the seafloor, and acoustic propagation within the seafloor. Extensive in situ measurements were made of the sediment geophysical properties and of the biological and hydrodynamic processes affecting the environment. An overview is given of the measurement program. Initial results from APL-UW acoustic measurements and modeling are then described.
DTIC
Acoustic Measurement; Acoustic Propagation; Acoustic Scattering; Acoustics; Ocean Bottom

20010041169 Harris, Miller, Miller and Hanson, Inc., Burlington, MA USA
Federal Interagency Committee on Aviation Noise: 1997 Annual Report ***Interim Report, Jan.-Dec. 1997***
Miller, Robert L.; Eagan, Mary E.; Feb. 1998; 115p; In English
Contract(s)/Grant(s): F33615-95-C-6014; AF Proj. 3037
Report No.(s): AD-A387786; AFRL-HE-WP-TR-1998-0144; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The Federal Interagency Committee on Aviation Noise (FICAN) was formed in 1993 to provide forums for debate over needs for future aviation noise research and to encourage new development efforts in this area. All federal agencies concerned with aviation noise are represented on the Committee, including the U.S. Army, the U. S. Air Force, the U.S. Navy, the Department of Interior, the Department of Transportation, the Federal Aviation Administration, the U. S. Environmental Protection Agency, the National Aeronautics and Space Administration, the Department of Housing and Urban Development, and the Department of Health and Human Services/Centers for Disease Control and Prevention. to help coordinate ongoing and future federal initiatives, FICAN meets regularly and holds additional forums to obtain broader input from the public at large as well as from interested members of the technical community. The Committee's activities in 1997 included five meetings, a public forum, publication of a position paper on the effects of aircraft noise on awakenings from sleep, and maintenance of FICAN's Web page on the Internet.
DTIC
Aircraft Noise; NASA Programs; Noise Reduction

20010041564 NASA Ames Research Center, Moffett Field, CA USA
Noise Analysis of Spatial Phase coding in analog Acoustooptic Processors
Gary, Charles K., NASA Ames Research Center, USA; [1994]; 1p; In English; International Symposium on Surface Waves in Solid and Layered Structures and Conference on Acoustoelectronics, 17-23 May 1994, Moscow, Russia
Contract(s)/Grant(s): RTOP 233-02-05; No Copyright; Avail: Issuing Activity; Abstract Only
Optical beams can carry information in their amplitude and phase; however, optical analog numerical calculators such as an optical matrix processor use incoherent light to achieve linear operation. Thus, the phase information is lost and only the magnitude can be used. This limits such processors to the representation of positive real numbers. Many systems have been devised to overcome this deficit through the use of digital number representations, but they all operate at a greatly reduced efficiency in contrast to analog systems. The most widely accepted method to achieve sign coding in analog optical systems has been the use of an offset for the zero level. Unfortunately, this results in increased noise sensitivity for small numbers. In this paper, we examine the use of spatially coherent sign coding in acoustooptical processors, a method first developed for digital calculations by D. V. Tigin. This coding technique uses spatial coherence for the representation of signed numbers, while temporal incoherence

allows for linear analog processing of the optical information. We show how spatial phase coding reduces noise sensitivity for signed analog calculations.
Author
Acousto-Optics; Analog Data; Coding

20010043699 Office of Naval Research, Arlington, VA USA
Passive Piezoelectric Prosthesis for the Inner Ear
Fisher, Stanley A., Inventor; DeReggi, Aime S., Inventor; May 09, 1997; 9p; In English
Patent Info.: US-Patent-Appl-SN-854-032
Report No.(s): AD-D018870; No Copyright; Avail: Defense Technical Information Center (DTIC)
A tubular prosthesis formed by an assembly of electrode segments enclosing an elongated inner chamber, is inserted into the inner ear of a patient for piezoelectric generation of electrical impulses and localized injection thereof in response to externally generated sound waves. Such electrical impulses are applied from the prosthesis to nerve endings adjacent to cochlea contact locations on the electrode segments so as to improve hearing adversely affected by biological damage to the inner ear.
DTIC
Piezoelectricity; Sound Waves; Ear; Hearing

20010043700 Naval Postgraduate School, Monterey, CA USA
Discrete-Mode Source Development and Testing for New Seismo-Acoustic Sonar
Gaghan, Frederick E., Jr.; Mar. 1998; 194p; In English
Report No.(s): AD-A344687; No Copyright; Avail: Defense Technical Information Center (DTIC)
A seismo-acoustic sonar concept that uses guided interface waves (Rayleigh or Scholte) is being developed to detect buried ordnance in the sea floor and beach sediments. This thesis describes the initial research conducted into the design, construction, and field testing of possible seismic sources that excite preferentially the interface waves desired for use in such a system. The theory of elasticity shows that seismic interface waves have elliptical particle velocity orbits in the vertical plane along the path of propagation. It was therefore decided that to selectively excite the desired interface waves, a harmonic source employed at the interface must induce elliptical particle motion in this plane. Several exploratory sources were developed to produce this type of excitation. Field tests of the discrete-mode sources developed were conducted to evaluate this hypothesis, but due to the non-optimum nature of the experimental sources, perfect discrete source excitation was not obtained. However, it was found that the medium itself acted as a selective filter for the interface waves after a few tens of meters of propagation. The experimental results obtained here suggest that the basic concept of discrete-mode excitation looks promising.
DTIC
Seismic Waves; Underwater Acoustics; Sonar; Performance Tests; Fabrication; Field Tests

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ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20010040849 Colorado Univ., Dept. of Computer Science, Boulder, CO USA
Large-Scale Optimization Methods With a Focus on Chemistry Problems ***Final Report, 1 Mar. 1997-30 Jun. 2000***
Schnabel, Robert B.; Byrd, Richard H.; Jan. 19, 2001; 10p; In English
Contract(s)/Grant(s): F49620-97-1-0164
Report No.(s): AD-A387837; CU-CS-153-7606; AFRL-SR-BL-TR-01-0164; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The objective of this research is to develop large scale optimization methods for optimization problems that arise in molecular chemistry. The main applications that are being targeted are problems whose solution is of direct and immediate interest to the Air Force, such as finding the structure of proteins and polymers. The primary optimization problem being considered is the large scale global optimization problem, via which protein structure can be determined. During this research period we have made major advances in the applicability of our methodology. The culmination of these advances has been our participation over the summer in the fourth CASP (Critical Assessment of Techniques for Protein Structure Prediction) competition, where we have attempted blind prediction of eight proteins of arbitrary complexity including mixed alpha helices and beta sheets, and of size ranging up to 242 amino acids. Enabling us to reach this stage have been advances in the past year in three key areas. The foremost of these

is the ability to handle beta sheets in our algorithm, including the development of new biasing techniques. Second is improvements to the main portion of our global optimization method to enable it to better select the portions of the protein to work on in the small scale global optimizations. Third, in conjunction with our collaborators at Berkeley, is continued improvement of the ability of the energy function to accurately distinguish correct folds from misfolds, through the treatment of hydration.
DTIC
Mathematical Models; Optimization

20010040855 Los Alamos National Lab., NM USA
ATW Simulations and the Role of Nuclear Cross-Section Data
Trellue, H., Los Alamos National Lab., USA; Oct. 31, 2000; 22p; In English; Original contains color illustrations
Report No.(s): PB2001-103953; LA-UR-00-5448; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
No abstract available.
NTIS
Simulation; Cross Sections; Data Collection Platforms

20010041121 Johns Hopkins Univ., Dept. of Chemistry, Baltimore, MD USA
The Interaction of Light Atoms with Small Molecular Clusters ***Final Report, 15 Nov. 1998 - 30 Nov. 2000***
Dagdigian, Paul J., Johns Hopkins Univ., USA; Alexander, Millard H., Johns Hopkins Univ., USA; November 2000; 24p; In English
Contract(s)/Grant(s): F49620-98-1-0187
Report No.(s): AD-A387517; AFRL-SR-BL-TR-01-0142; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Collaborative experimental and theoretical investigations of non-bonding interactions of the light atoms boron, carbon, oxygen, and aluminum with the hydrogen molecule and other species (rare gases and small molecules) have been carried out. Fluorescence excitation and depletion spectra of weakly bound atom - molecule complexes, prepared in supersonic molecular beams, have been recorded and analyzed to derive information on the relevant interaction potentials involving the ground and excited electronic states of the atoms. In a theoretical approach toward understanding these interactions, sophisticated quantum chemical methods have been employed to compute accurate interaction potentials. The derived potential energy surfaces have been employed to estimate the binding energies and spectroscopic parameters of binary complexes. Comparison with experimental data provides important information to calibrate the accuracy of the computed interactions. Monte Carlo methods have been employed to determine the binding energies of larger complexes. Using path integral molecular dynamics and interaction potentials derived from our work, the equilibrium properties of a boron impurity trapped in solid para-hydrogen have been investigated. A semiclassical Franck-Condon technique was employed to simulate the 3s<#0106>- 2p absorption spectrum of the B chromophore.
DTIC
Molecular Dynamics; Molecular Beams; Molecular Clusters; Quantum Chemistry

20010041559 NASA Ames Research Center, Moffett Field, CA USA
Theoretical Studies of PNC in Molecules: current Capabilites, Future Prospects, and Issues
Dyall, Kenneth G., Eloret Corp., USA; [1994]; 1p; In English; Relativistic Studies of Parity Non-Conserving Processes in Atoms and Molecules, 7-10 Apr. 1994, Oxford, UK
Contract(s)/Grant(s): RTOP 232-01-04; No Copyright; Avail: Issuing Activity; Abstract Only
The current capabilities of relativistic electronic structure codes for calculations on molecules such as TlF and YbF, which are of interest in the study of parity non-conservation, will be presented. The issues of basis set size and correlation methods will be discussed, and planned developments of the codes which would extend the range of their capabilities will be outlined. Issues of the sensitivity of the desired properties to the form of the nuclear potential and the flexibility of the wave function near the nucleus will be raised to stimulate discussion.
Author
Electronic Structure; Flexibility; Nuclear Potential

20010043658 Johns Hopkins Univ., Dept. of Chemistry, Baltimore, MD USA
Collisional Quenching and Vibrational Energy Transfer in the A2 Sigma Electronic State of the CF Radical
Nizamov, Boris, Johns Hopkins Univ., USA; Dagdigian, Paul J., Johns Hopkins Univ., USA; Journal of Physical Chemistry A; 2001; Volume 105, pp. 29-33; In English
Contract(s)/Grant(s): DAAG55-98-I-0312
Report No.(s): AD-A386732; ARO-37731.4-CH; Copyright; Avail: Defense Technical Information Center (DTIC)

Electronic quenching of the nu' = 0 and 1 vibrational levels and nu' = 0 vibrational energy transfer has been studied at room temperature for the A(sup 2)Sigma(sup +) electronic state of the CF radical. The colliders investigated were He, Ar, H2, N2, CH4, O2, CO, C3H8, and CF4. Room-temperature thermal rate constants were determined. With the exception of CF4, the quenching rate constants were significant for all molecular colliders. Vibrational energy transfer within the A(sup 2)Sigma(sup +) state was observed only for the CH4 collision partner.
DTIC
Collisions; Quenching (Atomic Physics); Vibration; Energy Transfer

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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.

20010040832 Institute of Nuclear Research, Dept. of Plasma Physics and Technology, Warsaw, Poland
Experimental Research on Optimization of Neutron Yield From PF-360 Machine ***Final Report***
Sadowski, Marek J.; Aug. 25, 2000; 37p; In English
Contract(s)/Grant(s): F61775-99-WE088
Report No.(s): AD-A388008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Soltan Institute of Nuclear Studies as follows: The contractor will investigate new techniques in order to overcome the neutron saturation effect and to increase the maximum neutron yield. The PF-360 machine will be modified and additional measuring equipment for neutron studies will be installed. Neutron measurements will be performed under selected experimental conditions and used for optimization of neutron yields by the application of gas-puffed targets or special cryogenic targets, and by modifications of the electrode-insulator configuration.
DTIC
Neutrons; Measuring Instruments

20010042783 California Univ., Lawrence Berkeley Lab., Advanced Light Source, Berkeley, CA USA
Beamline Design Guide: Information for Beamline Designers
Mar. 1998; 116p; In English; Original contains color illustrations
Report No.(s): PB2001-104160; PUB-3114; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

This manual (formerly known as ALS Beamline Design Requirements) is written as a guide for those involved in the design and construction of beamlines and endstations acceptable for use at the ALS. It contains guidelines and policies related to personnel safety and equipment and vacuum protection.
NTIS
Light Beams; Structural Design; Synchrotrons; Buildings; Construction

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OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20010040845 New York Univ., Courant Inst. of Mathematical Sciences, New York, NY USA
Numerical Study of Short Optical Pulse Propagation in Nonlinear Reverse Saturable Absorbers ***Interim Report, Jan.-Dec. 2000***
Kim, Sukkeun; Potasek, Mary; Feb. 2001; 26p; In English
Contract(s)/Grant(s): Proj-7757, \ 2304
Report No.(s): AD-A387858; AFRL-HE-BR-TR-2001-0009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A numerical method was derived for the propagation of the electromagnetic pulse in nonlinear reverse saturable absorbers. This method includes the nonlinear Kerr effect, dispersion, diffraction and reverse saturable absorption which is expressed in terms of a five-level model. This report describes derivation of the nonlinear wave equation, the reverse saturable absorption rate equations, and the numerical method.
DTIC
Electromagnetic Pulses; Nonlinear Equations; Wave Propagation; Mathematical Models; Wave Equations

20010040913 Army Research Lab., Sensors and Electron Devices Directorate, Adelphi, MD USA
Scale-Insensitive Detection Algorithm for FLIR Imagery ***Final Report, Jan. 1999 - Jun. 2000***
Der, Sandor; Dwan, Chris; Chan, Alex; Kwon, Hessung; Nasrabadi, Nasser; Feb. 2001; 22p; In English
Report No.(s): AD-A387936; ARL-TN-175; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes an algorithm for detecting military vehicles in FLIR imagery that will be used as a prescreener to eliminate large areas of the image from further analysis. The output is a list of likely target locations with confidence numbers to be sent to a more complex clutter-rejection algorithm for analysis. The algorithm uses simple features and is intended to be applicable to a wide variety of target-sensor geometries sensor configurations, and applications.
DTIC
Imagery; FLIR Detectors; Image Processing; Military Vehicles

20010040944 Michigan Technological Univ., Houghton, MI USA
Estimation-Theoretic Methods for Unconventional Imaging ***Final Report, 16 Dec. 1996 - 15 Dec. 1999***
Schulz, Timothy J., Michigan Technological Univ., USA; Feb. 04, 2001; 21p; In English
Contract(s)/Grant(s): F49620-97-1-0053; AF Proj. 2301; AF Proj. 2304
Report No.(s): AD-A387545; AFRL-SR-BL-TR-01-0148; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The objective of this program was to perform basic research on the application of estimation-theoretic processing methods for unconventional imaging systems. Imaging applications involving both incoherent (passive) and coherent (active) illumination were investigated, and results are described in this report for i) lower bounds on the estimation accuracy for multi-channel phase retrieval; and ii) dual-channel signal recovery from auto- and cross-correlation data. As a result of i), insight is gained into the relative merits of a Hartmann sensor for wavefront estimation, and the surprising result is obtained that a conventional image encodes more information about a wavefront than does a Hartmann sensor. As a result of ii), a novel processing method is derived for recovering two object functions from measurements of their auto- and cross-correlation functions.
DTIC
Imaging Techniques; Images

20010040996 Michigan Univ., Ann Arbor, MI USA
Rapid 4D MRI of Gad-DTPA Enhancement for Breast Lesion Characterization ***Annual Report, 1 Oct. 1996 - 30 Sep. 1997***
Chenevert, Thomas L., Michigan Univ., USA; Oct. 1997; 19p; In English
Contract(s)/Grant(s): DAMD17-94-J-4381
Report No.(s): AD-A341385; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objectives of this project are refinement and implementation of new methods designed to defeat the tradeoff between spatial resolution, temporal resolution and tissue coverage in dynamic gadolinium- enhanced MR mammography. The approach involves specialized software for data acquisition and reconstruction that allows dynamic scans of 32 sections through both breasts acquired at 10-13 second temporal resolution. Additional post-processing further improves temporal resolution to 5-6 seconds,

and reduces motion artifacts for improved quantitation via in numerical fitting of temporal enhancement features of lesions. Objectives related to development of data acquisition and processing tools have been completed.
DTIC
Data Processing; Mammary Glands; Magnetic Resonance; Imaging Techniques; Clinical Medicine; Diagnosis

20010043654 Surface Optics Corp., Dept. of Electronic Engineering, San Diego, CA USA
Wolf Effect From a Real Image as a Secondary Source
Lin, Zong-Qi, Shanghai Jiao Tong Univ., China; Gu, Zu-Han, Surface Optics Corp., USA; Apr. 04, 2001; 8p; In English
Contract(s)/Grant(s): DAAG55-98-C-0034
Report No.(s): AD-A387013; ARO-37728.2-PH; Copyright; Avail: Defense Technical Information Center (DTIC)

The coherence theory predicts that the correlation in the fluctuations of a source distribution can cause frequency shifts in the spectrum of the emitted radiation, even when the source is at rest relative to the observer. Recently, we have measured the Wolf Effect, or frequency shifts from a real image of a point source, and further verified the coherent interference effect of a finite-band source.
DTIC
Image Analysis; Frequency Shift; Spectrum Analysis

20010043657 Cincinnati Univ., OH USA
Comparison of the Optical Properties of Er(3+) Doped Gallium Nitride Prepared by Metalorganic Molecular Beam Epitaxy (MOMBE) and Solid Source Molecular Beam Epitaxy (SSMBE)
Hoemmerich, U., Hampton Univ., USA; Seo, J. T., Hampton Univ., USA; MacKenzie, J. D., Florida Univ., USA; Abernathy, C. R., Florida Univ., USA; Birkhahn, R., Cincinnati Univ., USA; Steck, A. J., European Research Office (US Army), UK; MRS Internet J. Nitride Semicond. Res. W11, 66; Fall 1999; 8p; In English
Contract(s)/Grant(s): DAAD19-99-I-0348; DAAH04-96-I-0089; DAAD19-99-I-0317
Report No.(s): AD-A386989; ARO-40045.3-EL; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

We report on the luminescence properties of Er doped GaN grown prepared by metalorganic molecular beam epitaxy (MOMBE) and solid-source molecular beam epitaxy (SSMBE) on Si substrates. Both types of samples emitted characteristics 1.54 micron PL resulting from the intra-4fEr(3+) transition (sup 4)I(sub 13/2) yields (sup 4)I(sub 15/2). Under below-gap excitation the samples exhibited very similar 1.54 micron PL intensities. On the contrary, under above-gap excitation GaN:Er (SSMBE) showed approximately 80 times more intense green luminescence at 537 nm and 558 nm, which was not observed from GaN:Er (MOMBE). The average lifetime of the green PL was determined to be 10.8 microsecond at 15 K and 5.5 microsecond at room temperature. A preliminary lifetime analysis suggests that the decrease in lifetime is mainly due to the strong thermalization between the (2)H11/2 and (4)S3/2 excited states. Nonradiative decay processes are expected to only weakly affect the green luminescence.
DTIC
Optical Properties; Erbium; Gallium Nitrides; Doped Crystals

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20010040758 NASA Marshall Space Flight Center, Huntsville, AL USA
Integrated Pulse Detonation Propulsion and Magnetohydrodynamic Power
Litchford, R. J., NASA Marshall Space Flight Center, USA; January 2001; 1p; In English
Report No.(s): NASA/TP-2001-210801; NAS 1.60:210801; M-1002; No Copyright; Avail: Issuing Activity; Abstract Only

The prospects for realizing an integrated pulse detonation propulsion and magnetohydrodynamic (MHD) power system are examined. First, energy requirements for direct detonation initiation of various fuel-oxygen and fuel-air mixtures are deduced from available experimental data and theoretical models. Second, the pumping power requirements for effective chamber scavenging are examined through the introduction of a scavenging ratio parameter and a scavenging efficiency parameter. A series of laboratory experiments were carried out to investigate the basic engineering performance characteristics of a pulse detonation-driven MHD electric power generator. In these experiments, stoichiometric oxy-acetylene mixtures seeded with a cesium hydroxide/methanol spray were detonated at atmospheric pressure in a 1-m-long tube having an i.d. of 2.54 cm.

Experiments with a plasma diagnostic channel attached to the end of the tube confirmed the attainment of detonation conditions (p(sub 2)/p(sub 1) approx. 34 and D approx. 2,400 m/sec) and enabled the direct measurement of current density and electrical conductivity (=6 S/m) behind the detonation wave front. In a second set of experiments, a 30-cm-long continuous electrode Faraday channel, having a height of 2.54 cm and a width of 2 cm, was attached to the end of the tube using an area transition duct. The Faraday channel was inserted in applied magnetic fields of 0.6 and 0.95 T. and the electrodes were connected to an active loading circuit to characterize power extraction dependence on load impedance while also simulating higher effective magnetic induction. The experiments indicated peak power extraction at a load impedance between 5 and 10 Ohm. The measured power density was in reasonable agreement with a simple electrodynamic model incorporating a correction for near-electrode potential losses. The time-resolved thrust characteristics of the system were also measured, and it was found that the MHD interaction exerted a negligible influence on system thrust and that the measured I(sub sp) of the system (200 sec) exceeded that computed for an equivalent nozzleless rocket (120 sec).
Author
Detonation Waves; Magnetohydrodynamic Generators; Mathematical Models; Simulation; Gas Mixtures; Propulsion

20010040959 HY-Tech Research Corp., Radford, VA USA
Development of a Simplified Plasma Opening Switch Using an Inverse Pinch as a Plasma Source*, 21 Feb. 1995 - 30 Jul. 1998*
Moschella, John J., HY-Tech Research Corp., USA; Sep. 2000; 85p; In English
Contract(s)/Grant(s): DNA001-95-C-0014; Proj-4662
Report No.(s): AD-A387201; DSWA-TR-98-71; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy
The design, development, and testing of the ”inverse pinch” plasma source for plasma opening switches is described. This source relies on the breakdown of a gas to form a plasma in an arrangement that is the inverse of a gas puff z-pinch. The plasma produced by the IP is best described as an expanding plasma ring and it has been designed to work with switches that have an IT product greater than I MA-micros. As a result, when using this source with a cylindrical POS, a single device mounted inside the center conductor is required as the ejected plasma matches the symmetry of the transmission line. The plasma produced by the IP was characterized on a test bed using framing photography, magnetic pick-up loops, spectroscopy, as well as single and dual beam heterodyne interferometry in various configurations. The results from field testing on the Hawk cylindrical POS with a shorted load is also reported. The POS experiments with a short circuit load indicated superior performance using a hydrogen plasma with strong dependence on the initial conditions. The data also implies that the conduction phase of the POS is influenced by secondary plasma formation from electrode surfaces. Further experimentation using the IP with H2 gas is planned.
DTIC
Pinch Effect; Switches; Fabrication; Inversions; Plasmas (Physics); Cylindrical Bodies

20010041079 Michigan Univ., Dept. of Atmospheric, Oceanic, and Space Sciences, Ann Arbor, MI USA
Langmuir Probe Spacecraft Potential End Item Specification Document ***Final Report, 21 May 1999 - 20 May 2001***
Gilchrist, Brian, Michigan Univ., USA; Apr. 18, 2001; 94p; In English
Contract(s)/Grant(s): NAG8-1612
Report No.(s): Rept-075-3046-Rev; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This document describes the Langmuir Probe Spacecraft Potential (LPSP) investigation of the plasma environment in the vicinity of the ProSEDS Delta II spacecraft. This investigation will employ a group of three (3) Langmuir Probe Assemblies, LPAs, mounted on the Delta II second stage to measure the electron density and temperature (n(sub e) and T(sub e)), the ion density (n(sub i)), and the spacecraft potential (V(sub s)) relative to the surrounding ionospheric plasma. This document is also intended to define the technical requirements and flight-vehicle installation interfaces for the design, development, assembly, testing, qualification, and operation of the LPSP subsystem for the Propulsive Small Expendable Deployer System (ProSEDS) and its associated Ground Support Equipment (GSE). This document also defines the interfaces between the LPSP instrument and the ProSEDS Delta II spacecraft, as well as the design, fabrication, operation, and other requirements established to meet the mission objectives. The LPSP is the primary measurement instrument designed to characterize the background plasma environment and is a supporting instrument for measuring spacecraft potential of the Delta II vehicle used for the ProSEDS mission. Specifically, the LPSP will use the three LPAs equally spaced around the Delta II body to make measurements of the ambient ionospheric plasma during passive operations to aid in validating existing models of electrodynamic-tether propulsion. These same probes will also be used to measure Delta II spacecraft potential when active operations occur. When the electron emitting plasma contractor is on, dense neutral plasma is emitted. Effective operation of the plasma contactor (PC) will mean a low potential difference between the Delta II second stage and the surrounding plasma and represents one of the voltage parameters needed to fully characterize the electrodynamic-tether closed circuit. Given that the LP already needs to be well away from any near-field

disturbances around the Delta II, it is possible to use the same probe with a simple reconfiguration of the electronics to measure potential with respect to the ambient plasma. The LP measurement techniques are outlined in the following text and discussed in detail in the Appendix. The scientific goals of the investigation, the physical and electrical characteristics of the instrument, and the on-orbit measurement requirements are also discussed in this document.
Author
Delta Launch Vehicle; Electrostatic Probes; Fabrication; Space Plasmas; Electrodynamics

20010042205 Institute of Plasma Physics and Laser Microfusion, Warsaw, Poland
Neutron Emission Experiment on the Megajoule Plasma-Focus Facility Operated at the IPPLM ***Final Report***
Scholz, Marek, Institute of Plasma Physics and Laser Microfusion, Poland; Aug. 24, 2000; 16p; In English
Contract(s)/Grant(s): F61775-99-W-E087
Report No.(s): AD-A387712; EOARD-SPC-99-4087; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report results from a contract tasking Institute of Plasma Physics and Laser Microfusion as follows: The contractor will optimize the PF-1000 Megajoule Plasma-Focus machine. Objectives are achievement of a maximum neutron yield for stored energy of 200-800 kJ and determination if and where the neutron yield saturates. He will also determine neutron emission characteristics and investigate the relation between the neutron yield and plasma sheath dynamics and plasma sheath structure, particular attention will be paid to the pinch filamentation phenomenon and its connection with the neutron yield.
DTIC
Neutron Emission; Plasma Physics; Plasma Focus

20010043696 Mission Research Corp., Albuquerque, NM USA
Benchmark Results for LSP on ASCI Red
Clark, R. E.; Hughes, T. P.; Jul. 1998; 16p; In English
Report No.(s): PB2001-104867; MRC/ABQ-N-591; No Copyright; Avail: National Technical Information Service (NTIS)
We have run two parallel benchmark series with the particle-in-cell code LSP. The benchmarks are from the QUICKSILVER set of benchmarks and were carried out on the ASCI Red (Teraflop) machine at Sandia National Laboratories. The results give a speedup factor of 26 on 32 processors for the case requiring no particle communication, and a factor of 20 for the case with significant particle communication.
NTIS
Laboratories; Plasma Accelerators; Plasma Physics

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SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

20010040760 NASA Marshall Space Flight Center, Huntsville, AL USA
Carbon Nanotubes Grown by CVD in Various Conditions
Zhu, S., NASA Marshall Space Flight Center, USA; Su, C., NASA Marshall Space Flight Center, USA; Cochrane, J. C., NASA Marshall Space Flight Center, USA; Lehoczky. S. L., NASA Marshall Space Flight Center, USA; Muntele, I., NASA Marshall Space Flight Center, USA; Ila, D., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 13th; ICCG, 30 Jul. 2001, Kyoto, Japan; No Copyright; Avail: Issuing Activity; Abstract Only
Since the superior properties of multi-wall carbon nanotubes (MWCNT) could be used in numerous devices such as electronics and sensors, many efforts have been engaged in synthesizing particular structural or dimensional MWCNT. This presentation will illustrate MWCNT synthesized on silicon substrates by thermal CVD. On the substrate, an array of catalysts is coated using sputtering deposition. A thin Ti buffer layer is also coated on some Si substrates prior to depositing catalyst particles. Nickel, cobalt or iron transition metals are used as catalysts for the MWCNT growth. Since the diameter of MWCNT depends on the size of catalyst particles, the catalyst particle size is investigated after annealed at various temperatures. MWCNT are grown on the substrate in the temperature range of 700 to 1000 C and the pressure range of 100 torr to one atmosphere. Methane and hydrogen gases with methane content of 10% to 100% are used for the MWCNT synthesis. Morphology, length and diameter of

these MWCNT are determined by scanning electron microscopy and Raman spectroscopy. The detailed results of syntheses and characterizations will be discussed in the presentation.
Author
Carbon; Catalysts; Coatings; Nanotubes; Transition Metals

20010040853 National Inst. of Standards and Technology, Mathematical and Computational Sciences Div., Gaithersburg, MD USA
Phase-Field Model for High Anisotropic Interfacial Energy
McFadden, G. B.; Eggleston, J. J.; Voorhees, P. W.; Jan. 2001; 28p; In English
Report No.(s): PB2001-102386; NISTIR-6706; Copyright; Avail: National Technical Information Service (NTIS)
Anisotropic surface free energy is included in a phase-field model to determine the equilibrium shapes of a free particle in a matrix. Our model allows for a crystal-melt interface with sharp corners due to a highly anisotropic surface free energy with missing orientations. Numerical simulations for various degrees of anisotropy were calculated and they show excellent agreement with analytical equilibrium shapes.
NTIS
Anisotropy; Interfacial Energy; Crystals; Mathematical Models

20010041021 Michigan Univ., Dept. of Materials Science and Engineering, Ann Arbor, MI USA
Molecular and Microstructure Scale Models of CVD Diamond Growth ***Final Report, 9 Nov. 1997-9 Oct. 2000***
Srolovitz, David J.; Mar. 20, 2000; 9p; In English
Contract(s)/Grant(s): N00014-97-1-6013
Report No.(s): AD-A388036; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This project developed atomistic and microstructural models for the growth of polycrystalline thin films. The atomistic simulations were based upon the kinetic Monte Carlo method and employed experimental and first-principles data for different surface reactions. The models predict the atomic structure of the film, the surface structure, point defect incorporation and the growth rate of different surfaces. The microstructural models employ the atomistic simulation predictions of growth rate for different surfaces to track the evolution of an ensemble of 1000 grains during film growth under a wide range of growth conditions. This model predicts the grain structure, grain size, surface roughness, crystallographic texture, etc. Both of these models were also used to show how to optimize diamond film growth.
DTIC
Microstructure; Polycrystals; Thin Films; Vapor Deposition; Mathematical Models; Diamond Films

20010041046 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Process for Automated, Safe MBE Start and Flux Calibration ***Final Report, Jan.-Jun. 2000***
Svensson, Stefan; Feb. 2001; 27p; In English
Report No.(s): AD-A387894; ARL-TR-2361; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A command procedure has been developed for the U.S. Army Research Laboratory (ARL) molecular beam epitaxy (MBE) computer control system that allows a user to set up the system for an automated, unattended start each morning. The automated sequence consists of 1. A system safety check to determine if cell ramping should be allowed. 2. A cell temperature ramp to an outgassing temperature. 3. An outgassing of cells. 4. A ramp-down of cells to nominal operating temperatures. 5. An automated setup through an iterative process of flux measurements and changes of temperatures until desired targets are reached. This command procedure allows a daily, safe start-up of the MBE system and generates identical flux settings that improve the crystal growth reproducibility. Typically, one can save two hours or more of a work day by using this automated procedure.
DTIC
Calibrating; Molecular Beam Epitaxy; Automatic Control; Systems Engineering; Applications Programs (Computers)

20010041170 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Solid State Research ***Quarterly Report, 1 May-31 Jul 2000***
Shaver, David C.; Feb. 16, 2001; 71p; In English; Original contains color plates
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A387784; 2000-3; ESC*-TR-2000-043; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report covers in detail the research work of the Solid State Division at Lincoln Laboratory for the period 1 May-31 July 2000. The topics covered are Quantum Electronics, Electro-optical Materials and Devices, Submicrometer Technology, Biosensor and Molecular Technologies, Advanced Imaging Technology, Analog Device Technology, and Advanced Silicon

Technology. Funding is provided by several DoD organizations-including the Air Force, Army, BMDO, DARPA, Navy, NSA, and OSD-and also by the DOE, NASA, and NIST.
DTIC
Research and Development; Quantum Electronics; Electro-Optics; Solid State Devices

20010041189 North Carolina State Univ., Raleigh, NC USA
Growth of Single Crystals and Fabrication of GaN and AlN Wafers ***Final Report, 1 Jan. 2000-1 Jan. 2000***
Sitar, Z.; Davis, R. F.; Mar. 2001; 18p; In English
Contract(s)/Grant(s): N00014-00-1-0192
Report No.(s): AD-A387721; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

GaN and AlN single crystals were grown from the vapor phase by evaporation of gallium or aluminum metals under an ammonia or nitrogen flow in a high temperature reactor. A growth rate of 500 micrometer/hr in the c direction was achieved for GaN while the growth rates for AlN were as high as a few millimeters per hour. The crystal size reached 3 mm for GaN and up to 15 mm for AlN. For both materials, the crystal aspect ratio (c/a) could be controlled by temperature and partial pressure of reactants. The resulting crystals were transparent and of excellent crystalline quality, as confined by x-ray diffraction, Raman scattering, and transmission electron microscopy studies. Photoluminescence studies on GaN conducted at 77 K showed a sharp emission peak centered at 359 mm. Time dependent photoluminescence measurements revealed optical metastability in bulk GaN.
DTIC
Fabrication; Single Crystals; Gallium Nitrides; Aluminum Nitrides; Crystal Growth

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PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.

20010040761 NASA Marshall Space Flight Center, Huntsville, AL USA
A Realistic Accretion Disk Model for AGNs
Suleimanov, V., NASA Marshall Space Flight Center, USA; Ghosh, K. K., NASA Marshall Space Flight Center, USA; Austin, R. A., NASA Marshall Space Flight Center, USA; Ramsey, B. D., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We present a new relativistic accretion disk model of AGNs, based on alpha modified accretion disk theory, where alpha is a parameter that characterizes the efficiency of the mechanism of angular momentum transport. In this model we have considered a geometrically-thin, high-luminosity (alpha-accretion disk, around a supermassive black hole. The geometrically thin limit assumes a local energy balance within the accretion disk, which has been used to derive the plasma temperature of the disk. The energy balance equation has three solutions: low, medium and high temperature, depending on the heating rate of the accretion disk. We predict that the inner part of a high luminosity accretion disk is in the high- temperature (10(exp 7) to 10(exp 9) K) state and for this we obtain the high temperature solution of the energy balance equation using a Comptonization process. We find the local spectrum of each ring of the disk (we have divided the high temperature region of the disk into 50 rings) to be a diluted Wien spectrum. However, the emergent integral spectrum of the high temperature region is a power-law with a high-energy cutoff that depends on the basic parameters of AGNs (the accretion rate, the incidence angle, and the mass and the angular momentum of the central black hole). We have fitted the observed spectra of 28 AGNs using the present model and have derived the values of the basic parameters of these AGNs. Results of these spectral fittings have been discussed in the framework of the unification model of AGNs.
Author
Models; Accretion Disks; Active Galactic Nuclei; Black Holes (Astronomy); Plasma Temperature; Spectra

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SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula.

20010040768 Bolton Inst. of Tech., Bolton Business School, UK
Condition Monitoring and Diagnostic Techniques to Improve Teaching and Learning in Higher Education
Narasimhan, K., Bolton Inst. of Tech., UK; International Journal of COMADEM; April 2001; ISSN 1363-7681; Volume 4, No. 2, pp. 27-34; In English; Copyright; Avail: Issuing Activity

A number of changes affecting the higher education industry has resulted in it becoming increasingly highly competitive. A decrease in funding coupled with an increase in the dropout rate necessitates that higher education institutions improve the retention rate to improve their financial position. One of the reasons for students dropping out may be their dissatisfaction with the quality of teaching. Various diagnostic approaches are used for assessing students' satisfaction at the institution level as well as their satisfaction with teaching. one of the most widely used approaches for assessing the latter is the use of end-of-term student ratings of teaching. However, any improvement effected based on students' feedback does not benefit the students responding to the survey. It is suggested that better condition monitoring and diagnostic systems than the present student ratings of teachers need to be instituted, to identify any current malfunctions or impending failures that may cause student dissatisfaction leading to complaints or withdrawal from the system. This paper explains the need for a new approach based on the concept of perceptions minus expectation gaps in service, to address some of the deficiencies of present methods of obtaining student feedback. The new approach is described with the aid of a case study and the implications of the new method are discussed. The study findings confirm previous findings that teachers are not sometimes aware of students' expectations and perceptions and that they are also found to use methods that are not congruent with their ideal conceptions of teaching. ideas for further research are also presented.
Author
Education; Surveys; Students; Ratings

20010041322 National Inst. for Literacy, Washington, DC USA
Learning to Think, Learning to Learn: What the Science of Thinking and Learning Has to Offer Adult Education. NIFL Literacy Leader Fellowship Program Reports, Volume 4, *1998-1999*
[1999]; 238p; In English
Contract(s)/Grant(s): Proj. X2571980003
Report No.(s): PB2001-102623; No Copyright; Avail: CASI; A03, Microfiche; A11, Hardcopy

Thirty years ago, most theories about teaching and learning (for children and adults) were based on drill. The idea was that if facts were repeated enough, then students would memorize them, and this was learning. According to a 1954 teacher training textbook, "Learning is shown by a change in behavior as a result of experience." Notice that nothing is mentioned about what students believe, what process they use to solve problems, or their own awareness of their thinking. Although adult educators like Paolo Freire and Malcolm Knowles encouraged teachers to use real-life examples that students were interested in, most adult reading workbooks looked about the same as children's drill-based workbooks. This approach can be described as a "behaviorist" approach to learning.
NTIS
Education; Reading; Learning

20010043367 National Science Foundation, Arlington, VA USA
An Emerging Field of Interdisciplinary Research and Education in Science and Engineering
Oct. 1999; 46p; In English; Quantum Information Science, 28-29 Oct. 1999, Arlington, VA, USA; Original contains color illustrations
Report No.(s): PB2001-104712; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Quantum information science (QIS) is a new field of science and technology, combining and drawing on the disciplines of physical science, mathematics, computer science, and engineering. Its aim is to understand how certain fundamental laws of physics discovered earlier in this century can be harnessed to dramatically improve the acquisition, transmission, and processing of information. The exciting scientific opportunities offered by QIS are attracting the interest of a growing community of scientists and technologists, and are promoting unprecedented interactions across traditional disciplinary boundaries. Advances in QIS will become increasingly critical to our national competitiveness in information technology during the coming century.
NTIS
Information Systems; Research and Development; Physical Sciences; Conferences

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20010040858 General Accounting Office, Washington, DC USA
Information Management: Progress in Implementing the 1996 Electronic Freedom of Information Act Amendments
Mar. 2001; 58p; In English
Report No.(s): PB2001-104410; GAO/01-378; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

On December 19, 2000, we briefed your offices on our review of the 1996 Electronic Freedom of Information Act Amendments, known as e-FOIA. As you know, the Freedom of Information Act requires federal agencies to make certain types of information available for public inspection. e-FOIA, among other things, was intended to improve agency responsiveness and provide for greater public access to government information electronically. In response to your request, we reviewed the progress made at 25 major federal departments and agencies in implementing the e-FOIA amendments.
NTIS
Inspection; Progress

20010041324 Technological Research and Development Authority, Titusville, FL USA
NASA-KSC/Florida Dual Use Technology Partnership ***Final Report, 1 Dec. 1999 - 30 Nov. 2000***
Kershaw, David, Technological Research and Development Authority, USA; Mar. 12, 2001; 21p; In English
Contract(s)/Grant(s): NAG10-0275; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document constitutes the Technological Research and Development Authority's (TRDA) Final Reports for the NASA-KSC/Florida Dual Use Technology Partnership grant covering the period December 1, 1999 through November 30, 2000. The NASA Grant and Cooperative Agreement Handbook requires the TRDA to provide NASA with a final report on Subject Inventions, Federal Cash Transactions, Summary Research, and Federally-Owned Property. This report contains those requirements as well as a description of the TRDA's grant performance related to activities undertaken, difficulties incurred, remedial actions, and the current financial status of the contract.
Derived from text
Research and Development; Commercialization; Technology Assessment

20010041338 Rochester Univ., Computer Science Dept., NY USA
A Dialogue-Based Approach to Mixed-Initiative Plan Management ***Final Report, Jun. 1995-Jul. 2000***
Allen, James F., Rochester Univ., USA; Ferguson, George M., Rochester Univ., USA; Schubert, Lenhart K., Rochester Univ., USA; Oct. 2000; 77p; In English
Contract(s)/Grant(s): F30602-95-1-0025; DARPA ORDER-C642; AF Proj. C642
Report No.(s): AD-A386564; AFRL-IF-RS-TR-2000-148; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This research investigates ways to augment human plan reasoning capabilities in command and control tasks, such as logistics planning, crisis management and situation assessment. The goal was to avoid making the simplifying assumptions made in traditional research in planning that prevented effective human-computer collaborative planning. Specifically, no assumptions were made relative to goals being well specified in the beginning, or that the evaluation criteria can be precisely defined in a quantitative manner. The groundwork was laid for research in mixed-initiative planning through development of TRIPS (The Rochester Interactive Planning System), a robust speech-driven mixed initiative planning system, which has been installed at Global Infotech in Washington DC for the Command Post of the Future (CPOF) jumpstart demonstration as well as at the Air Force Research Lab in Rome, New York. TRIPS runs stand-alone without Rochester researchers present. New Theoretical techniques for speeding up well-founded domain-independent planners were also developed. In addition, simulation and data mining techniques to find improvements to large-scale plans that could not be reasoned about using traditional techniques were developed and demonstrated.
DTIC
Management Information Systems; Speech Recognition; Logistics Management; Human-Computer Interface

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

20010041120 Defense Systems Management School, Fort Belvoir, VA USA
Glossary of Defense Acquisition Acronyms & Terms
Cochrane, C. B., Defense Systems Management School, USA; Hagan, G. J., Defense Systems Management School, USA; January 2001; 181p; In English
Report No.(s): AD-A387514; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

This is the Tenth Edition of Defense Acquisition Acronyms and Terms. The GLOSSARY: Defense Acquisition Acronyms and Terms contains most acronyms, abbreviations, and terms commonly used in the weapon systems acquisition process within the Department of Defense (DoD) defense industries. It focuses on terms with generic DoD application but also includes some service unique terms that others might deal with, and thus require reference. Appendix A contains a listing of common abbreviations and acronyms. Appendix B contains definitions of terms used throughout the DoD acquisition community, including terms that have commonality between U.S. and allied acquisition programs.
DTIC
Abbreviations; Defense Program; Dictionaries; Terms; Terminology

20010041178 General Accounting Office, Washington, DC USA
INFORMATION SECURITY: IRS Electronic Filing Systems
Feb. 2001; 30p; In English
Report No.(s): AD-A387752; GAO-01-306; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In connection with your request that we evaluate the effectiveness of the Internal Revenue Service's (IRS) computer controls over its external access points and internal networks and systems, we assessed the effectiveness of key computer controls designed to ensure the security, privacy, and reliability of IRS electronic filing systems and electronically filed taxpayer data during last year s tax filing season. This report discusses computer control weaknesses that existed in IRS electronic filing systems during the 2000 tax filing season and describes actions IRS has taken to correct these weaknesses prior to the current 2001 tax filing season.
DTIC
Computer Information Security; Information Systems; Computer Networks; Data Processing

20010041308 General Accounting Office, Washington, DC USA
Information Management: Progress in Implementing the 1996 Electronic Freedom of Information Act Amendments
Mar. 2001; 53p; In English; The original document contains color images. Report to Congressional Requesters.
Report No.(s): AD-A387946; GAO-01-378; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

On December 19, 2000, we briefed your offices on our review of the 1996 Electronic Freedom of Information Act Amendments, known as e-FOIA. As you know, the Freedom of Information Act requires federal agencies to make certain types of information available for public inspection. e-FOIA, among other things, was intended to improve agency responsiveness and provide for greater public access to government information electronically. In response to your request, we reviewed the progress made at 25 major federal departments and agencies in implementing the e-FOIA amendments.
DTIC
Information Retrieval; Information Transfer; Information Management; Congressional Reports

20010041336 Binghamton Univ., Office of Research and Sponsored Programs, Binghamton, NY USA
Multi-Databases: Removal of Redundant Information ***Final Report, Apr. 1998-Jun. 1999***
Bourbakis, Nicholas G., Binghamton Univ., USA; Meng, Weiyi, Binghamton Univ., USA; Dec. 2000; 33p; In English
Contract(s)/Grant(s): F30602-98-C-0072; AF Proj. 3481
Report No.(s): AD-A386557; AFRL-IF-RS-TR-2000-168; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This effort included the partial development of a search engines for multimedia web documents and the complete implementation of a prototype methodology for removing (partially or totally) redundant information from multiple documents in an effort to synthesize new documents. A typical multimedia document contains free text and images and additionally has associating well-structured data. An SQL-like query language, WebSSQL, has been used to retrieve these types of documents. The main differences between Web SSQL and other proposed SQL extensions for retrieving web documents are that Web SSQL

is similarity-based and supports conditions on images. This report also describes a software methodology for the detection and removal of redundant information (text paragraphs and images) from multiple retrieved documents. Documents reporting the same or related events and stories may contain substantial redundant information. The removal of the redundant information and the synthesis of these documents into a single document can not only save a user's time to acquire the information, but also storage space to archive the data. The methodology reported here consists of techniques for analyzing text paragraphs and images as well as a set of similarity criteria used to detect redundant paragraphs and images. The methodology developed in this project has the ability either to work independently with text paragraphs and images, or to combine both in one synthetic document.
DTIC
Data Management; Computer Programming; Data Base Management Systems

20010041374 General Accounting Office, Washington, DC USA
REgulatory Management: Communication About Technology-Based Innovations Can Be Improved
Feb. 2001; 39p; In English; Report to Congressional Requesters.
Report No.(s): AD-A387751; GAO-01-232; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

During the past several years, information technology (IT) has played an increasingly important role in how federal agencies interact with the public and accomplish their missions. Sometimes referred to as electronic government or E-gov, the use of IT has already changed how public policy is developed and administered in a variety of areas and has the potential to introduce even more changes in the future. One area of public policy that is beginning to feel the effects of IT is regulatory management, which includes such interrelated processes as rulemaking, compliance assistance, information collection and dissemination, and regulatory enforcement. The use of IT in regulatory management can reduce regulatory burden; improve the transparency of regulatory processes; and, ultimately, facilitate the accomplishment of regulatory objectives.
DTIC
Information Systems; Policies; Congressional Reports

20010043701 Walter Reed Army Inst. of Research, Washington, DC USA
1997 Accession Medical Standards Analysis & Research Activity (AMSARA) ***Annual Report***
Clark, K. L.; Krauss, M. R.; Kelley, P. W.; Onaitis, J.; Li, Y.; May 1998; 67p; In English
Report No.(s): AD-A344596; WRAIR-TR-98-0001; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Accession Medical Standards Analysis and Research Activity (AMSARA) is a major new epidemiologic entity. Historically, military medical accession policy and waiver deliberations were based heavily on expert opinion. A common limitation of expert opinion is that although experience teaches much about those with certain conditions who develop problems, it does not teach about those with the same conditions who remain well. AMSARA produces analyses of epidemiologic data necessary for the joint personnel and medical flag-level Department of Defense (DOD) Accessions Medical Standards Steering Commiflee to make evidence-based accession policy decisions. This report contains descriptive statistics on data used and comprehensive epidemiologic studies on the cost-effectiveness of syphilis screening in military remit applicants, the asthma accession standards, and academic skills defect. Adding an epidemiologic perspective to medical accession policy development allows the DOD to address unacceptable high rates of premature attrition, lost duty time, avoidable medical care costs, sick leave, disability, and various wasteful, inefficient practices.
DTIC
Standards; Steering; Sicknesses; Medical Science; Armed Forces; Information Management

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20010040766 Glaxochem Ltd., GlaxoWellcome Operations, Ulverston, UK
Condition Based Maintenance: A Method of Assessing the Financial Benefits
Rajan, B. S., Glaxochem Ltd., UK; Roylance, B. J., Wales Univ., UK; International Journal of COMADEM; April 2001; ISSN 1363-7681; Volume 4, No. 2, pp. 13-18; In English; Copyright; Avail: Issuing Activity

A research investigation has been undertaken to develop a generic model that would allow cost benefit analyses of decisions to introduce Condition Monitoring, prior to their implementation. A prime objective of this study has been to develop a tool which will allow plant engineers, maintenance managers, etc., to objectively evaluate the likely financial effects of implementation of each of the various CM techniques that are currently available and then to optimize their selection such that the maximum financial

benefit is achieved. The results of this study have resulted in an evaluation method that has been proved in batch process plants in the pharmaceutical industry and this has been coded into an MS Excel(c) workbook for ease of use. Both the development of the method and the use of the workbook are described in this paper.
Author
Cost Effectiveness; Maintenance; Cost Analysis

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in Space Sciences see categories 89 through 93.

20010040757 IIT Research Inst., R and B Operations, West Conshohocken, PA USA
Comparison of Commercial EMI Test Techniques to NASA EMI Test Techniques ***Final Report***
Smith, Valerie, IIT Research Inst., USA; November 2000; 1p; In English
Contract(s)/Grant(s): N00039-97-C-0053; NASA Order H-30231-D
Report No.(s): NASA/CR-2000-210400; NAS 1.26:210400; M-987; No Copyright; Avail: Issuing Activity; Abstract Only

This systems report describes how the Optical Properties Monitor (OPM) experiment was developed. Pertinent design parameters are discussed, along with mission information and system requirements to successfully complete the mission. Environmental testing was performed on the OPM to certify it for spaceflight. This testing included vibration, thermal vacuum, electromagnetic interference and conductance, and toxicity tests. Instrument and monitor subsystem performances, including the reflectometer, vacuum ultraviolet, total integrated scatter, atomic oxygen monitor, irradiance monitor, and molecular contamination monitor during the mission are discussed. The OPM experiment was launched aboard the Space Shuttle on mission STS-81 in January 1997 and transferred to the Mir space station. An extravehicular activity (EVA) was performed in April 1997 to attach the OPM experiment to the outside of the Mir/Shuttle Docking Module for space environment exposure. The OPM conducted in situ measurements of a number of material samples. These data may be found in the OPM Science Report. OPM was retrieved during an EVA in January 1998 and was returned to Earth on board the Space Shuttle on mission STS-89.
Author
Numerical Analysis; Electromagnetic Interference; Data Management; Reflectometers; Irradiance; Far Ultraviolet Radiation; Design Analysis; Aerospace Environments

20010041071 Physical Sciences, Inc., Andover, MA USA
Satellite Contamination and Materials Outgassing Knowledgebase - An Interactive Database Reference ***Final Report***
Green, D. B., Physical Sciences, Inc., USA; March 2001; 127p; In English
Contract(s)/Grant(s): NAS8-98215
Report No.(s): NASA/CR-2001-210909; M-1010; NAS 1.26:210909; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The goal of this program is to collect at one site much of the knowledge accumulated about the outgassing properties of aerospace materials based on ground testing, the effects of this outgassing observed on spacecraft in flight, and the broader contamination environment measured by instruments on-orbit. We believe that this Web site will help move contamination a step forward, away from anecdotal folklore toward engineering discipline. Our hope is that once operational, this site will form a nucleus for information exchange, that users will not only take information from our knowledge base, but also provide new information from ground testing and space missions, expanding and increasing the value of this site to all. We urge Government and industry users to endorse this approach that will reduce redundant testing, reduce unnecessary delays, permit uniform comparisons, and permit informed decisions.
Derived from text
Outgassing; Data Bases; Aircraft Construction Materials; Spacecraft Construction Materials; Spacecraft Contamination

89
ASTRONOMY

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20010040876 Hawaii Univ., Inst. for Astronomy, Honolulu, HI USA
University of Hawaii Institute for Astronomy, ***1 Oct. 1999-30 Sep. 2000***
Jan. 2001; 18p; In English
Report No.(s): AD-A387690; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Institute for Astronomy (IfA) is the astronomical research organization of the University of Hawaii (UH). Its headquarters is located in Honolulu on the island of Oahu near the University of Hawaii at Manoa, the main UH cam-pus. The IfA is responsible for administering and maintaining the infrastructure for Haleakala Observatories on the island of Maui and for Mauna Kea Observatories (MKO) on the island of Hawaii.
DTIC
Astronomy; Astronomical Observatories

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20010041319 NASA Marshall Space Flight Center, Huntsville, AL USA
Radial Flows in Supergranules
Hathaway, D. H., NASA Marshall Space Flight Center, USA; Beck, J. G., Stanford Univ., USA; Han, S., Tennessee Technological Univ., USA; Raymond, J., Tennessee Technological Univ., USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We determine the radial component of the supergranular flow velocity by examining the center-to-limb variation of the Doppler velocity signal. We acquire individual Doppler images obtained with the MDI instrument on the SOHO spacecraft and process them to remove the p-mode oscillation signal, the axisymmetric flows, the convective blueshift signal, and instrumental artifacts. The remaining Doppler signal contains only cellular flow structures. The Doppler signal from the horizontal flows in these cells varies like sin p, where p is the heliocentric angle from disk center. The Doppler signal from radial flows varies like cos p. We fit the center-to-limb variation of the mean squared velocity signal to a straight line in sin(exp 2) rho over the central portion of the disk. The intercept of this line at disk center gives the amplitude of the radial component of the flow. The slope of the line gives the amplitude of the horizontal component. We find that the radial flows for typical supergranules have speeds about 10% that of their associated horizontal flows or about 30 m/s. The ratio of the radial to horizontal flow speed increases from 9% to about 18% as the size of the cells decreases from is greater than 60 Mm to approximately 5 Mm. We use data simulations to check these results and find a ratio that increases from 5% to only about 12% over the same range of cell sizes. These smaller ratios are attributed to an underestimation of the horizontal flow speeds due to the fact that, the transverse component of the horizontal flow is not detected by the Doppler measurements.
Author
Convection; Radial Flow; Solar Corona; Stellar Structure; Solar Atmosphere; Sun; Solar Activity

20010041340 Eureka Scientific, Inc., Oakland, CA USA
Boundary Conditions of the Heliosphere ***Progress Report, 11 Mar. 1999 - 10 Mar. 2001***
Slavin, Jonathan D., Eureka Scientific, Inc., USA; Frisch, Priscilla C ., Chicago Univ., USA; Apr. 01, 2001; 23p; In English
Contract(s)/Grant(s): NASW-98027; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We present new calculations of the ionization of the Local Interstellar Cloud (LIC) by directly observed sources including nearby stellar extreme ultraviolet (EUV) sources and the diffuse emission of the Soft X-ray Background (SXRB). In addition, we model the important, unobserved EUV emission both from the hot gas responsible for the SXRB and from a possible evaporative boundary between the LIC and the hot gas. We show that these ionization sources can provide the necessary ionization and heating of the cloud to match observations. Including the radiation from the conductive boundary, while not required, does improve the agreement with observations of the temperature of the LIC. The ionization predicted in our models shows good agreement with pickup ion results, interstellar absorption line data towards epsilon CMa, and EUV opacity measurements of nearby white dwarf stars. The areas of disagreement point to a possible underabundance (relative to solar abundance) of neon in the LIC. The presence

of dust in the cloud, or at least depleted abundances, is necessary to maintain the heating/cooling balance and reach the observed temperature.
Author
Interstellar Matter; Ionization; Heat Balance; Computerized Simulation

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20010041202 Lunar and Planetary Inst., Houston, TX USA
Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020
Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001; 106p; In English; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020, 21-22 February 2001, Houston, TX, USA; Sponsored by Lunar and Planetary Inst., USA; See also 20010041203 through 20010041296
Report No.(s): LPI-Contrib-1084; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This volume contains abstracts that have been accepted for presentation at the Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020.
Author
Conferences; Space Exploration; Spacecraft Propulsion; Deep Space; Space Missions

20010041203 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Highly Survivable Avionics Systems for Long-Term Deep Space Exploration
Alkalai, L., Jet Propulsion Lab., California Inst. of Tech., USA; Chau, S., Jet Propulsion Lab., California Inst. of Tech., USA; Tai, A. T., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 1; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
The design of highly survivable avionics systems for long-term (> 10 years) exploration of space is an essential technology for all current and future missions in the Outer Planets roadmap. Long-term exposure to extreme environmental conditions such as high radiation and low-temperatures make survivability in space a major challenge. Moreover, current and future missions are increasingly using commercial technology such as deep sub-micron (0.25 microns) fabrication processes with specialized circuit designs, commercial interfaces, processors, memory, and other commercial off the shelf components that were not designed for long-term survivability in space. Therefore, the design of highly reliable, and available systems for the exploration of Europa, Pluto and other destinations in deep-space require a comprehensive and fresh approach to this problem. This paper summarizes work in progress in three different areas: a framework for the design of highly reliable and highly available space avionics systems, distributed reliable computing architecture, and Guarded Software Upgrading (GSU) techniques for software upgrading during long-term missions. Additional information is contained in the original extended abstract.
Derived from text
Aerospace Systems; Avionics; Commercial Off-The-Shelf Products; Reliability Analysis; Redundant Components

20010041204 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
A Miniaturized Seismometer for Surface Measurements in the Outer Solar System
Banerdt, W. B., Jet Propulsion Lab., California Inst. of Tech., USA; Pike, W. T., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 2; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
Seismology is a powerful tool for investigating the inner structure and dynamic processes of a planetary body. The interior structure information derived from seismic measurements is complementary to other methods of probing the subsurface (such as gravity and electromagnetics), both in terms of spatial and depth resolution and the relevant types of material properties being sensed. The propagation of seismic waves is sensitive to composition (via density and elastic parameters), temperature (via attenuation) and physical state (solid vs. liquid). In addition, the seismicity (level and distribution in space and time of seismic activity) provides information on the impact flux and tectonic forces currently active within the body. The major satellites of the outer solar system provide obvious targets for seismic investigations. In addition, small bodies, such as asteroids and comets, can also benefit from seismic measurements. We have developed an extremely small, lightweight, low-power seismometer for

planetary applications which is ideally suited for use in the outer solar system. This instrument has previously been proposed and selected for use on a comet (on the Rosetta Lander, subsequently deselected for programmatic reasons) and Mars (on the NetLander mission). Additional information is contained in the original extended abstract.
Derived from text
Gas Giant Planets; Seismology; Seismographs

20010041205 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Approaches for Exploring the Organic Evolution of Titan's Surface
Beauchamp, P., Jet Propulsion Lab., California Inst. of Tech., USA; Beauchamp, J., California Inst. of Tech., USA; Dougherty, D., California Inst. of Tech., USA; Raulin, F., Paris Univ., France; Smith, M., Arizona Univ., USA; Welch, C., Merck and Co., Inc., USA; Shapiro, R., New York Univ., USA; Lunine, J., Arizona Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 3; In English; See also 20010041202; Supported by a DDF grant to P.B. and Distinguished Visiting Scientist grant to J. L.; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Saturn's largest moon Titan has a cold, very dense nitrogen atmosphere rich in methane and the hydrocarbon and nitride products of methane photolysis. Sources of energy for atmospheric chemistry include solar ultraviolet radiation, Saturn magnetospheric particles, and galactic cosmic rays. The chemistry of Titan's atmosphere, while interesting from the point of view of planetary photochemistry, is largely free radical driven and therefore not particularly suited to the synthesis of polymeric biomolecules or even their precursors. However, the nature of Titan's atmosphere, in particular its redox state (hydrogen escapes rapidly and is under abundant compared to in the giant planets), and the presence of a variegated surface make consideration of surface chemistry on Titan interesting from an astrobiological viewpoint. Additional information is contained in the original extended abstract.
Derived from text
Oxidation-Reduction Reactions; Satellite Atmospheres; Titan; Organic Compounds; Atmospheric Composition; Space Exploration

20010041206 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
A Radiation-Tolerant, Low-Power Non-Volatile Memory Based on Silicon Nanocrystal Quantum Dots
Bell, L. D., Jet Propulsion Lab., California Inst. of Tech., USA; Boer, E. A., California Inst. of Tech., USA; Ostraat, M. L., California Inst. of Tech., USA; Brongersma, M. L., California Inst. of Tech., USA; Flagan, R. C., California Inst. of Tech., USA; Atwater, H. A., California Inst. of Tech., USA; deBlauwe, J., Lucent Technologies, USA; Green, M. L., Lucent Technologies, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 4; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Nanocrystal nonvolatile floating-gate memories are a good candidate for space applications - initial results suggest they are fast, more reliable and consume less power than conventional floating gate memories. In the nanocrystal based NVM device, charge is not stored on a continuous polysilicon layer (so-called floating gate), but instead on a layer of discrete nanocrystals. Charge injection and storage in dense arrays of silicon nanocrystals in SiO2 is a critical aspect of the performance of potential nanocrystal flash memory structures. The ultimate goal for this class of devices is few- or single-electron storage in a small number of nanocrystal elements. In addition, the nanocrystal layer fabrication technique should be simple, 8-inch wafer compatible and well controlled in program/erase threshold voltage swing was seen during 100,000 program and erase cycles. Additional near-term goals for this project include extensive testing for radiation hardness and the development of artificial layered tunnel barrier heterostructures which have the potential for large speed enhancements for read/write of nanocrystal memory elements, compared with conventional flash devices. Additional information is contained in the original extended abstract.
Derived from text
Computer Storage Devices; Memory (Computers); Nanocrystals; Quantum Dots

20010041207 NASA Glenn Research Center, Cleveland, OH USA
Advanced Communication Architectures and Technologies for Missions to the Outer Planets
Bhasin, K., NASA Glenn Research Center, USA; Hayden, J. L.; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 6; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Missions to the outer planets would be considerably enhanced by the implementation of a future space communication infrastructure that utilizes relay stations placed at strategic locations in the solar system. These relay stations would operate autonomously and handle remote mission command and data traffic on a prioritized demand access basis. Such a system would

enhance communications from that of the current direct communications between the planet and Earth. The system would also provide high rate data communications to outer planet missions, clear communications paths during times when the sun occults the mission spacecraft as viewed from Earth, and navigational ”lighthouses” for missions utilizing onboard autonomous operations. Additional information is contained in the original extended abstract.
Derived from text
Space Communication; Space Missions; Communication Networks; Radio Relay Systems

20010041208 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Micro Navigator
Blaes, B. R., Jet Propulsion Lab., California Inst. of Tech., USA; Kia, T., Jet Propulsion Lab., California Inst. of Tech., USA; Chau, S. N., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 9; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Miniature high-performance low-mass space avionics systems are desired for planned future outer planetary exploration missions (i.e. Europa Orbiter/Lander, Pluto-Kuiper Express). The spacecraft fuel and mass requirements enabling orbit insertion is the driving requirement. The Micro Navigator is an integrated autonomous Guidance, Navigation & Control (GN&C)micro-system that would provide the critical avionics function for navigation, pointing, and precision landing. The Micro Navigator hardware and software allow fusion of data from multiple sensors to provide a single integrated vehicle state vector necessary for six degrees of freedom GN&C. The benefits of this MicroNavigator include: 1) The Micro Navigator employs MEMS devices that promise orders of magnitude reductions in mass power and volume of inertial sensors (accelerometers and gyroscopes), celestial sensing devices (startracker, sun sensor), and computing element; 2) The highly integrated nature of the unit will reduce the cost of flight missions. a) The advanced miniaturization technologies employed by the Micro Navigator lend themselves to mass production, and therefore will reduce production cost of spacecraft. b) The integral approach simplifies interface issues associated with discrete components and reduces cost associated with integration and test of multiple components; and 3) The integration of sensors and processing elements into a single unit will allow the Micro Navigator to encapsulate attitude information and determination functions into a single object. This is particularly beneficial for object-oriented software architectures that are used in advanced spacecraft. Additional information is contained in the original extended abstract.
Derived from text
Autonomous Navigation; Miniaturization; Multisensor Fusion; Space Navigation; Spacecraft Guidance

20010041209 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Micro-Avionics Node for Distributed Avionics System
Blaes, B. R., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 7; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

An avionics system is a platform residing on a flight vehicle that provides the resources (hardware and software) needed to manage the flight mission. Distributing the avionics system components, both functionally and spatially, can provide characteristics that benefit the overall system robustness, reliability, testability, and maintainability. This abstract discusses the concept of a distributed avionics system consisting of a network of micro-avionics nodes. Additional information is contained in the original extended abstract.
Derived from text
Avionics; Architecture (Computers); Systems Integration

20010041210 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Miniature Free-Flying Magnetometer Utilizing System-On-A-Chip Technology
Eyre, F. B., Jet Propulsion Lab., California Inst. of Tech., USA; Blaes, B. R., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 8; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Four Free-Flying Magnetometers (FFMs), developed at the Jet Propulsion Laboratory (JPL) for the Enstrophy mission, were successfully deployed from the payload of a sounding rocket launched from Poker Flats, Alaska on February 11, 1999. The FFMs functioned successfully by synchronously measuring the vector magnetic field at 4 points separate from the payload and at relative distances up to 3 km, and communicated their data, in bursts, to the ground. This is the first time synchronized in-situ multipoint measurements of the Earth’s magnetic field utilizing miniature spin-stabilized ”sensorcraft” have been performed. The data they provided have enabled, for the first time, the direct measure of field-aligned current density and are enabling new science by

determining the fine-scale structure of the currents in the Earth's ionosphere involved in the production of aurora. These proof-of-concept "hockey puck" (80 mm diameter, 38 mm height, 250 gram mass) FFMs were built using off-the-shelf commercial, industrial, and military grade surface-mount electronic components. Radiation-hard electronics was not required for the Enstrophy mission's short sub-orbital flight. The successful design, implementation, and flight demonstration of this 1st generation FFM design has provided a solid base for further development of a 2nd generation FFM design for planetary science applications. A reliable ultra-miniature radiation-hard 2nd-generation FFM utilizing System-On-A-Chip (SOAC) technologies is proposed. This design would be targeted for long-term planetary missions to investigate magnetospheric field configurations in regions having small-scale structure and to separate spatial and temporal variations. A fleet of short-lived (expendable) FFMs would be deployed into a targeted region to gather multiprobe vector magnetic field data. The FFMs would be ejected from a parent spacecraft at a speed of a few m/sec and would cover spatial volumes of order tens of kilometers for times of order one hour. The parent spacecraft would carry a sufficient number of FFMs for multiple deployments. Additional information is contained in the original extended abstract.
Derived from text
Magnetometers; Free Flight Test Apparatus; Ionospheric Currents; Geomagnetism

20010041211 Raytheon Co., Remote Sensing, Santa Barbara, CA USA
Advanced THEMIS for Multispectral Thermal IR Imaging
Blasius, K. R., Raytheon Co., USA; Silverman, S. H., Raytheon Co., USA; Christensen, P. R., Arizona State Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 10; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Advanced THEMIS is a project to define and develop to breadboard stage, a miniature infrared imaging radiometer with applications to Mars orbiter and lander missions and missions to other bodies of the outer and inner solar system. The goal is to maintain or enhance functionality of the Thermal Emission Imaging System (THEMIS), recently delivered to the Mars 2001 Odyssey Orbiter, while reducing volume by approx. 75%. Other improvements expected are a broadened spectral range and improved radiometric calibration. A new generation of microbolometer detectors will be tested and further developed. These detectors have a new structure and smaller pitch, 25 microns vs. 50 microns used for THEMIS. Advanced THEMIS will be a substantially smaller instrument than THEMIS, so it will reduce the cost of multispectral thermal emission imaging on future missions. Candidate missions include future landed and orbiting platforms at Mars and other solar system objects where priority science requires multispectral imaging in the thermal infrared. The reduction in instrument mass may greatly improve mission science return compared to previous technical approaches. Advanced THEMIS offers opportunities for science data return in at least three areas: surface mineralogy, surface temperature dynamics, and atmospheric phenomena, similar to the return from Mars Global Surveyor Thermal Emission Spectrometer (TES) now in operation . Additional information is contained in the original extended abstract.
Derived from text
Themis Project; Infrared Imagery; Miniaturization; Thermal Emission; Radiometers

20010041212 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Enabling Technologies for High Science Return and Low-Power
Bokulic, R. S., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 11; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

This paper provides an overview of enabling RF technologies and architectures, developed recently at the Applied Physics Laboratory (APL), that can serve to the benefit of the Outer Planets Program. The close proximity of flight programs and technology development programs at APL has enabled the rapid infusion of innovative new RF technologies into deep space missions such as CONTOUR and MESSENGER. These technologies serve to improve the science return either directly (antennas, power amplifiers) or indirectly (low-power, low mass electronics). Our approach is forward thinking and aggressive, yet grounded in technical and fiscal reality. Additional information is contained in the original extended abstract.
Derived from text
Power Amplifiers; Space Communication; Interplanetary Communication; Furlable Antennas; Radio Frequencies; Transmitter Receivers

20010041213 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Jupiter: Atmospheric Sounding and Sensing of the Interior (JASSI)

Bolton, S. J., Jet Propulsion Lab., California Inst. of Tech., USA; Owen, T., Hawaii Univ., USA; Gautier, D., Observatoire de Paris, France; Gulkis, S., Jet Propulsion Lab., California Inst. of Tech., USA; Janssen, M., Jet Propulsion Lab., California Inst. of Tech., USA; Atreya, S., Michigan Univ., USA; Guillot, T., Observatoire de la Cote d'Azur, France; Anderson, J., NASA Goddard Space Flight Center, USA; Allison, M., Arizona Univ., USA; Lunine, J.; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 12; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The formation of the giant planets is one of the most fundamental questions in solar system exploration. Understanding the process that led to the creation of Jupiter is essential to understanding the nature of the primordial solar nebula, and the formation of our solar system and others currently being discovered. Data from Galileo combined with HST and Ulysses results validated our basic understanding of Jupiter as a giant planet whose gaseous envelope consists of solar nebula gas enriched in elements heavier than He by in falling icy planetesimals. However, the current Galileo Probe data set does not itself allow firm conclusions about the original planetesimal composition or the process of giant planet formation - we crucially need the O and N abundances that Galileo could not determine. We propose a new and simple concept capable of determining these abundance in Jupiter plus substantial gravity science. Additional information is contained in the original extended abstract.

Derived from text

Atmospheric Sounding; Jupiter Atmosphere; Remote Sensing; Flyby Missions

20010041214 NASA Glenn Research Center, Cleveland, OH USA

Nuclear Thermal Rocket (NTR) Propulsion and Power Systems for Outer Planetary Exploration Missions

Borowski, S. K., NASA Glenn Research Center, USA; Cataldo, R. L., NASA Glenn Research Center, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 13; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The high specific impulse (I (sub sp)) and engine thrust generated using liquid hydrogen (LH2)-cooled Nuclear Thermal Rocket (NTR) propulsion makes them attractive for upper stage applications for difficult robotic science missions to the outer planets. Besides high (I (sub sp)) and thrust, NTR engines can also be designed for "bimodal" operation allowing substantial amounts of electrical power (10's of kWe) to be generated for onboard spacecraft systems and high data rate communications with Earth during the course of the mission. Two possible options for using the NTR are examined here. A high performance injection stage utilizing a single 15 klbf thrust engine can inject large payloads to the outer planets using a 20 t-class launch vehicle when operated in an "expendable mode". A smaller bimodal NTR stage generating approx. 1 klbf of thrust and 20 to 40 kWe for electric propulsion can deliver approx. 100 kg using lower cost launch vehicles. Additional information is contained in the original extended abstract.

Derived from text

Nuclear Propulsion; Space Exploration; Nuclear Rocket Engines; Specific Impulse

20010041215 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Electrically Isolating Subsystems in SOAC Technologies

Boyd, R. M., Kansas State Univ., USA; Mojarradi, M. M., Jet Propulsion Lab., California Inst. of Tech., USA; Kuhn, W. B., Kansas State Univ., USA; Shumaker, E. A., Kansas State Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 14; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Integrated circuit fabrication technology has evolved to the point that it is possible to construct complete systems, including power, data processing, and communications, on a single chip. Such System-on-a-chip (SOAC) technologies can enable drastic reductions in spacecraft size and weight, lowering the cost of missions and presenting new mission opportunities. This paper overviews some key enabling technologies unique to the needs of spacecraft for outer-planet exploration and missions requiring extreme resistance to radiation such as Europa orbiters and Europa Landers. The work is being carried out by Kansas State University (KSU) under direction of the Center for Integrated Space Microsystems (CISM) at NASA's Jet Propulsion Laboratory. Additional information is contained in the original extended abstract.

Derived from text

Microelectronics; Integrated Circuits; CMOS; SOI (Semiconductors)

20010041216 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Integration of Passive Components for Spacecraft Avionics

Brandon, E. J., Jet Propulsion Lab., California Inst. of Tech., USA; Wesseling, E., Jet Propulsion Lab., California Inst. of Tech., USA; White, V., Jet Propulsion Lab., California Inst. of Tech., USA; Lieneweg, U., Jet Propulsion Lab., California Inst. of Tech., USA; Mojarradi, M., Jet Propulsion Lab., California Inst. of Tech., USA; Ulrich, R., Arkansas Univ., USA; Wasef, M., Arkansas Univ., USA; Mantooth, A., Arkansas Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 15; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The NASA roadmap outlining future deep space missions to Europa and other outer planetary destinations calls for continued reductions in the mass and volume of the spacecraft avionics. Spacecraft power electronics, including the power switches and converters, remain difficult to miniaturize due to the need for large numbers of discrete passive components such as resistors, capacitors, inductors and transformers. As part of the System-on-a-chip program at the Center for Integrated Space Microsystems and at the University of Arkansas, we are working to develop integrated or embedded passive components geared specifically for use in power management and distribution (PMAD) in future avionics over the next five to ten years. This will not only enable a scaling down of the power subsystems, but will make possible new architectures such as ”distributed” PMAD. Additional information is contained in the original extended abstract.

Derived from text

Miniaturization; Spacecraft Components; Microelectronics; Avionics

20010041217 Eoetvoes LORANd Univ., Dept. G. Physics, Budapest, Hungary

Search for Ammonia Containing Life Building Blocks in Outer Solar System

Berczi, Sz., Eoetvoes LORANd Univ., Hungary; Lukacs, B., Central Research Inst. for Physics, Hungary; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 5; In English; See also 20010041202

Contract(s)/Grant(s): OTKA T/26660; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Amino acids are critical building blocks for proteins. The most important ancient source for them could have been the ammonia ice which was a basic ice component in the models of the early Solar System. Outer Solar System bodies may have preserved ammonia and some of its compounds in ice form, or in the form of ammonia(um)-silicates. Ammonia could be the solvent for life molecules, too. The sources of the other, more important component and solvent for life molecules, water, are better known. We estimated simultaneous occurrence of ammonia and water: in atmospheres of Jupiter, Saturn, and Titan. For comparisons terrestrial planet possibilities are also shown. Additional information is contained in the original extended abstract.

Derived from text

Amino Acids; Ammonia; Gas Giant Planets; Solar System; Exobiology; Solar System Evolution

20010041218 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Laser TOF-MS for In Situ Analysis of Outer Planetary Moons and Small Bodies

Brinckerhoff, W. B., Johns Hopkins Univ., USA; Cornish, T. J., Johns Hopkins Univ., USA; Cheng, A. F., Johns Hopkins Univ., USA; McEntire, R. W., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 16; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The in-depth exploration of the moons and small bodies of the outer solar system represents an enormously exciting and challenging long-term vision for planetary science. Such missions will require increasingly sophisticated and miniaturized robotic analytical tools for in situ sampling and composition studies. Surface and sub-surface rock, ice, and fine samples will be accessed and studied on a range of spatial scales. Microscopy, mineralogy, and molecular/organic, elemental, and isotopic analyses are all needed to address in situ goals. These techniques must work as an efficient suite to provide complementary and cross-calibrated data. Toward such a suite, we are developing miniature time-of-flight mass spectrometers (TOF-MS) for microanalysis of minimally prepared samples. An adjustable-energy pulsed laser volatilizes and ionizes material from a small region on the sample. Ions enter the instrument and are detected at a sequence of times proportional to the square root of their mass-to-charge ratios. Thus, each laser pulse produces a complete mass spectrum (in less than 50 microseconds). These instruments can now be significantly miniaturized while maintaining high performance. Additional information is contained in the original extended abstract.

Derived from text

Mass Spectrometers; Microanalysis; Miniaturization; Time of Flight Spectrometers; Space Exploration; In Situ Measurement

20010041219 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Technologies for Icy Bodies Access

Carsey, F. D., Jet Propulsion Lab., California Inst. of Tech., USA; Anderson, F. S., Jet Propulsion Lab., California Inst. of Tech., USA; French, L. C., Jet Propulsion Lab., California Inst. of Tech., USA; Green, J. R., Jet Propulsion Lab., California Inst. of Tech., USA; Jones, J. A., Jet Propulsion Lab., California Inst. of Tech., USA; Lane, A. L., Jet Propulsion Lab., California Inst. of Tech., USA; Leger, P. C., Jet Propulsion Lab., California Inst. of Tech., USA; Zimmerman, W. F., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 17; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Recent events in planetary exploration have profoundly changed the way both space scientists and the public regard the solar system and our place in it. These events include the Galileo data suggesting subsurface oceans in the Jovian system, ever stronger suggestions of near-surface water on Mars, as well as the complex structure observed for the Mars polar caps. And, of course, interest in icy cometary bodies is as old as humankind. Finally, the Mars north polar cap may conceivably cover and protect an ancient ocean floor, an obvious candidate ancient or extant habitat. In short, our interest in searching for life embraced early on the search for liquid water, and that has led us to an additional appreciation for water ice as both a commonplace partner with liquid water and as an issue to be addressed in the exploration of a host of interesting sites. In general, the spectrum of specialized technology for space exploration has not yet been broadened to include the requirements brought about by exploration of icy sites. We argue that technologies for access, operations, and science in icy solar system sites must be examined and their prioritized development initiated in order to successfully plan missions to these compelling sites over the next two decades. Additional information is contained in the original extended abstract.

Derived from text

Solar System; Space Exploration; Technology Assessment; Icy Satellites

20010041220 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Compact Holographic Data Storage

Chao, T. H., Jet Propulsion Lab., California Inst. of Tech., USA; Reyes, G. F., Jet Propulsion Lab., California Inst. of Tech., USA; Zhou, H., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 18; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

NASA's future missions would require massive high-speed onboard data storage capability to Space Science missions. For Space Science, such as the Europa Lander mission, the onboard data storage requirements would be focused on maximizing the spacecraft's ability to survive fault conditions (i.e., no loss in stored science data when spacecraft enters the 'safe mode') and autonomously recover from them during NASA's long-life and deep space missions. This would require the development of non-volatile memory. In order to survive in the stringent environment during space exploration missions, onboard memory requirements would also include: (1) survive a high radiation environment (1 Mrad), (2) operate effectively and efficiently for a very long time (10 years), and (3) sustain at least a billion write cycles. Therefore, memory technologies requirements of NASA's Earth Science and Space Science missions are large capacity, non-volatility, high-transfer rate, high radiation resistance, high storage density, and high power efficiency. JPL, under current sponsorship from NASA Space Science and Earth Science Programs, is developing a high-density, nonvolatile and rad-hard Compact Holographic Data Storage (CHDS) system to enable large-capacity, high-speed, low power consumption, and read/write of data in a space environment. The entire read/write operation will be controlled with electrooptic mechanism without any moving parts. This CHDS will consist of laser diodes, photorefractive crystal, spatial light modulator, photodetector array, and I/O electronic interface. In operation, pages of information would be recorded and retrieved with random access and high-speed. The nonvolatile, rad-hard characteristics of the holographic memory will provide a revolutionary memory technology meeting the high radiation challenge facing the Europa Lander mission. Additional information is contained in the original extended abstract.

Derived from text

Data Storage; Airborne/Spaceborne Computers; Holography; Optical Memory (Data Storage)

20010041221 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

A Multi-Mission Testbed for Advanced Technologies

Chau, S. N., Jet Propulsion Lab., California Inst. of Tech., USA; Lang, M., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 20; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The mission of the Center for Space Integrated Microsystem (CSIM) at the Jet Propulsion Laboratory is to develop advanced avionics systems for future deep space missions. The Advanced Micro Spacecraft (AMS) task is building a multi-mission testbed

facility to enable the infusion of CSIM technologies into future missions. The testbed facility will also perform experimentation for advanced avionics technologies and architectures to meet challenging power, performance, mass, volume, reliability, and fault tolerance of future missions. The testbed facility has two levels of testbeds: (1) a Proof-of-Concept (POC) Testbed and (2) an Engineering Model Testbed. The methodology of the testbed development and the process of technology infusion are presented in a separate paper in this conference. This paper focuses only on the design, implementation, and application of the POC testbed. Additional information is contained in the original extended abstract.
Derived from text
Test Stands; Avionics; Spacecraft Components

20010041222 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Challenging Technology, and Technology Infusion into 21st Century
Chau, S. N., Jet Propulsion Lab., California Inst. of Tech., USA; Hunter, D. J., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 19; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In preparing for the space exploration challenges of the next century, the National Aeronautics and Space Administration (NASA) Center for Integrated Space Micro-Systems (CISM) is chartered to develop advanced spacecraft systems that can be adapted for a large spectrum of future space missions. Enabling this task are revolutions in the miniaturization of electrical, mechanical, and computational functions. On the other hand, these revolutionary technologies usually have much lower readiness levels than those required by flight projects. The mission of the Advanced Micro Spacecraft (AMS) task in CISM is to bridge the readiness gap between advanced technologies and flight projects. Additional information is contained in the original extended abstract.
Derived from text
Miniaturization; Space Missions; Technology Utilization; Aerospace Systems

20010041223 Lockheed Martin Aerospace, Denver, CO USA
Jovian Moon Sampler
Clark, B. C., Lockheed Martin Aerospace, USA; Gamber, R. T., Lockheed Martin Aerospace, USA; Sutter, B. M., Lockheed Martin Aerospace, USA; Faulconer, C. E., Lockheed Martin Aerospace, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 21; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Recently, a lot of interest has been focused on Europa and Ganymede due the evidence of subsurface water oceans. Unique methods of exploring the Jovian moons have been developed that allow sampling of the lunar surfaces. These methods include low cost concepts to collect a surface sampled return it to Earth using concepts similar to the Stardust Discovery mission. The spacecraft can be placed on a ballistic trajectory that will carry it close to the surface of the moons of Jupiter. High resolution imaging of the surface can be collected during the approach phase. Small projectiles can be released and used to kick up a plume of surface material. Unique collectors can capture material from this plume as the spacecraft flies over the surface and through the plume of small particles. The spacecraft is protected from damage by shields. This material can then be retracted into a small Sample Return Capsule, SRC, similar to the Stardust capsule. Aerogel and other absorbant materials are used as the collecting medium. A ballistic return to Earth allows for tracking and capture of the capsule at Earth and return to the Utah Test and Training range. Small hard-landing capsules can be dropped to the surface of the moons during the low flyby by using a retrorocket to slow the capsules. These small landers can also collect critical data on the surface composition and relay it to the flyby spacecraft.
Derived from text
Flyby Missions; Samplers; Sample Return Missions; Satellite Surfaces; Jupiter Satellites

20010041224 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Miniaturized, Low-Power Laser Altimeter (MLLA)
Cole, T. D., Johns Hopkins Univ., USA; Reiter, R. A., Johns Hopkins Univ., USA; Paschalidis, N. P., Johns Hopkins Univ., USA; Cheng, A. F., Johns Hopkins Univ., USA; Domingue, D., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 22; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

High accuracy measurements of surface elevations, slopes, and roughness from laser altimeters are primary datasets for geophysical and geological studies of planetary bodies. Surface elevations together with gravity measurements allow us to probe the internal structures (e.g., crustal thicknesses and density variations). These measurements can be used to relate crustal structures with the volcanic plumes on Triton, or with flexure due to a subsurface ocean as hypothesized on Europa. In addition,

high-resolution measurements of surface topography reveal detailed geologic processes shaping the surface. to obtain these data, a miniaturized, low-power laser altimeter will be developed to provide high spatial and temporal resolution altimetry from an orbiting platform. The capability of this altimeter design, denoted MLLA, will lend itself to exploration of the outer planets by incorporating recent efforts to reduce both mass and power consumption of laser altimeters while enhancing measurement capability. In particular, to satisfy mission design requirements for the exploration of exceedingly distant objects from the sun, mass and power become premium commodities. For an altimeter associated with any outer planet missions, total mass should not exceed 3.5 kg and average power should be less than 6 W. In addition, altimeter designs must implement techniques to improve signal sampling while working at nadir ranges in excess of 100 km. The MLLA addresses each of these issues. Additional information is contained in the original extended abstract.
Derived from text
Laser Altimeters; Miniaturization; Spacecraft Instruments

20010041225 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Heterogeneous Integration, An Approach to High Density and High Flexibility Electronic Packaging
DAgostino, S. A., Jet Propulsion Lab., California Inst. of Tech., USA; Schatzel, D. V., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 23; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Key to the design of spacecraft for exploration of the outer planets will be the development of highly integrated and mass/volume efficient electronic systems. Exploration of the outer planets will require optimized propulsion approaches which mandates mass minimization. If one looks at a mission such as the Europa Lander, a high mass/volume efficiency feeds back directly into lower mass for radiation shielding. Concurrently the long mission lengths will drive the need for fault isolation and fault tolerance. The ability to build distributed electronic systems is an inherent requirement and one which is enabled by heterogeneous integration. The electronic packaging approach must be capable of interconnecting various components at a scale comparable with that on the components themselves (chip scale) and it must facilitate efficient integration of the electronics with elements of the spacecraft such as structure or antennae. The concept of 'Heterogeneous Integration' is being explored in the System On A Chip (SOAC) Project at JPL. The goal, of this approach to electronic packaging, is to enable the fabrication and assembly of complete electronic subsystems from components fabricated by a range of processes. Included in such a system could be MEMS sensors, SOI mixed signal ASICs, micro scale passive components and micro power. Secondarily the compact size will enable distributed architectures and integrated assemblies. Additional information is contained in the original extended abstract.
Derived from text
Electronic Packaging; Chips (Electronics); Spacecraft Electronic Equipment; Microelectronics

20010041226 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
System Miniaturization Via Heterogeneous Integration of Electronic Devices for Deep Space Missions
DelCastillo, L., Jet Propulsion Lab., California Inst. of Tech., USA; Schatzel, D. V., Jet Propulsion Lab., California Inst. of Tech., USA; Graber, R. W., Jet Propulsion Lab., California Inst. of Tech., USA; Mottiwala, A., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 24; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The scientific devices designed for each of the Outer Planets Program Focuses will likely be groundbreaking not only with respect to their scientific role but also regarding the electronics required to perform such investigations. In the past, the performance of packaged electronics was limited by the components themselves, with minimal influence of the packaging technology. The rapid development of integrated circuit technology, however, has drastically increased the importance of packaging technology in the ultimate performance of devices. If not carefully considered in the overall design, the packaging may become the limiting factor in the operation of the system. Although industry is responsible for several significant accomplishments in the field of electronics packaging, deep space/outer planet missions must take into account additional requirements such as extremely low temperatures, high radiation levels, hermetic sealing, and severe size and weight limitations. Therefore, the present investigation has been designed to meet the needs of NASA's sensor intensive outer planets program by combining (using flip chip technology) an array of devices (including analog, digital, power volt-age, passives, and MEMS) into a miniaturized heterogeneous system and utilizing optical buses to enable autonomy. Additional information is contained in the original extended abstract.
Derived from text
Electronic Packaging; Spacecraft Electronic Equipment; Miniaturization; Integrated Circuits; Microelectronics

20010041227 NASA Glenn Research Center, Cleveland, OH USA

Low-Temperature Spacecraft: Challenges/Opportunities

Dickman, J. E., NASA Glenn Research Center, USA; Patterson, R. L., NASA Glenn Research Center, USA; Overton, E., NASA Glenn Research Center, USA; Hammoud, A. N., DYNACS Engineering Co., Inc., USA; Gerber, S. S., Zin Technologies, Inc., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 25; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Imagine sending a spacecraft into deep space that operates at the ambient temperature of its environment rather than hundreds of degrees Kelvin warmer. The average temperature of a spacecraft warmed only by the sun drops from 279 K near the Earth's orbit to 90 K near the orbit of Saturn, and to 44 K near Pluto's orbit. At present, deep space probes struggle to maintain an operating temperature near 300 K for the onboard electronics. to warm the electronics without consuming vast amounts of electrical energy, radioisotope heater units (RHUs) are used in vast numbers. Unfortunately, since RHU are always 'on', an active thermal management system is required to reject the excess heat. A spacecraft designed to operate at cryogenic temperatures and shielded from the sun by a large communication dish or solar cell array could be less complex, lighter, and cheaper than current deep space probes. Before a complete low-temperature spacecraft becomes a reality, there are several challenges to be met. Reliable cryogenic power electronics is one of the major challenges. The Low-Temperature Power Electronics Research Group at NASA Glenn Research Center (GRC) has demonstrated the ability of some commercial off the shelf power electronic components to operate at temperatures approaching that of liquid nitrogen (77 K). Below 77 K, there exists an opportunity for the development of reliable semiconductor power switching technologies other than bulk silicon CMOS. This paper will report on the results of NASA GRC's Low-Temperature Power Electronics Program and discuss the challenges to (opportunities for) the creation of a low-temperature spacecraft.

Derived from text

Low Temperature Environments; Spacecraft Electronic Equipment; Temperature Control; Switching

20010041228 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Quantum Dots Based Rad-Hard Computing and Sensors

Fijany, A., Jet Propulsion Lab., California Inst. of Tech., USA; Klimeck, G., Jet Propulsion Lab., California Inst. of Tech., USA; Leon, R., Jet Propulsion Lab., California Inst. of Tech., USA; Qiu, Y., Jet Propulsion Lab., California Inst. of Tech., USA; Toomarian, N., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 26; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Quantum Dots (QDs) are solid-state structures made of semiconductors or metals that confine a small number of electrons into a small space. The confinement of electrons is achieved by the placement of some insulating material(s) around a central, well-conducting region. Thus, they can be viewed as artificial atoms. They therefore represent the ultimate limit of the semiconductor device scaling. Additional information is contained in the original extended abstract.

Derived from text

Semiconductor Devices; Quantum Dots; Quantum Electronics

20010041229 Eoetvoes LORANd Univ., Dept. G. Physics, Budapest, Hungary

Indicating the Deep Structure (Below the Icy and Liquid Layers) of Europa and Titan by Measurements with a Giant Solenoid System on Board of an Orbiting Space Probe

Berczi, Sz., Eoetvoes LORANd Univ., Hungary; Foeldi, T., FOELDIX, Hungary; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 28; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We propose a large, few wind solenoid experiment to measure on a circular orbit the depth of the ice crust of Europa and Titan. The solenoid is orbiting the Jovian or Saturnian satellite, it represents an oscillator with ultralong wavelength (from 100 Hz to 40,000 Hz). The diameter of the few wind solenoid may be between 200 m and 800 m. The oscillator is established as a putch-hull oscillator. We use the solenoid as a special antenna. We do not use it as a radar, so we do not consider its far field. Instead of it, we use the near field of the antenna. The near field of the antenna can be deduced from the emitted and received oscillation. In an ideal case the near field is pi/2 phase delayed as compared to their field of the antenna. In a real case the phase delay between the two fields (because of the losses in the near field) is a little bit different from pi/2 phase delayed. This difference from pi/2 is caused by the ice covered deep mountains (if they exist) below the icy crust of Europa or Titan. by this measurement it can be

derived that how deep is the rocky material below the volatile ice and liquid spheres. Additional information is contained in the original extended abstract.
Derived from text
Satellite Surfaces; Planetary Crusts; Ice; Europa; Titan

20010041230 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Solid-State Power Generating Microdevices for Distributed Space System Architectures
Fleurial, J.-P., Jet Propulsion Lab., California Inst. of Tech., USA; Patel, J., Jet Propulsion Lab., California Inst. of Tech., USA; Snyder, G. J., Jet Propulsion Lab., California Inst. of Tech., USA; Huang, C.-K., Jet Propulsion Lab., California Inst. of Tech., USA; Averback, R., Illinois Univ., USA; Hill, C., Illinois Univ., USA; Chen, G., California Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 27; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Deep space missions have a strong need for compact, high power density, reliable and long life electrical power generation and storage under extreme temperature conditions. Conventional power generating devices become inefficient at very low temperatures (temperatures lower than 200 K encountered during Mars missions for example) and rechargeable energy storage devices cannot be operated thereby limiting mission duration. At elevated temperatures (for example for planned solar probe or Venus lander missions), thin film interdiffusion destroys electronic devices used for generating and storing power. Solar power generation strongly depends upon the light intensity, which falls rapidly in deep interplanetary missions (beyond 5 AU), and in planetary missions in the sun shadow or in dusty environments (Mars, for example). Radioisotope thermoelectric generators (RTGs) have been successfully used for a number of deep space missions RTGs. However, their energy conversion efficiency and specific power characteristics are quite low, and this technology has been limited to relatively large systems (more than 100 W). The National Aeronautics and Space Administration (NASA) and the Jet Propulsion Laboratory (JPL) have been planning the use of much smaller spacecrafts that will incorporate a variety of microdevices and miniature vehicles such as microdetectors, microsensors, and microrovers. Except for electrochemical batteries and solar cells, there are currently no available miniaturized power sources. Novel technologies that will function reliably over a long duration mission (ten years and over), in harsh environments (temperature, pressure, and atmosphere) must be developed to enable the success of future space missions. It is also expected that such micropower sources could have a wide range of terrestrial applications, in particular when the limited lifetime and environmental limitations of batteries are key factors. Additional information is contained in the original extended abstract.
Derived from text
Microinstrumentation; Miniaturization; Thermoelectric Generators; Solid State Devices

20010041231 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Kuiper Belt Mapping Radar
Freeman, A., Jet Propulsion Lab., California Inst. of Tech., USA; Nilsen, E., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 29; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Since their initial discovery in 1992, to date only a relatively small number of Kuiper Belt Objects (KBO's) have been discovered. Current detection techniques rely on frame-to-frame comparisons of images collected by optical telescopes such as Hubble, to detect KBO's as they move against the background stellar field. Another technique involving studies of KBO's through occultation of known stars has been proposed. Such techniques are serendipitous, not systematic, and may lead to an inadequate understanding of the size, range, and distribution of KBO's. In this paper, a future Kuiper Belt Mapping Radar is proposed as a solution to the problem of mapping the size distribution, extent, and range of KBO's. This approach can also be used to recover radar albedo and object rotation rates. Additional information is contained in the original extended abstract.
Derived from text
Kuiper Belt; Space Based Radar; Radar Maps

20010041232 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Subsurface Exploration Technologies and Strategies for Europa
French, L. C., Jet Propulsion Lab., California Inst. of Tech., USA; Anderson, F. S., Jet Propulsion Lab., California Inst. of Tech., USA; Carsey, F. D., Jet Propulsion Lab., California Inst. of Tech., USA; Green, J. R., Jet Propulsion Lab., California Inst. of Tech., USA; Lane, A. L., Jet Propulsion Lab., California Inst. of Tech., USA; Zimmerman, W. F., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 30; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Galileo data from Europa has resulted in the strong suggestion of a large, cold, salty, old subglacial ocean and is of great importance. We have examined technology requirements for subsurface exploration of Europa and determined that scientific access to the hypothesized Europa ocean is a key requirement. by 'scientific access' we intend to direct attention to the fact that several aspects of exploration of a site such as Europa must be addressed at the system level. Specifically needed are a robotic vehicle that can descend through ice, scientific instrumentation that can interrogate the ice near the vehicle (but largely unaffected by its presence), scientific instrumentation for the subglacial ocean, communication for data and control, chemical analysis of the environment of the vehicle in the ice as well as the ocean, and methods for conducting the mission without contamination. We have embarked on a part of this extremely ambitious development sequence by developing the Active Thermal Probe, or Cryobot. Additional information is contained in the original extended abstract.
Derived from text
Europa; Robotics; Space Probes; Satellite Surfaces

20010041233 NASA Marshall Space Flight Center, Huntsville, AL USA
Initial Results from the Jovian Electrodynamic Tether Systems (JETS) Study
Gallagher, D. L., NASA Marshall Space Flight Center, USA; Garbe, G. P., NASA Marshall Space Flight Center, USA; Moore, J., SRS Technologies, USA; Talley, C., SRS Technologies, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 31; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Jovian system with its rapid planetary rotation and strong magnetic field presents exciting opportunities for the use of electrodynamic (EM) tethers in system applications on a Jovian spacecraft. Previous analysis for a radial, 10 km length tether demonstrated the possibility of propulsive forces as large as 50 N and power generation levels as high as 10(exp 6) W for low perijov passing trajectories. For orbital positions beyond approximately 2.5 Jovian radii, JETS can be used simultaneously for power and increases in the orbital altitude. Previous study demonstrated the physical feasibility of EM tether use at Jupiter, but did not address the issues of limited gravity gradient force for tether extension and power regulation needed before JETS can be implemented as a practical spacecraft system. This presentation will discuss these issues and current progress in an ongoing systems feasibility study.
Derived from text
Tethering; Tetherlines; Spacecraft Equipment

20010041234 NASA Glenn Research Center, Cleveland, OH USA
Sub-Kilowatt Radioisotope Electric Propulsion for Outer Solar System Exploration
Gefert, L. P., NASA Glenn Research Center, USA; Oleson, S. R., NASA Glenn Research Center, USA; Patterson, M. J., NASA Glenn Research Center, USA; Schrieber, J., NASA Glenn Research Center, USA; McAdams, J., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 32; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

An activity has begun to perform a multi-mission trajectory/systems analysis study that examines the combined benefit of three key technology development areas. The three key technologies leveraged in the study include sub-kilowatt ion propulsion, Stirling radioisotope power systems and microelectronics/lightweight spacecraft bus technologies. This study is being performed jointly by NASA Glenn Research Center and the Applied Physics Laboratory to leverage their combined areas of expertise in advanced power/propulsion and spacecraft design. Missions examined in this study include missions to outer planets' moons, such as Europa, Titan, and Triton, and a Comet Nucleus Sample Return mission. Additional information is contained in the original extended abstract.
Derived from text
Electric Propulsion; Trajectory Analysis; Ion Propulsion; Microelectronics; Propulsion System Configurations

20010041235 BAE Systems, Mission Solutions, San Diego, CA USA
Hyperspectral Data Compression as an Enabling Technology for Deep Space Missions
Granahan, J. C., BAE Systems, USA; Rupert, S. T., BAE Systems, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 33; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Hyperspectral sensors have played an important role in the exploration of the outer solar system. Hyperspectral sensors or imaging spectrometers have been flown on the Galileo and Cassini spacecraft to map the compositions of planetary surfaces and atmospheres. The Galileo Near Infrared Mapping Spectrometer (NIMS) discovered the presence and mapped the distribution of organics, hydrated sulfates, carbon dioxide, and sulfur dioxide on the surface of the icy Galilean satellites. The problem with

sensors such as NIMS and the Cassini Visual Infrared Mapping Spectrometer (VIMS) is that they collect imaging with hundreds of bands of spectral data that can overload downlink bandwidths and onboard memory resources rapidly. Hence, an efficient data compression method for use with imaging spectrometers would enable more surfaces and atmospheres to be mapped during any given deep space planetary mission. Additional information is contained in the original extended abstract.
Derived from text
Data Compression; Imaging Spectrometers; Imaging Techniques

20010041236 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The Extraterrestrial Materials Simulation Laboratory
Green, J. R., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 34; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In contrast to fly-by and orbital missions, in situ missions face an incredible array of challenges in near-target navigation, landing site selection, descent, landing, science operations, sample collection and handling, drilling, anchoring, subsurface descent, communications, and contamination. The wide range of materials characteristics and environments threaten mission safety and success. For example, many physical properties are poorly characterized, including strength, composition, heterogeneity, phase change, texture, thermal properties, terrain features, atmospheric interaction, and stratigraphy. Examples of the range of materials properties include, for example: (1) Comets, with a possible compressive strength ranging from a light fluff to harder than concrete: 10(exp 2) to 10 (exp 8) Pa; (2) Europa, including a possible phase change at the surface, unknown strength and terrain roughness; and (3) Titan, with a completely unknown surface and possible liquid ocean. Additional information is contained in the original extended abstract.
Derived from text
Simulators; Satellite Surfaces; Laboratories; Research Facilities

20010041237 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA
A Need to Update the Exploration Strategy for Europa
Greenberg, R., Arizona Univ., USA; Tufts, B. R., Arizona Univ., USA; Hoppa, G. V., Arizona Univ., USA; Geissler, P., Arizona Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 35; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The current exploration strategy for Europa, for which the Europa orbiter is the next step, was predicated on a prevailing belief that Europa's ocean, if any, lies isolated from the surface beneath approximately 10 km or more of ice. First, the orbiter would determine whether there indeed is a liquid water ocean. Then a lander would assess surface conditions, laying the groundwork for a subsequent mission to send a probe down through the ice to the ocean below. The ocean is the ultimate destination because of its appealing possibility as a site of life. In this scenario, the multiple missions and the central technological challenge of devising a way to penetrate the ice imply a timetable stretching over several decades. Additional information is contained in the original extended abstract.
Derived from text
Europa; Oceans; Satellite Surfaces; Space Missions; Mission Planning

20010041238 Space Science Inst., Ridgefield, CT USA
The Case for a Neptune Orbiter/Multi-Probe Mission
Hammel, H. B., Space Science Inst., USA; Porco, C. C., Arizona Univ., USA; Rages, K., Space Physics Research Inst., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 36; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We propose a mission to the Neptune system comprised of an orbiter with a Neptune atmospheric multi-probe. NASA's Solar System Exploration theme listed a Neptune mission as one of its top priorities for the mid-term (2008-2013). A recent NASA study also gave it top ranking for rich scientific return and connections to astrophysical problems outside the Solar System (atmospheric structure and dynamics; geology; ring systems/dynamics; magnetic fields/dynamos; pre-biotic chemistry on Triton; local extrasolar planet analog), calling it 'almost Cassini-like in scope, near Discovery-like in cost'. Additional information is contained in the original extended abstract.
Derived from text
Space Exploration; Neptune (Planet); Space Probes; Space Missions

20010041239 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

A Multifunctional, Multispectral, Outer Planetary Imager

Henshaw, R. M., Johns Hopkins Univ., USA; Darlington, E. H., Johns Hopkins Univ., USA; Hawkins, S. E., III, Johns Hopkins Univ., USA; Heffernan, K. J., Johns Hopkins Univ., USA; Humm, D. C., Johns Hopkins Univ., USA; Stohbehn, K., Johns Hopkins Univ., USA; Thompson, P., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 37; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Multispectral imaging systems are essential to any future planetary mission. The next generation of imaging systems need to provide high resolution spectral information at equivalent spatial resolution to current imaging systems. Any successful mission to the outer planets requires science payloads that are extremely frugal with resource utilization (such as mass, power, and volume). to achieve multispectral imaging systems which are low mass and power efficient, advanced technology must be applied to the design and development of the optical systems. Any mission to the inner Jovian system must have a high radiation tolerance. We propose a radiation tolerant, resource efficient, dual purpose scientific imager and star camera capable of electronic passband selection and active focus control. The Outer Planetary Imager (OPI) would meet these physical requirements, as well as any science and optical navigation requirements. by applying new technology currently under development at The Johns Hopkins University Applied Physics Laboratory (JHU/APL) to our existing remote sensing expertise, the OPI will feature low mass (approx. 3 kg), low power (approx. 3 W), radiation tolerant electronics and optics, image motion focus control, and electronically controlled optical filtering. Additional information is contained in the original extended abstract.

Derived from text

Remote Sensing; Space Missions; Imaging Techniques; Planetary Surfaces; Multispectral Band Cameras

20010041240 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Advanced RF Front End Technology

Herman, M. I., Jet Propulsion Lab., California Inst. of Tech., USA; Valas, S., Jet Propulsion Lab., California Inst. of Tech., USA; Katehi, L. P. B., Michigan Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 38; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The ability to achieve low-mass low-cost micro/nanospacecraft for Deep Space exploration requires extensive miniaturization of all subsystems. The front end of the Telecommunication subsystem is an area in which major mass (factor of 10) and volume (factor of 100) reduction can be achieved via the development of new silicon based micromachined technology and devices. Major components that make up the front end include single-pole and double-throw switches, diplexer, and solid state power amplifier. JPL's Center For Space Microsystems - System On A Chip (SOAC) Program has addressed the challenges of front end miniaturization (switches and diplexers). Our objectives were to develop the main components that comprise a communication front end and enable integration in a single module that we refer to as a 'cube'. In this paper we will provide the latest status of our Microelectromechanical System (MEMS) switches and surface micromachined filter development. Based on the significant progress achieved we can begin to provide guidelines of the proper system insertion for these emerging technologies. Additional information is contained in the original extended abstract.

Derived from text

Chips (Electronics); Microelectromechanical Systems; Miniaturization; Switches

20010041241 Colorado Univ., Lab. for Atmospheric and Space Physics, Boulder, CO USA

DMOSS: Dust Measurements in the Outer Solar System

Horanyi, M., Colorado Univ., USA; Lawrence, G., Colorado Univ., USA; Withnell, P., Colorado Univ., USA; Tuzzolino, A., Chicago Univ., USA; McKibben, R. B., Chicago Univ., USA; Auer, S., A & M Associates, USA; Gruen, E., Max-Planck-Inst. fuer Kernphysik, Germany; Schwehm, G., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Svedhem, H., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 39; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We propose a large surface area (approx.0.5 sq m), light-weight (is less than 0.5 kg) and low-power (is less than 1 w) dust detector to investigate the dust distribution in the Solar System beyond the orbits of the giant planets. Dust Measurements in the Outer Solar System (DMOSS) observations will greatly advance our understanding of the origin and evolution of our own Solar System and allow for comparative studies of planet formation in dust disks around other stars. The dust disk around beta Pictoris is an example where the observed structure is thought to indicate the presence of planets. We know far more about the outer edges of the dust disks in these distant systems than about our own Solar System's dust disk. DMOSS will make significant contributions

towards understanding the origin and evolution of our own Solar System and to compare it with planetary systems around other stars. Additional information is contained in the original extended abstract.
Derived from text
Cosmic Dust; Solar System; Detectors; Outer Planets Explorers

20010041242 NASA Marshall Space Flight Center, Huntsville, AL USA
Space Fission Propulsion System Development Status
Houts, M., NASA Marshall Space Flight Center, USA; Van Dyke, M. K., NASA Marshall Space Flight Center, USA; Godfroy, T. J., NASA Marshall Space Flight Center, USA; Pedersen, K. W., NASA Marshall Space Flight Center, USA; Martin, J. J., NASA Marshall Space Flight Center, USA; Dickens, R., NASA Marshall Space Flight Center, USA; Williams, E., NASA Marshall Space Flight Center, USA; Harper, R., NASA Marshall Space Flight Center, USA; Salvail, P., NASA Marshall Space Flight Center, USA; Hrbud, I., NASA Marshall Space Flight Center, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 40; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The world's first man-made self-sustaining fission reaction was achieved in 1942. Since then fission has been used to propel submarines, generate tremendous amounts of electricity, produce medical isotopes, and provide numerous other benefits to society. Fission systems operate independently of solar proximity or orientation, and are thus well suited for deep space or planetary surface missions. In addition, the fuel for fission systems (enriched uranium) is virtually non-radioactive. The primary safety issue with fission systems is avoiding inadvertent system start. Addressing this issue through proper system design is straight-forward. Despite the relative simplicity and tremendous potential of space fission systems, the development and utilization of these systems has proven elusive. The first use of fission technology in space occurred 3 April 1965 with the US launch of the SNAP-10A reactor. There have been no additional US uses of space fission systems. While space fission systems were used extensively by the former Soviet Union, their application was limited to earth-orbital missions. Early space fission systems must be safely and affordably utilized if we are to reap the benefits of advanced space fission systems. NASA's Marshall Space Flight Center, working with Los Alamos National Laboratory (LANL), Sandia National Laboratories, and others, has conducted preliminary research related to a Safe Affordable Fission Engine (SAFE). An unfueled core has been fabricated by LANL, and resistance heaters used to verify predicted core thermal performance by closely mimicking heat from fission. The core is designed to use only established nuclear technology and be highly testable. In FY01 an energy conversion system and thruster will be coupled to the core, resulting in an 'end-to-end' nuclear electric propulsion demonstrator being tested using resistance heaters to closely mimic heat from fission. Results of the SAFE test program will be presented. The applicability of a SAFE-powered electric propulsion system to outer planet science missions will also be discussed.
Derived from text
Fission; Nuclear Electric Propulsion; Space Missions; Spacecraft Power Supplies

20010041243 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Integrated Avionics System (IAS)
Hunter, D. J., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 41; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

As spacecraft designs converge toward miniaturization and with the volumetric and mass constraints placed on avionics, programs will continue to advance the 'state of the art' in spacecraft systems development with new challenges to reduce power, mass, and volume. Although new technologies have improved packaging densities, a total system packaging architecture is required that not only reduces spacecraft volume and mass budgets, but increase integration efficiencies, provide modularity and scalability to accommodate multiple missions. With these challenges in mind, a novel packaging approach incorporates solutions that provide broader environmental applications, more flexible system interconnectivity, scalability, and simplified assembly test and integration schemes. This paper will describe the fundamental elements of the Integrated Avionics System (IAS), Horizontally Mounted Cube (HMC) hardware design, system and environmental test results. Additional information is contained in the original extended abstract.
Derived from text
Miniaturization; Space Missions; Architecture (Computers)

20010041244 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Molecularly Imprinted Polymer Geochemical Detectors for Outer Solar System Exploration

Izenberg, N. R., Johns Hopkins Univ., USA; Uy, O. M., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 42; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Molecularly imprinted polymer (MIP) geochemical detectors translate new fiber optic sensor technology to planetary and space environment applications. Characterization of planetary atmospheres, their variability with altitude, time, and geographic location, and their physical and chemical relationships with planetary surfaces are fundamental to the understanding of planetary geology, climate, and evolution. Solid state, low mass, low power, low volume tools for determining atmospheric constituents and activity will enable significant improvement in our understanding of the atmospheres of the outer planets and their moons, terrestrial planets, and other solar system bodies (e.g., active comets). Additional information is contained in the original extended abstract.

Derived from text

Space Exploration; Fiber Optics; Geochemistry; Solid State Devices

20010041245 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

An Active Substrate Driver for Enabling Mixed-Voltage SOI Systems-On-A-Chip

Jackson, S. A., Mississippi State Univ., USA; Blalock, B. J., Mississippi State Univ., USA; Mojarradi, M. M., Jet Propulsion Lab., California Inst. of Tech., USA; Li, H. W., Idaho Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 43; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The current trend for space application systems is towards fully integrated systems-on-a-chip. to facilitate this drive, high-voltage transistors must reside on the same substrate as low-voltage transistors. These systems must also be radiation tolerant, particularly for space missions such as the Europa Lander and Titan Explorer. SOI CMOS technology offers high levels of radiation hardness. As a result, a high-voltage lateral MOSFET has been developed in a partially-depleted (PD) SOI technology. Utilizing high voltages causes a parasitic transistor to have non-negligible effects on a circuit. Several circuit architectures have been used to compensate for the radiation induced threshold voltage shift of the parasitic back-channel transistor. However, a new architecture for high-voltage systems must be employed to bias the substrate to voltage levels insuring all parasitic transistors remain off. An active substrate driver has been developed to accomplish task. Additional information is contained in the original extended abstract.

Derived from text

Spacecraft Electronic Equipment; Chips (Electronics); Substrates; Integrated Circuits; SOI (Semiconductors)

20010041246 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Delay/Doppler Radar Altimetry for Outer Planet Applications

Jensen, J. R., Johns Hopkins Univ., USA; Raney, R. K., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 44; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

New concepts, which improve the design and performance of spaceborne radar altimeters for remote sensing of the Earth, can be applied to the mapping of extraterrestrial bodies. An inherent advantage of a radar altimeter is that it is capable of application where the atmosphere of the body being observed is opaque to micron-scale wavelengths. Furthermore, radar altimeters are typically pulse-limited, so the measurement area is determined by the intersection of the transmitted pulse with the surface. This limits the sensitivity of the altitude measurement to the spacecraft attitude knowledge. The recently developed and demonstrated delay/Doppler concept combines these advantages with a reduction in the size of the altimeter through more efficient use of the backscattered power and improvement in the along-track spatial resolution. The delay/Doppler altimeter was originally proposed because of its many advantages in Earth altimetry (open water, sea ice, continental ice sheets, etc.), but the basic concept has wide application, including subsurface sounding as well as altimetry. This sounding application is being considered for the search for subsurface water on Mars and Europa. Altimetry is also a primary data set for geophysical studies (e.g., measurements of planetary tides, rotation state/libration) which provide fundamental constraints on origins and evolution, as well as geological processes (e.g., volcanic, tectonic) that affect topography. This instrument orbiting Europa or Triton can provide key measurements for the understanding of crustal tidal effects, which have implications for geologic processes that may contribute to resurfacing. A delay/Doppler altimeter can distinguish between diffuses and specular reflecting surfaces and

therefore between solid and liquid surfaces which can be useful in determining the presence of methane ponds on Titan. Additional information is contained in the original extended abstract.
Derived from text
Remote Sensing; Doppler Radar; Radio Altimeters; Altimetry

20010041247 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
A Large Array of Small Antennas to Support Future NASA Missions
Jones, D. L., Jet Propulsion Lab., California Inst. of Tech., USA; Weinreb, S., Jet Propulsion Lab., California Inst. of Tech., USA; Preston, R. A., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 45; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A team of engineers and scientists at JPL is currently working on the design of an array of small radio antennas with a total collecting area up to twenty times that of the largest existing (70 m) DSN antennas. An array of this size would provide obvious advantages for high data rate telemetry reception and for spacecraft navigation. Among these advantages are an order-of-magnitude increase in sensitivity for telemetry downlink, flexible sub-arraying to track multiple spacecraft simultaneously, increased reliability through the use of large numbers of identical array elements, very accurate real-time angular spacecraft tracking, and a dramatic reduction in cost per unit area. NASA missions in many disciplines, including planetary science, would benefit from this increased DSN capability. The science return from planned missions could be increased, and opportunities for less expensive or completely new kinds of missions would be created. The DSN array would also bean immensely valuable instrument for radio astronomy. Indeed, it would be by far the most sensitive radio telescope in the world. Additional information is contained in the original extended abstract.
Derived from text
Antenna Arrays; Radio Antennas; Deep Space Network

20010041248 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Inflatable Vehicles for In-Situ Exploration of Titan
Jones, J. A., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 46; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Space Inflatable vehicles have been finding popularity in recent years for applications as varied as spacecraft antennas, space-based telescopes, solar sails, and manned habitats. Another branch of space inflatable technology has also considered developing ambient-filled, solar balloons for Mars as well as ambient-filled inflatable rovers. More recently, some of these inflatable technologies have been applied to the outer solar system bodies with the result that there are some rather unique and compelling inflatable mission capabilities for in situ explorations of Titan, Triton, Uranus, and Neptune. Additional information is contained in the original extended abstract.
Derived from text
Inflatable Spacecraft; Balloons; Space Exploration; Natural Satellites

20010041249 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Titan Airship Surveyor
Kerzhanovich, V., Jet Propulsion Lab., California Inst. of Tech., USA; Yavrouian, A., Jet Propulsion Lab., California Inst. of Tech., USA; Cutts, J., Jet Propulsion Lab., California Inst. of Tech., USA; Colozza, A., NASA Glenn Research Center, USA; Fairbrother, D., NASA Wallops Flight Facility, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 47; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Saturn's moon Titan is considered to be one of the prime candidates for studying prebiotic materials - the substances that precede the formation of life but have disappeared from the Earth as a result of the evolution of life. A unique combination of a dense, predominantly nitrogen, atmosphere (more than four times that of the Earth), low gravity (six times less than on the Earth) and small temperature variations makes Titan the almost ideal planet for studies with lighter-than-air aerial platforms (aerobots). Moreover, since methane clouds and photochemical haze obscure the surface, low-altitude aerial platforms are the only practical means that can provide global mapping of the Titan surface at visible and infrared wavelengths. One major challenge in Titan exploration is the extremely cold atmosphere (approx. 90 K). However, current material technology the capability to operate aerobots at these very low temperatures. A second challenge is the remoteness from the Sun (10 AU) that makes the nuclear (radioisotopic) energy the only practical source of power. A third challenge is remoteness from the Earth (approx. 10 AU, two-way

light-time approx. 160 min) which imposes restrictions on data rates and makes impractical any meaningful real-time control. A small-size airship (approx. 25 cu m) can carry a payload approximately 100 kg. A Stirling engine coupled to a radioisotope heat source would be the prime choice for producing both mechanical and electrical power for sensing, control, and communications. The cold atmospheric temperature makes Stirling machines especially effective. With the radioisotope power source the airship may fly with speed approximately 5 m/s for a year or more providing an excellent platform for in situ atmosphere measurements and a high-resolution remote sensing with unlimited access on a global scale. In a station-keeping mode the airship can be used for in situ studies on the surface by winching down an instrument package. Floating above the surface allows relatively simple means for flight control. Mission requirements and possible methods of navigation, control, data acquisition, and communications are discussed. The presentation describes also the state-of-the art and current progress in aerial deployed aerobots.
Derived from text
Mission Planning; Titan; Space Exploration; Airships; Remote Sensing

20010041250 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Sounding of Icy Galilean Satellites by Surface Observatories
Khurana, K. K., California Univ., USA; Banerdt, W. B., Jet Propulsion Lab., California Inst. of Tech., USA; Johnson, T. V., Jet Propulsion Lab., California Inst. of Tech., USA; Russell, C. T., California Univ., USA; Kivelson, M. G., California Univ., USA; Davis, P. M., California Univ., USA; Vidale, J. E., California Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 48; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Several independent geological and geophysical investigations suggest that Europa and Ganymede contain subsurface oceans. Using Jupiter's rotating magnetic field as a primary signal, the magnetometer experiment onboard Galileo has measured secondary induction signals emanating from Europa, Ganymede, and surprisingly Callisto. The strong electromagnetic induction from these moons suggests that large global electrical conductors are located just below their icy crusts. A detailed analysis reveals that global salty oceans with salinity similar to the Earth's ocean and thicknesses in the range of approx. 6-100 kms can explain the induction observed by the Galileo magnetometer. Additional information is contained in the original extended abstract.
Derived from text
Callisto; Europa; Ganymede; Magnetic Induction; Sounding; Electromagnetic Measurement

20010041251 Los Alamos National Lab., NM USA
A Combined Gamma-Ray and Neutron Detector for Measuring the Chemical Composition of Comets and Other Planetary Bodies
Lawrence, D. J., Los Alamos National Lab., USA; Barraclough, B. L., Los Alamos National Lab., USA; Feldman, W. C., Los Alamos National Lab., USA; Prettyman, T. H., Los Alamos National Lab., USA; Wiens, R. C., Los Alamos National Lab., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 49; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Galactic cosmic rays (GCR) constantly impinge all planetary bodies and produce characteristic gamma-ray lines and leakage neutrons as reaction products. Together with gamma-ray lines produced by radioactive decay, these nuclear emissions provide a powerful technique for remotely measuring the chemical composition of airless planetary surfaces. While lunar-ray spectroscopy was first demonstrated with Apollo Gamma-Ray (AGR) measurements, the full value of combined Gamma-ray and neutron spectroscopy was shown for the first time with the Lunar Prospector Gamma-Ray (LP-GRS) and Neutron Spectrometers (LP-NS). Analysis of other elements such as Ca, Mg, O, Al, and U should soon be completed using LP-GRS data. Furthermore, it has been shown that measurements of thermal neutrons provide an important correction (up to a factor of 3) to measurements of neutron-capture gamma-ray lines such as those from Fe and Ti. With the inclusion of a gamma-ray instrument on the NEAR mission, and gamma-ray and neutron instruments on missions to Mars and Mercury, it is clear that gamma-ray and neutron spectroscopy (GR/NS) is becoming a standard technique for planetary science missions. While we are focusing here on using GR/NS for future cometary missions, these techniques will also provide powerful ways of measuring the surface composition on rocky and icy moons and asteroids. Additional information is contained in the original extended abstract.
Derived from text
Gamma Ray Astronomy; Gamma Ray Spectrometers; Neutron Spectrometers; Remote Sensing; Comets

20010041252 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Ultra Low Power, Radiation Tolerant UHF Radio Technologies for In Situ Communication Applications
Lay, N. E., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 50; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

For future deep space missions, significant reductions in the mass and power requirements for short-range telecommunication systems will be critical in enabling a wide variety of new mission concepts. These possibilities include penetrators, gliders, miniature rovers, and sensor networks. Under joint funding from NASA's Cross Enterprise and JPL's Telecommunications and Mission technology programs, recent development activity has focused on the design of ultralow mass and power transceiver systems and subsystems suitable for operation in a flight environment. For these efforts, the functionality of the transceiver has been targeted towards a specific Mars communications scenario. However, the overall architecture is well suited to any short or medium range application where a remote probe will aperiodically communicate with a base station, possibly an orbiter, for the eventual purpose of relaying science information back to Earth. In 2001, these sponsors have been augmented with collaborative expertise and funding from JPL's Center for Integrated Space Microsystems in order to migrate existing concepts and designs to a System on a Chip (SOAC) solution. Additional information is contained in the original extended abstract.
Derived from text
Transmitter Receivers; Radio Communication; Space Communication; Mission Planning

20010041253 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
ReMaSp: A Reflectron Time-of-Flight Mass Spectrometer
Livi, S. A., Johns Hopkins Univ., USA; Domingue, D. L., Johns Hopkins Univ., USA; Brinckerhoff, W. B., Johns Hopkins Univ., USA; Wurz, P., Bern Univ., Switzerland; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 51; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The ReMaSp (Reflectron Mass Spectrometer) is designed to analyze in situ the chemical and isotopic composition of the gaseous environment of planets and small bodies. Analysis of the local gas composition establish ground truth for remote observations, and can determine parameters that are otherwise difficult, if not impossible, to obtain, like isotope ratios or abundance of noble gases and organic compounds. The intrinsic high mass resolution (delta(m)/m is greater than 1000), high sensitivity (10(exp -3) A/torr), working pressure range (10(exp -15) to 10(exp -14) Torr), and radiation resistance (> 100 krad) of the proposed sensor are well suited to address several key questions regarding outer solar system bodies, from comets to planetary satellites. This instrument placed on a cometary mission can address such issues as the presence of organics, the implied chemical composition of the solar protonebula, and the chemical mechanisms that contribute to the loss of materials from comets. This addresses our understanding of the origin and evolution of the early solar system and the transport of volatiles and pre-biotic material throughout the solar system. The ability to measure the chemical composition of tenuous atmospheres allows for interesting studies of such planetary satellites as Europa and Triton. Measurements taken by this instrument can address such issues as the molecular composition of Europa's atmosphere (Is there water in the atmosphere? What radiation products from the interaction of the Jovian magnetosphere with the water ice surface are present in the atmosphere? Are pre-biotic materials present and being sputtered off the surface?), the chemical composition of the Triton plumes, the production rate of Europa and Triton's atmosphere (for Europa: how much surface material is lost at what rate due to magnetospheric interactions), and the spatial variability of the Europa's atmospheric composition and its relationship to the ion distribution relative to possible variations in surface composition. Such an instrument also has intrinsic applications for any probe of Titan's thick atmosphere and the measure of any organic materials. Additional information is contained in the original extended abstract.
Derived from text
Mass Spectrometers; Time of Flight Spectrometers; Chemical Composition; Spacecraft Instruments; Satellite Atmospheres

20010041254 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Petit Grand Tour: Mission Concepts to Outer Planet Satellites Using Non-Conic Low Energy Trajectories
Lo, M. W., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 52; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Our Solar System is connected by a vast Interplanetary Superhighway System (ISSys) providing low energy transport throughout. The Outer Planets with their satellites and rings are smaller replicas of the Solar System with their own ISSys, also providing low energy transport within their own satellite systems. This low energy transport system is generated by all of the Lagrange points of the planets and satellites within the Solar System. Figures show the tubular passage-ways near L1 of Jupiter and the ISSys of Jupiter schematically. These delicate and resilient dynamics may be used to great effect to produce free temporary captures of a spacecraft by a planet or satellite, low energy interplanetary and inter-satellite transfers, as well as precision impact orbits onto the surface of the satellites. Additional information is contained in the original extended abstract.
Derived from text
Mission Planning; Interplanetary Trajectories; Solar System; Interplanetary Transfer Orbits

20010041255 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA

Flexibility for Titan Exploration: The Titan Helicopter

Lorenz, R. D., Arizona Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 53; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Future Titan exploration should focus on what Cassini will not be able to provide, such as detailed chemical analysis of surface materials (especially where abundant organics have interacted with transient exposures of liquid water), subsurface mapping including the benthic topography of hydrocarbon lakes, high-resolution (m-scale) optical images of the spectacular landscape taken from beneath the blurring haze layers, and meteorological and geophysical monitoring. Neither an orbiter nor a single lander can adequately meet all these objectives. A rover is an uncertain prospect for Titan's environment, so some kind of aerial platform is required. Additional information is contained in the original extended abstract.

Derived from text

Titan; Flying Platforms; Satellite Surfaces; Mission Planning; Helicopters

20010041256 Plus Ultra Technologies, Stony Brook, NY USA

A Nuclear Ramjet Flyer for Exploration of Jovian Atmosphere

Maise, G., Plus Ultra Technologies, USA; Powell, J., Plus Ultra Technologies, USA; Paniagua, J., Plus Ultra Technologies, USA; Lecat, R., Plus Ultra Technologies, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 54; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We investigated the design, operation, and data gathering possibilities of a nuclear-powered ramjet flyer in the Jovian atmosphere. The MITEE nuclear rocket engine can be modified to operate as a ramjet in planetary atmospheres. (Note: MITEE is a compact, ultra-light-weight thermal nuclear rocket which uses hydrogen as the propellant.) to operate as a ramjet, MITEE requires a suitable inlet and diffuser to substitute for the propellant that is pumped from the supply tanks in a nuclear rocket engine. Such a ramjet would fly in the upper Jovian atmosphere, mapping in detail temperatures, pressures, compositions, lightning activity, and wind speeds in the highly turbulent equatorial zone and the Great Red Spot. The nuclear ramjet could operate for months because: (1) the Jovian atmosphere has unlimited propellant, (2) the MITEE nuclear reactor is a (nearly) unlimited power source, and (3) with few moving parts, mechanical wear should be minimal. This paper presents a conceptual design of a ramjet flyer and its nuclear engine. The flyer incorporates a swept-wing design with instruments located in the twin wing-tip pods (away from the radiation source and readily shielded, if necessary). The vehicle is 2 m long with a 2 m wingspan. Its mass is 220 kg, and its nominal flight Mach number is 1.5. Based on combined neutronic and thermal/hydraulic analyses, we calculated that the ambient pressure range over which the flyer can operate to be from about 0.04 to 4 (terrestrial) atmospheres. This altitude range encompasses the three uppermost cloud layers in the Jovian atmosphere: (1) the entire uppermost visible NH3 ice cloud layer (where lightning has been observed), (2) the entire NH4HS ice cloud layer, and (3) the upper portion of the H2O ice cloud layer.

Derived from text

Jupiter Atmosphere; Ramjet Engines; Space Exploration; Jupiter Probes; Mission Planning; Nuclear Rocket Engines

20010041257 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Electrically Isolating Thermally Coupled Device for Noise Suppression of Circuits in Deep Space

Mantooth, A., Arkansas Univ., USA; McNutt, T., Arkansas Univ., USA; Mojarradi, M., Jet Propulsion Lab., California Inst. of Tech., USA; Li, H., Idaho Univ., USA; Blalock, B., Mississippi State Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 55; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Mixed mode rad hard avionics Systems on a Chip (SoC) designed for deep space applications such as Europa orbiters and Europa Landers will require data isolation circuits to block noise. This paper presents the simulation performance for a novel rad hard SOI CMOS compatible thermal transducer used for on-chip data isolation in SoC. The research presented involves the use of commercially available computer aided design tools to model the transient electrothermal behavior of the transducer. Both one- and two-dimensional analyses of a prototype thermal transducer were performed. Results indicate that thermal-based data isolator technology can pass a data bit in under a microsecond and, as a measurement of feasibility, I(exp 2)C bus specifications can be met.

Derived from text

Digital Electronics; Transducers; Chips (Electronics); Noise Reduction; Microelectronics

20010041258 Washington Univ., Dept. of Earth and Planetary Sciences, Saint Louis, MO USA

A Proposed Sequence of Exploration for Europa and the Other Galilean Satellites

McKinnon, W. B., Washington Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 56; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Europa, by virtue of its complex geology, geophysics, and exobiological potential has emerged as the prime planetary target in the Jupiter system, post Galileo. Here I discuss aspects of an exploration strategy for Europa as well as the rest of the Galilean satellites. The primary issue I address is the sequence of missions that leads to the most comprehensive exploration of Europa, and the answers to the most compelling scientific questions concerning that body, all subject to the manifest constraints of resources and mission duration. I also discuss possibilities that arise when resource constraints are modestly relaxed. Additional information is contained in the original extended abstract.

Derived from text

Europa; Mission Planning; Space Exploration; Galilean Satellites

20010041259 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

A Library of Rad Hard Mixed-Voltage/Mixed-Signal Building Blocks for Integration of Avionics Systems for Deep Space

Mojarradi, M. M., Jet Propulsion Lab., California Inst. of Tech., USA; Blaes, B., Jet Propulsion Lab., California Inst. of Tech., USA; Kolawa, E. A., Jet Propulsion Lab., California Inst. of Tech., USA; Blalock, B. J., Mississippi State Univ., USA; Li, H. W., Idaho Univ., USA; Buck, K., Idaho Univ., USA; Houge, D., Boeing Co., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 57; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

To build the sensor intensive system-on-a-chip for the next generation spacecrafts for deep space, Center for Integration of Space Microsystems at JPL (CISM) takes advantage of the lower power rating and inherent radiation resistance of Silicon on Insulator technology (SOI). We are developing a suite of mixed-voltage and mixed-signal building blocks in Honeywell's SOI process that can enable the rapid integration of the next generation avionics systems with lower power rating, higher reliability, longer life, and enhanced radiation tolerance for spacecrafts such as the Europa Orbiter and Europa Lander. The mixed-voltage building blocks are predominantly for design of adaptive power management systems. Their design centers around an LDMOS structure that is being developed by Honeywell, Boeing Corp, and the University of Idaho. The mixed-signal building blocks are designed to meet the low power, extreme radiation requirement of deep space applications. These building blocks are predominantly used to interface analog sensors to the digital CPU of the next generation avionics system on a chip. Additional information is contained in the original extended abstract.

Derived from text

Avionics; Systems Integration; SOI (Semiconductors); Microelectronics

20010041260 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Nanotube-based Sensors and Systems for Outer Planetary Exploration

Noca, F., Jet Propulsion Lab., California Inst. of Tech., USA; Hunt, B. D., Jet Propulsion Lab., California Inst. of Tech., USA; Hoenk, M. E., Jet Propulsion Lab., California Inst. of Tech., USA; Choi, D., Jet Propulsion Lab., California Inst. of Tech., USA; Kowalczyk, R., Jet Propulsion Lab., California Inst. of Tech., USA; Williams, R., Jet Propulsion Lab., California Inst. of Tech., USA; Xu, J., Brown Univ., USA; Koumoutsakos, P., Eidgenoessische Technische Hochschule, Switzerland; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 58; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Direct sensing and processing at the nanometer scale offer NASA the opportunity to expand its capabilities in deep space exploration, particularly for the search for signatures of life, the analysis of planetary oceans and atmospheres, and communications systems. Carbon nanotubes, with their unique mechanical, electrical, and radiation-tolerant properties, are a promising tool for this exploration. We are developing devices based on carbon nanotubes, including sensors, actuators, and oscillators. Additional information is contained in the original extended abstract.

Derived from text

Nanotubes; Actuators; Mechanical Oscillators

20010041261 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Nuclear Electric Propulsion for the Exploration of the Outer Planets

Noca, M., Jet Propulsion Lab., California Inst. of Tech., USA; Polk, J. E., Jet Propulsion Lab., California Inst. of Tech., USA; Lenard, R., Sandia National Labs., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp.

59; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

New power and propulsion technology efforts such as the DS-1 ion propulsion system demonstration and renewed interest in space nuclear power sources call for a reassessment of the mission benefits of Nuclear Electric Propulsion (NEP). In this study, a large emphasis has been placed in defining the NEP vehicle configuration and corresponding subsystem elements in order to produce an estimate of the vehicle's payload delivery capability which is as credible as possible. Both a 100 kWe and a 1 MWe system are defined. Various Outer Planet missions are evaluated using NEP, such as a Pluto Orbiter, a Europa Lander and Sample Return, attain/Saturn Sample Return and a Neptune Orbiter. Additional information is contained in the original extended abstract.
Derived from text

Nuclear Electric Propulsion; Space Exploration; Ion Propulsion; Spacecraft Power Supplies; Spacecraft Configurations; Propulsion System Configurations

20010041262 Tethers Unltd., Lynnwood, WA USA

Application of Synergistic Multipayload Assistance with Rotating Tethers (SMART) Concept to Outer Planet Exploration

Forward, R. L., Tethers Unltd., USA; Hoyt, R. P., Tethers Unltd., USA; Nordley, G. D.; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 60; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We propose an innovative approach to outer planet exploration using the Synergistic Multipayload Assistance with Rotating Tethers (SMART) concept invented by Gerald David Nordley. The basic concept can be implemented in many different ways to accomplish many different types of planetary missions, especially missions to the outer planets. Additional information is contained in the original extended abstract.
Derived from text

Tetherlines; Mission Planning; Space Exploration; Spacecraft Configurations; Space Missions

20010041263 NASA Glenn Research Center, Cleveland, OH USA

Pluto/Kuiper Missions with Advanced Electric Propulsion and Power

Oleson, S. R., NASA Glenn Research Center, USA; Patterson, M. J., NASA Glenn Research Center, USA; Schrieber, J., NASA Glenn Research Center, USA; Gefert, L. P., NASA Glenn Research Center, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 61; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In response to a request by NASA Code SD Deep Space Exploration Technology Program, NASA Glenn Research center performed a study to identify advanced technology options to perform a Pluto/Kuiper mission without depending on a 2004 Jupiter Gravity Assist, but still arriving before 2020. A concept using a direct trajectory with small, sub-kilowatt ion thrusters and Stirling radioisotope power system was shown to allow the same or smaller launch vehicle class (EELV) as the chemical 2004 baseline and allow launch in any year and arrival in the 2014 to 2020 timeframe. With the nearly constant power available from the radioisotope power source such small ion propelled spacecraft could explore many of the outer planetary targets. Such studies are already underway. Additional information is contained in the original extended abstract.
Derived from text

Electric Propulsion; Space Exploration; Ion Engines; Radioisotope Batteries; Spacecraft Power Supplies

20010041264 Brown Univ., Dept. of Geological Sciences, Providence, RI USA

The Grandeur of Ganymede: Suggested Goals for an Orbiter Mission

Pappalardo, R. T., Brown Univ., USA; Khurana, K. K., California Univ., USA; Moore, W. B., California Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 62; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Ganymede is an icy satellite of planetary grandeur, with alluring surface geology and chemistry, an internally generated magnetic field, a differentiated interior and hot iron core, and a tenuous but dynamic atmosphere. Its linked surface, interior, and orbital evolution recount the history of the jovian system. Moreover, an induced magnetic field component and warm interior imply a liquid water deep within the moon, and the potential for harboring primitive life. Broad goals of surface, magnetosphere, interior, and atmosphere--and overarching themes of water and organics--tie to high priority to NASA's exploration objectives. All can be thoroughly addressed by a dedicated Ganymede mission. Additional information is contained in the original extended abstract.
Derived from text

Ganymede; Mission Planning; Space Exploration; Satellite Surfaces; Magnetic Fields; Satellite Atmospheres

20010041265 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Nonvolatile Memory Solution for Near-Term NASA Missions

Patel, J. U., Jet Propulsion Lab., California Inst. of Tech., USA; Blaes, B. R., Jet Propulsion Lab., California Inst. of Tech., USA; Mojarradi, M. M., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 63; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Nonvolatile memory (NVM) system that could reliably function in extreme environments is one of the most critical components for many spacecrafts being developed for NASA missions to be launched in next four to seven years. NVM supports the computer system in saving and updating critical state data required for a warm restart after power cycling or in case of a power bus failure. It also provides a power independent mass storage capacity for the scientific data gathered by the instruments. In some cases the window for gathering such data is very small and occurs only once in a given mission. Commercially popular and fully developed Flash NVM technology is inappropriate for many reasons such as the limited read write cycles with slower access speeds, radiation intolerance, higher Single Event Upsets (SEU) rates, etc. It is desirable to have an NVM system based upon a robust cell technology making it immune to the SEUs and with sufficient radiation hardness. Availability of such NVM system seems to be still 5 to 10 years in the future. Meanwhile, it is possible to provide an interim hybrid solution by combining the existing rad-hard technologies. Additional information is contained in the original extended abstract.

Derived from text

Memory (Computers); Space Exploration; Spacecraft Components; Data Systems

20010041266 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Electronics for Extreme Environments

Patel, J. U., Jet Propulsion Lab., California Inst. of Tech., USA; Cressler, J., Auburn Univ., USA; Li, Y., Auburn Univ., USA; Niu, G., Auburn Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 64; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Most of the NASA missions involve extreme environments comprising radiation and low or high temperatures. Current practice of providing friendly ambient operating environment to electronics costs considerable power and mass (for shielding). Immediate missions such as the Europa orbiter and lander and Mars landers require the electronics to perform reliably in extreme conditions during the most critical part of the mission. Some other missions planned in the future also involve substantial surface activity in terms of measurements, sample collection, penetration through ice and crust and the analysis of samples. Thus it is extremely critical to develop electronics that could reliably operate under extreme space environments. Silicon On Insulator (SOI) technology is an extremely attractive candidate for NASA's future low power and high speed electronic systems because it offers increased transconductance, decreased sub-threshold slope, reduced short channel effects, elimination of kink effect, enhanced low field mobility, and immunity from radiation induced latch-up. A common belief that semiconductor devices function better at low temperatures is generally true for bulk devices but it does not hold true for deep sub-micron SOI CMOS devices with microscopic device features of 0.25 micrometers and smaller. Various temperature sensitive device parameters and device characteristics have recently been reported in the literature. Behavior of state of the art technology devices under such conditions needs to be evaluated in order to determine possible modifications in the device design for better performance and survivability under extreme environments. Here, we present a unique approach of developing electronics for extreme environments to benefit future NASA missions as described above. This will also benefit other long transit/life time missions such as the solar sail and planetary outposts in which electronics is out open in the unshielded space at the ambient space temperatures and always exposed to radiation. Additional information is contained in the original extended abstract.

Derived from text

Space Exploration; Spacecraft Electronic Equipment; Radiation Tolerance; SOI (Semiconductors); CMOS

20010041267 NASA Glenn Research Center, Cleveland, OH USA

Ion Propulsion Technology Programs at NASA Glenn Research Center

Patterson, M. J., NASA Glenn Research Center, USA; Oleson, S. R., NASA Glenn Research Center, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 65; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

As lead center for the agency in electric and ion propulsion, the NASA Glenn Research Center (GRC) is pursuing technology development in ion propulsion for a range of mission applications. The program goal is to develop key technologies for advanced NSTAR-derivative high-power ion propulsion, lightweight low power high-performance ion propulsion, 'micro' ion propulsion, and engine and component technologies for high-power electric propulsion for very ambitious missions. Products include: (1) a 5 kW, 400 kg throughput ion thruster and power processing technology; (2) extremely-lightweight high-efficiency sub-kilowatt

ion thruster and power processor; (3) a 1-25 W high-specific impulse ion engine; and (4) engine and component technologies for high-power (30 kW class) ion and Hall engines. Identified applications include outer planetary science missions such as Europa orbiter/lander, Comet Nucleus Sample Return mission, Titan Explorer, Neptune/Triton, Pluto-Kuiper Belt Objects Mission, various second generation interplanetary Micro spacecraft, and the Interstellar Probe Mission. Additional information is contained in the original extended abstract.
Derived from text
Ion Propulsion; Space Exploration; Technology Utilization

20010041268 Plus Ultra Technologies, Shoreham, NY USA
MITEE: A Compact Ultralight Nuclear Thermal Propulsion Engine for Planetary Science Missions
Powell, J., Plus Ultra Technologies, USA; Maise, G., Plus Ultra Technologies, USA; Paniagua, J., Plus Ultra Technologies, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 66; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A new approach for a near-term compact, ultralight nuclear thermal propulsion engine, termed MITEE (Miniature Reactor Engine) is described. MITEE enables a wide range of new and unique planetary science missions that are not possible with chemical rockets. With U-235 nuclear fuel and hydrogen propellant the baseline MITEE engine achieves a specific impulse of approximately 1000 seconds, a thrust of 28,000 newtons, and a total mass of only 140 kilograms, including reactor, controls, and turbo-pump. Using higher performance nuclear fuels like U-233, engine mass can be reduced to as little as 80 kg. Using MITEE, V additions of 20 km/s for missions to outer planets are possible compared to only 10 km/s for H2/O2 engines. The much greater V with MITEE enables much faster trips to the outer planets, e.g., two years to Jupiter, three years to Saturn, and five years to Pluto, without needing multiple planetary gravity assists. Moreover, MITEE can utilize in-situ resources to further extend mission V. One example of a very attractive, unique mission enabled by MITEE is the exploration of a possible subsurface ocean on Europa and the return of samples to Earth. Using MITEE, a spacecraft would land on Europa after a two-year trip from Earth orbit and deploy a small nuclear heated probe that would melt down through its ice sheet. The probe would then convert to a submersible and travel through the ocean collecting samples. After a few months, the probe would melt its way back up to the MITEE lander, which would have replenished its hydrogen propellant by melting and electrolyzing Europa surface ice. The spacecraft would then return to Earth. Total mission time is only five years, starting from departure from Earth orbit. Other unique missions include Neptune and Pluto orbiter, and even a Pluto sample return. MITEE uses the cermet Tungsten-UO2 fuel developed in the 1960's for the 710 reactor program. The W-UO2 fuel has demonstrated capability to operate in 3000 K hydrogen for many hours - a much longer period than the approximately one hour burn time for MITEE. Using this cermet fuel, and technology available from other nuclear propulsion programs, MITEE could be developed and ready for implementation in a relatively short time, i.e., approximately seven years. An overview description of the MITEE engine and its performance capabilities is provided.
Derived from text
Space Missions; Nuclear Propulsion; Spacecraft Power Supplies; Space Exploration

20010041269 Honeybee Robotics Ltd., New York, NY USA
Touch and Go Surface Sampler (TGSS)
Gorevan, S. P., Honeybee Robotics Ltd., USA; Rafeek, S., Honeybee Robotics Ltd., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 67; In English; See also 20010041202
Contract(s)/Grant(s): NAS2-00019; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Touch and Go Surface Sampler (TGSS) is a new class of planetary and small body sample acquisition tool that can be used for the surface exploration of Europa, Titan and comets. TGSS in its basic configuration consists of a high speed sampling head attached to the end of a flexible shaft. The sampling head consists of counter rotating cutters that rotates at speeds of 3000 to 15000 RPM. The attractive feature of this if touch and go type sampler is that there are no requirements for a lander type spacecraft. Additional information is contained in the original extended abstract.
Derived from text
Samplers; Space Exploration; Spacecraft Configurations; Tetherlines

20010041270 Honeybee Robotics Ltd., New York, NY USA
A Balloon-delivered Subsurface Sample Acquisition and Transfer Mechanism
Gorevan, S. P., Honeybee Robotics Ltd., USA; Rafeek, S., Honeybee Robotics Ltd., USA; Kong, K. Y., Honeybee Robotics Ltd., USA; Ummy, M. A., Honeybee Robotics Ltd., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 70; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The scientific interest in studying the surfaces of both Titan and Triton is clear and strong, however as of yet the technologies that will enable such studies are not. Honeybee Robotics offers a novel access technology concept that could be realistically implemented in a landed mission in the coming decades. The concept is a balloon-delivered Sample Acquisition and Transfer Mechanism (SATM). The balloon-delivered SATM answers the solicitation of Focus Area 1 by providing both access to surfaces of planetary bodies with atmospheres such as Titan and Triton, and by extracting subsurface samples and transferring them to in situ scientific instrumentation. Heritage exists at Honeybee Robotics for this concept in the form of a working SATM breadboard. The presentation will communicate more fully the concept's framework, it's heritage, and how it can enable successful sampling missions. Additional information is contained in the original extended abstract.
Derived from text
Titan; Core Sampling; Triton; Balloon-Borne Instruments; Samplers; Space Exploration

20010041271 Honeybee Robotics Ltd., New York, NY USA
Subsurface Sample Acquisition and Transfer Systems (SSATS)
Rafeek, S., Honeybee Robotics Ltd., USA; Gorevan, S. P., Honeybee Robotics Ltd., USA; Kong, K. Y., Honeybee Robotics Ltd., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 69; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In the exploration of planets and small bodies, scientists will need the services of a deep drilling and material handling system to not only obtain the samples necessary for analyses but also to precisely transfer and deposit those samples in in-situ instruments on board a landed craft or rover. The technology for such a deep sampling system as the SSATS is currently been developed by Honeybee Robotics through a PIDDP effort. The SSATS has its foundation in a one-meter prototype (SATM) drill that was developed under the New Millenium Program for ST4/Champollion. Additionally the SSATS includes relevant coring technology form a coring drill (Athena Mini-Corer) developed for the Mars Sample Return Mission. These highly developed technologies along with the current PIDDP effort, is combined to produce a sampling system that can acquire and transfer samples from various depths. Additional information is contained in the original extended abstract.
Derived from text
Drilling; Space Exploration; Spacecraft Instruments; Core Sampling

20010041272 Honeybee Robotics Ltd., New York, NY USA
The Inchworm Deep Drilling System for Kilometer Scale Subsurface Exploration of Europa (IDDS)
Rafeek, S., Honeybee Robotics Ltd., USA; Gorevan, S. P., Honeybee Robotics Ltd., USA; Bartlett, P. W., Honeybee Robotics Ltd., USA; Kong, K. Y., Honeybee Robotics Ltd., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 68; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Inchworm Deep Drilling System (IDDS) is a compact subsurface transport system capable of accessing regions of astrobiological interest deep below the surface of Jupiter's moon, Europa. The IDDS answers Focus Investigation Area 1 as an innovative concept for implementing subsurface exploration of Europa. The concept is being developed at Honeybee Robotics to reach depths on the order of one kilometer with no tether or umbilical of any kind. The device's unique, inchworm-burrowing method appears capable of achieving this near-term depth goal and it is foreseeable that the IDDS will be capable of autonomously drilling to tens of kilometers below the surface. Logical applications of the concept also include accessing the proposed subsurface oceans on Ganymede and Callisto, subsurface water ice on Mars, and Lake Vostok on Earth. The conference presentation will communicate the IDDS concept and how it can enable the search for prebiotic and biotic chemical processes on Europa by bringing proper instrumentation to the subsurface ocean for in-situ investigation and/or returning samples to the surface. Currently, a proposal for breadboarding the IDDS is pending for the Research Opportunities for Space Science's Astrobiology Science and Technology Instrument Development NRA. Additional information is contained in the original extended abstract.
Derived from text
Drilling; Europa; Samplers; Satellite Surfaces; Core Sampling

20010041273 Los Alamos National Lab., Space and Atmospheric Sciences, NM USA
Ion Mass Spectroscopy for the Outer Solar System
Reisenfeld, D. B., Los Alamos National Lab., USA; Elphic, R. C., Los Alamos National Lab., USA; McComas, D. J., Southwest Research Inst., USA; Nordholt, J. E., Los Alamos National Lab., USA; Steinberg, J. T., Los Alamos National Lab., USA; Wiens, R. C., Los Alamos National Lab., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 71; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A proven method for determination of the exospheric and surface composition of moons and comets is ion mass spectroscopy. Ions are produced via sputtering of surface constituents by the ambient plasma (solar wind or planetary magnetospheres), and via photo- and electron impact ionization of neutral exospheric/atmospheric constituents. A promising emergent technology in the field of space-based ion mass spectrometry is the low-cost, miniaturized but high-performance ion mass spectrometer (IMS) as exhibited by the Plasma Experiment for Planetary Exploration (PEPE) on Deep Space 1 (DS-1). A technology demonstration instrument, the PEPE IMS realized a mass resolution (M/delta(M)) of approximately 10. Its energy range extends from 5 eV to 9 keV at this mass resolution, and up to 33.5 keV in a lower mass resolution mode. With minimal development, these capabilities can be greatly extended. Already, we have produced a fully functional engineering model having a M/delta(M) = 20 and an energy range extending to 18 keV in the high-mass resolution mode. Further design modifications anticipate extending the mass resolution to 30-40 while still maintaining a miniaturized design. This makes possible many more isotopic and molecular differentiations than achievable with the original PEPE design. A PEPE-class spectrometer can address a significant number of the OPP key strategic objectives. In particular, in situ cometary nucleus analysis, studies of Triton's atmospheric and surface composition, and Europa surface composition analysis, can all be performed through IMS measurements. Additional information is contained in the original extended abstract.
Derived from text
Mass Spectrometers; Space Exploration; Spacecraft Instruments; Surface Properties; Time of Flight Spectrometers

20010041274 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Significant Science at Jupiter Using Solar Power
Reitsema, H. J., Ball Aerospace and Technologies Corp., USA; Smith, E. J., Jet Propulsion Lab., California Inst. of Tech., USA; Spilker, T., Jet Propulsion Lab., California Inst. of Tech., USA; Reinert, R., Ball Aerospace and Technologies Corp., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 72; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Missions to the Outer Planets are challenging for a number of reasons, primary of which is the low output of solar arrays at large heliocentric distances. The INSIDE Jupiter mission is a Discovery concept for a science investigation at Jupiter that is capable of producing major studies of the Jovian internal structure and ionospheric-magnetospheric coupling. Additional information is contained in the original extended abstract.
Derived from text
Magnetosphere-Ionosphere Coupling; Jupiter (Planet); Space Exploration; Spacecraft Equipment

20010041275 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Use of Hibernation Modes for Deep Space Missions as a Method to Lower Mission Operations Costs
Reynolds, E. L., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 73; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Deep space missions are dominated by long periods of low activity cruise before arrival at their main objective. The traditional technique of maintaining regular contact with a spacecraft as it cruises to a distant objective is expensive: a mission operations team must be staffed and DSN antenna time costs thousands of dollars per hour. As more missions are launched, each with longer cruise durations, the strain on resources will become unacceptable. Placing spacecraft in an unattended hibernation state is a practical solution for drastically reducing mission operations costs and deep space network usage costs. Such a technique was used successfully on GIOTTO's extended mission and a new version of hibernation mode is baselined for NASA's CONTOUR spacecraft. CONTOUR is a Discovery class mission that cruises to different comet nucleii over several years. Ultimately, hibernation mode enables more resources to be dedicated toward science operations and analysis by reducing infrastructure costs associated with mission cruise. A white paper on CONTOUR's hibernation mode has been developed that covers different aspects of long term unattended operation including spacecraft configuration and operation, autonomy requirements, navigation requirements, go/no go criteria, failure modes and response, spacecraft recovery strategy, historical precedent, etc. The presentation will present details of the CONTOUR white paper along with discussions regarding the implications of hibernation for outer planets missions. Also discussed will be possible use of a beacon mode assisted hibernation for outer planet missions.
Derived from text
Space Missions; Space Exploration; Autonomy; Spacecraft Configurations; Operating Costs

20010041276 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Miniature Neutron-Alpha Activation Spectrometer

Rhodes, E., Johns Hopkins Univ., USA; Goldsten, J., Johns Hopkins Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 74; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We are developing a miniature neutron-alpha activation spectrometer for in situ analysis of samples including rocks, fines, ices, and drill cores, suitable for a lander or Rover platform, that would meet the severe mass, power, and environmental constraints of missions to the outer planets. In the neutron-activation mode, a gamma-ray spectrometer will first perform a penetrating scan of soil, ice, and loose material underfoot (depths to 10 cm or more) to identify appropriate samples. Chosen samples will be analyzed in bulk in neutron-activation mode, and then the sample surfaces will be analyzed in alpha-activation mode using Rutherford backscatter and x-ray spectrometers. The instrument will provide sample composition over a wide range of elements, including rock-forming elements (such as Na, Mg, Si, Fe, and Ca), rare earths (Sm and Eu for example), radioactive elements (K, Th, and U), and light elements present in water, ices, and biological materials (mainly H, C, O, and N). The instrument is expected to have a mass of about l kg and to require less than 1 W power. Additional information is contained in the original extended abstract.

Derived from text

Neutron Activation Analysis; Planetary Surfaces; Sampling; Space Exploration; Spacecraft Instruments; Spectrometers

20010041277 NASA Goddard Space Flight Center, Greenbelt, MD USA

Pluto and Triton: Interactions Between Volatiles and Dynamics

Rubincam, D. P., NASA Goddard Space Flight Center, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 75; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Volatiles moving across the surfaces of Pluto and Triton can give rise to interesting dynamical consequences. Conversely, measurement of dynamical states can help constrain the movement of volatiles and interior structure of both bodies. Polar wander may theoretically occur on both Triton and Pluto. Triton's obliquity is low, so that the equatorial regions receive more insolation than the poles. Hence there is a tendency for nitrogen ice to sublime at the equator and condense at the poles, creating polar caps. If the nitrogen supply is large enough, then these caps could move in approximately 10(exp 5) years the global equivalent of 200 m of ice to the poles. At this point the equatorial moment of inertia becomes larger than the moment of inertia measured about the rotation axis, so that Triton overbalances and becomes dynamically unstable. The satellite then undergoes polar wander, restoring stability when the new equator contains the excess matter. Hence the pole may be continually wandering. Neptune raises a permanent tidal bulge on Triton, so that the satellite's surface is elongated like a football, with the long axis pointing at Neptune. This is expected to be the axis about which the pole wanders. Volatile migration would resurface the satellite to some depth and wandering would disturb leading side/trailing side crater statistics. Additional information is contained in the original extended abstract.

Derived from text

Polar Caps; Tides; Triton; Polar Wandering (Geology); Pluto (Planet)

20010041278 NASA Glenn Research Center, Cleveland, OH USA

Stirling Radioisotope Power System as an Alternative for NASAs Deep Space Missions

Shaltens, R. K., NASA Glenn Research Center, USA; Mason, L. S., NASA Glenn Research Center, USA; Schreiber, J. G., NASA Glenn Research Center, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 76; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The NASA Glenn Research Center (GRC) and the Department of Energy (DOE) are developing a free-piston Stirling convertor for a Stirling Radioisotope Power System (SRPS) to provide on-board electric power for future NASA deep space missions. The SRPS currently being developed provides about 100 watts and reduces the amount of radioisotope fuel by a factor of four over conventional Radioisotope Thermoelectric Generators (RTG). The present SRPS design has a specific power of approximately 4 W/kg which is comparable to an RTG. GRC estimates for advanced versions of the SRPS with improved heat source integration, lightweight Stirling convertors, composite radiators, and chip-packaged controllers improves the specific mass to about 8 W/kg. Additional information is contained in the original extended abstract.

Derived from text

Thermoelectric Generators; Stirling Engines; Spacecraft Power Supplies

20010041279 NASA Goddard Space Flight Center, Greenbelt, MD USA

Titan Orbiter Aerorover Mission

Sittler Jr., E. C., NASA Goddard Space Flight Center, USA; Acuna, M., NASA Goddard Space Flight Center, USA; Burchell, M. J., Kent Univ., UK; Coates, A., Mullard Space Science Lab., UK; Farrell, W., NASA Goddard Space Flight Center, USA; Flasar, M., NASA Goddard Space Flight Center, USA; Goldstein, B. E., Jet Propulsion Lab., California Inst. of Tech., USA; Gorevan, S., Honeybee Robotics Ltd., USA; Hartle, R. E., NASA Goddard Space Flight Center, USA; Johnson, W. T. K., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 77; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

We propose a combined Titan orbiter and Titan Aerorover mission with an emphasis on both in situ and remote sensing measurements of Titan's surface, atmosphere, ionosphere, and magnetospheric interaction. The biological aspect of the Titan environment will be emphasized by the mission (i.e., search for organic materials which may include simple organics to 'amono' analogues of amino acids and possibly more complex, lightening detection and infrared, ultraviolet, and charged particle interactions with Titan's surface and atmosphere). An international mission is assumed to control costs. NASA will provide the orbiter, launch vehicle, DSN coverage and operations, while international partners will provide the Aerorover and up to 30% of the cost for the scientific instruments through collaborative efforts. to further reduce costs we propose a single PI for orbiter science instruments and a single PI for Aerorover science instruments. This approach will provide single command/data and power interface between spacecraft and orbiter instruments that will have redundant central DPU and power converter for their instruments. A similar approach could be used for the Aerorover. The mission profile will be constructed to minimize conflicts between Aerorover science, orbiter radar science, orbiter radio science, orbiter imaging science, and orbiter fields and particles (FP) science. Additional information is contained in the original extended abstract.

Derived from text

Titan; Space Exploration; Remote Sensing; In Situ Measurement; Spacecraft Instruments

20010041280 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

A Return to Io: Science Goals and Implementation

Spencer, J. R., Lowell Observatory, USA; Smythe, W. D., Jet Propulsion Lab., California Inst. of Tech., USA; Lopes-Gautier, R., Jet Propulsion Lab., California Inst. of Tech., USA; McEwen, A. S., Arizona Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 78; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Io remains one of the most fascinating objects in the solar system: the only place beyond Earth where we can watch hard-rock geology in action. In its high heat flow Io resembles the early Earth, providing a present-day analog to some of the processes that dominated the Earth's geology at the time that life first appeared. Io's usefulness as an early-Earth analog has been underscored recently by the detection of very high eruption temperatures, hotter than terrestrial basaltic lavas. These temperatures are most plausibly interpreted as resulting from ultramafic lava compositions, analagous to the komatiites that were common on Earth in the Precambrian but which have been virtually absent during the Phanerozoic. The large scale of many Io eruptions also provides useful analogs to Phanerozoic terrestrial eruptions, such as flood basalts, which are important for the Earth's geological and biological evolution but which occur too rarely to be witnessed by humans on our own planet. by providing living examples, Io can thus play the same role in understanding large-scale planetary volcanism that volcanically active terrestrial regions have played in understanding the results of smaller-scale volcanic processes seen in the geological record worldwide. Additional information is contained in the original extended abstract.

Derived from text

Io; Volcanology; Geology; Analogs; Space Exploration

20010041281 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Saturn Ring Observer

Spilker, T. R., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 80; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Answering fundamental questions about ring particle characteristics, and individual and group behavior, appears to require close-proximity (a few km) observations. Saturn's magnificent example of a ring system offers a full range of particle sizes, densities, and behaviors for study, so it is a natural choice for such detailed investigation. Missions implementing these observations require post-approach Delta(V) of approximately 10 km/s or more, so past mission concepts called upon Nuclear Electric Propulsion. The concept described here reduces the propulsive Delta(V) requirement to as little as 3.5 km/s, difficult but

not impossible for high-performance chemical propulsion systems. Additional information is contained in the original extended abstract.
Derived from text
Nuclear Electric Propulsion; Saturn Rings; Space Exploration; Propulsion System Performance

20010041282 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Saturn Deep Atmospheric Entry Probes Delivered by INSIDE Jupiter Derivative Spacecraft
Spilker, T. R., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 79; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In situ probes are the most reliable means for sampling composition and conditions deep in giant planet atmospheres. Deep constituent abundances at the giant planets offer clues to conditions in the solar systems protoplanetary disk and variations with heliocentric distance. Currently in situ atmospheric data are available from only one giant planet, Jupiter, and probes that penetrate deeper than the Galileo probe are needed there to measure the deep abundances of such important species as H2O and H2S. Deep probes at Saturn would extend the sampled heliocentric range to Saturn, providing important constraints on the conditions and variability of the protoplanetary disk, and would provide significant new information about Saturn and its evolutionary processes. Such a probe mission could be implemented using a derivative of the INSIDE Jupiter mission's spacecraft as the Carrier/Relay Spacecraft (CRSC), with probes per JPL/Team X and other design studies. Additional information is contained in the original extended abstract.
Derived from text
Atmospheric Entry; Sampling; Space Exploration; In Situ Measurement; Space Probes; Saturn Atmosphere

20010041283 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Flyby Delivers Multiple Deep Jupiter Probes
Spilker, T. R., Jet Propulsion Lab., California Inst. of Tech., USA; Hubbard, W. B., Arizona Univ., USA; Ingersoll, A. P., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 81; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In situ probes are the most reliable means for sampling composition and conditions deep in giant planet atmospheres. While exceeding its baseline mission, the Galileo probe entered a distinctly non-representative region of Jupiter (a 'hot spot') and apparently did not measure the full deep abundances of such important species as H2O and H2S, whose measured abundances were still increasing at the deepest datum. Multiple deep (approx. 100 bar) in situ probes minimize the hot spot risk, and address spatial variations and deep constituent abundances. Additional information is contained in the original extended abstract.
Derived from text
Jupiter Probes; Sampling; Space Exploration; In Situ Measurement

20010041284 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Evolvable Hardware for Extreme Environments: Hot or Cold
Stoica, A., Jet Propulsion Lab., California Inst. of Tech., USA; Thakoor, A., Jet Propulsion Lab., California Inst. of Tech., USA; Keymeulen, D., Jet Propulsion Lab., California Inst. of Tech., USA; Zebulum, R., Jet Propulsion Lab., California Inst. of Tech., USA; Daud, T., Jet Propulsion Lab., California Inst. of Tech., USA; Toomarian, B., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 82; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Temperature tolerant electronics and long life survivability are key capabilities required for future NASA/JPL missions. Current approaches to electronics for extreme environments focus on component level robustness and hardening. Compensation techniques, e.g., as offered by bias cancellation circuits, have also been employed. This paper presents a novel approach, based on evolvable hardware technology, which allows adaptive in situ circuit redesign/reconfiguration during the operation in the environment. This technology would complement material/device advancements and bring closer the success of missions in harsh environments. Additional information is contained in the original extended abstract.
Derived from text
Circuits; Robustness (Mathematics); Aerospace Environments; Temperature Effects; Electronic Equipment

20010041285 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA

In Situ Chronology in the Outer Solar System

Swindle, T. D., Arizona Univ., USA; Brown, R., Arizona Univ., USA; Greenberg, R., Arizona Univ., USA; Lunine, J., Arizona Univ., USA; McEwen, A., Arizona Univ., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 83; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Determining the age of a feature on a solar system body is one of the most important tasks that can be done on a planetary sample, since almost any model has to include time as one of its parameters. Unfortunately, determining the age of a feature is also one of the most difficult things to do in situ. At the University of Arizona's Lunar and Planetary Laboratory, we have identified techniques that could provide essential age determinations, using in situ technologies suitable for spacecraft delivery. We will adopt a 10% uncertainty as a target precision. For many planetary situations, an age with an uncertainty of 10% would be a huge improvement on current knowledge, and could resolve critical issues of origins and evolution. For example, there are major uncertainties about the size-frequency distribution and abundances of small bodies in the outer solar system, so a few in situ dates could go a long ways toward calibration of cratering statistics. Similarly, in situ ages would be useful for bodies on which cryovolcanism does, or might, occur, such as Europa and Titan. In addition, in situ dating could be used to determine the rates of surface processes such as sputtering on Europa. We propose four basic techniques: (1) potassium-argon (K-AR) dating, (2) cosmogenic noble gas exposure age dating, (3) C-14 dating, and (4) maturation of D/H in surface ices. K-Ar dating measures the time since formation (or perhaps significant reheating) of an ice, while the others measure surface exposure. Additional information is contained in the original extended abstract.

Derived from text

In Situ Measurement; Chronology; Time Measurement; Solar System

20010041286 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Seismoball: A Small Europa Orbiter Drop-Off Probe for Early Exploration of the Europan Surface

Tamppari, L., Jet Propulsion Lab., California Inst. of Tech., USA; Zimmerman, W., Jet Propulsion Lab., California Inst. of Tech., USA; Green, J., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 84; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Recent magnetometry data received from Galileo indicate that the most likely explanation for the magnetic signature there is indeed a global conducting layer below the surface. This conducting layer is well matched by a salty, mineral rich strata beneath the Europan ice crust or a salt water ocean. Galileo imaging results show a variety of terrain types thought to contain young material; for example, lineaments, chaotic terrain, and eruption features. Additionally, Galileo images have shown indications of areas of up-welling where subsurface material periodically gets pushed to the surface due to the forces of fracturing, butting, and refreezing of the ice sheet. While Europa Orbiter will provide close-flyby high resolution images, as well as magnetometry, spectroscopy and other remote sensing data of the surface, it will not be able to provide essential engineering data like surface hardness and surface ice structure needed to support eventual landed missions. Additionally, ice chemical composition at microscopic scales can only be studied in detail through in situ instrumentation. Seismoball is a small probe designed to be injected into a surface intersect orbit around Europa. Using small reverse thrusters, the probe will be capable of nulling the high horizontal injection velocity as it approaches the 2 km surface injection altitude, thus allowing it to fall to the surface at an impact velocity of is less than 100m/sec (much less than the DS-2 impact velocities). The external breakaway thruster structure and crushable exterior shell absorb the impact energy while allowing the science instrument suite to remain intact. JPL has already started analyzing the entry dynamics and designing/building a small, low mass probe which will withstand the impact g-forces and fit as a 'carry-on' on board the Europa Orbiter. The probe will carry a suite of 5-6 micro-instruments for imaging the surface (both microscopic and far-field), surface and shallow subsurface ice temperatures, surface hardness, crustal dynamics and periodicity, and compositional chemistry. If selected, this flight development activity will provide a unique science opportunity and adjunct to the primary Orbiter science mission. The final flight system will be designed to accommodate orbiter mass, volume, and power interface constraints, as well as entry dynamics, g-load mitigation, and arbitrary landing orientation.

Derived from text

Europa; Flyby Missions; Space Probes; Space Exploration; Satellite Surfaces

20010041287 Teledyne Brown Engineering, Huntsville, AL USA

Concepts and Engineering Advances Required for Near-Term Solar Sail Propelled Outer Planet Probes

Taylor, T. S., Teledyne Brown Engineering, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 85; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The concept of using light pressure for propulsion is not a new one. In fact, Tsiolkovsky was writing about the possibility as early as 1921. Solar sailing has been the subject of many papers and has been discussed in at least four textbooks since that time. However, most research in solar sails ordinarily focuses on specific aspects of the concept and goes into great detail about one subcomponent or is more general and discusses basic theories involved, without investigating finer details that may inhibit successful implementation of the concept. Teledyne Brown Engineering (TBE) has developed an internal solar sail research concept that suggests that it is possible to use solar sails on the order of 200-500 m in diameter to propel payloads up to 100 kg at speeds of nearly 10 AU/year. However, these spacecraft would be constructed of state-of-the-art and near-term available technologies, so there is some program risk involved. This presentation discusses the concept and engineering advances required to make solar sail propulsion an enabling technology. Additional information is contained in the original extended abstract.
Derived from text
Solar Sails; Technology Assessment; Spacecraft Propulsion

20010041288 ANSER Corp., Arlington, VA USA
NIAC Support to Innovation in Outer Planet Exploration
Turner, R. E., ANSER Corp., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 86; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Imagine: A magnetized plasma bubble is riding the solar wind, delivering payloads to the outer planets in months instead of years. Swarms of thousands of thumbnail sized 'mesocopters' are measuring the outgassing of an awakening volcano on Titan. A long-duration, nuclear ramjet-powered unmanned aircraft is navigating the winds of Jupiter. A colony of robotic swimmers are exploring remote oceanic vents under the Europan ice. This vision is derived from a sampling of the many studies in aerospace and aeronautics underway or completed through the auspices of the NASA Institute for Advanced Concepts (NIAC). NIAC was established in 1998 for the explicit purpose of being an independent source of revolutionary aeronautical and space concepts that could dramatically impact how NASA develops and conducts its mission. The institute is to provide a highly visible, recognized and high-level entry point for outside thinkers and researchers. The purpose of the NIAC is to provide an independent, open forum for the external analysis and definition of space and aeronautics advanced concepts to complement the advanced concepts activities conducted within the NASA Enterprises. The NIAC has advanced concepts as its sole focus. It addresses revolutionary concepts, specifically systems and architectures, that can have a major impact on missions of the NASA Enterprises in the time frame of 10 to 40 years in the future. It generates ideas for how the current NASA Agenda can be done better; it expands our vision of future possibilities. NIAC's interest in participating in the Innovations in Outer Planet Exploration Workshop is three-fold: (1) Ensure that NIAC is aware of the innovative research in Outer Planet exploration funded in NASA Centers; (2) Ensure that the appropriate individuals in NASA are aware of relevant NIAC studies; and (3) Communicate to the broader research community that NIAC exists and is funded by name to pursue long range revolutionary research that could impact NASA missions.
Derived from text
Public Relations; Technology Utilization; Research and Development

20010041289 Ball Aerospace and Technologies Corp., SIRTF/IRS Customer Office, Boulder, CO USA
Small Nuclear-powered Hot Air Balloons for the Exploration of the Deep Atmosphere of Uranus and Neptune
Van Cleve, J. E., Ball Aerospace and Technologies Corp., USA; Grillmair, C. J., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 87; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Galileo probe gathered data in the Jovian atmosphere for about one hour before its destruction. For a wider perceptive on the atmospheres of the outer planets, multiple, long-lived observations platforms would be useful. In this paper we examine the basic physics of hot-air ballooning in a hydrogen atmosphere, using plutonium RTGs as a heat source. We find that such balloons are buoyant at a sufficiently great depth in these atmospheres, and derive equations for the balloon radius and mass of plutonium required as a function of atmospheric mass density and balloon material parameters. We solve for the buoyancy depth given the constraint that each probe may contain 1.0 kg of Pu, and find that the temperature at that depth is too great for conventional electronics (>70 C) for Jupiter and Saturn. However, the Pu mass constraint and the operating temperature constraint are consistent for Uranus and Neptune, and this concept may be applicable to those planets. Additional information is contained in the original extended abstract.
Derived from text
Balloons; Planetary Atmospheres; Outer Planets Explorers; Space Exploration; Nuclear Electric Power Generation

20010041290 Department of Energy, Office of Space and Defense Power Systems, Germantown, MD USA

Radioisotope Power Systems for Outer Planet Missions

Wahlquist, E. J., Department of Energy, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 88; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A summary of the Department of Energy's (DOE) capabilities and ongoing program efforts to develop and provide radioisotope power systems to support space exploration missions will be presented. The Office of Nuclear Energy, Science and Technology (DOE/NE) within DOE is responsible for the development, assembly, testing, acceptance, and delivery of radioisotope power systems to the National Aeronautics and Space Administration (NASA). to that end, DOE/NE is maintaining a program and facility infrastructure at various DOE laboratories and production sites ensuring the viability of future missions that will require radioisotope power systems. This infrastructure includes facilities to manufacture key components, process and encapsulate plutonium-238, and assemble, test, and accept the systems. DOE also pursues a low level technology program committed to the continued evolution of energy conversion technologies with applicability to radioisotope power systems. In addition, DOE recently made a decision to pursue re-establishing the domestic capability to produce plutonium-238 as part of DOE's commitment to maintaining the infrastructure necessary to produce and deliver radioisotope power systems. The currently available US inventory of plutonium-238 is sufficient to provide one radioisotope power system of roughly the same power level as each of the three units used on the Cassini spacecraft. Until the domestic production is realized, plutonium-238 requirements can be met through an existing contract with Russia.

Derived from text

Energy Technology; Plutonium 238; Spacecraft Power Supplies

20010041291 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Odyssey Comet Nucleus Orbiter: The Next Step in Cometary Exploration

Weissman, P. R., Jet Propulsion Lab., California Inst. of Tech., USA; Nilsen, E. N., Jet Propulsion Lab., California Inst. of Tech., USA; Smythe, W. D., Jet Propulsion Lab., California Inst. of Tech., USA; Marriott, J., Ball Aerospace and Technologies Corp., USA; Reinert, R., Ball Aerospace and Technologies Corp., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 89; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Cometary nuclei are the most primitive bodies in the solar system, containing a cosmo-chemical record of the primordial solar nebula. Flyby missions to comets, such as those that encountered Comet Halley in 1986, provide a glimpse at this record. However, to study a cometary nucleus in detail requires a rendezvous mission, i.e., a nucleus orbiter. Only an orbiter provides the ability to map the entire nucleus surface at high resolution, to study the complex chemistry in the cometary coma and its variation with time, and to determine the mass and bulk density of the nucleus, key parameters in understanding how small bodies first formed in the solar nebula. A nucleus orbiter also provides the opportunity to sense the nucleus surface in preparation for more ambitious landing and sample return missions in the future. Additional information is contained in the original extended abstract.

Derived from text

Comet Nuclei; Comets; Space Exploration; In Situ Measurement; Space Missions

20010041292 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Micro-Power Sources Enabling Robotic Outpost Based Deep Space Exploration

West, W. C., Jet Propulsion Lab., California Inst. of Tech., USA; Whitacre, J. F., Jet Propulsion Lab., California Inst. of Tech., USA; Ratnakumar, B. V., Jet Propulsion Lab., California Inst. of Tech., USA; Brandon, E. J., Jet Propulsion Lab., California Inst. of Tech., USA; Studor, G. F., NASA Johnson Space Center, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 90; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Robotic outpost based exploration represents a fundamental shift in mission design from conventional, single spacecraft missions towards a distributed risk approach with many miniaturized semi-autonomous robots and sensors. This approach can facilitate wide-area sampling and exploration, and may consist of a web of orbiters, landers, or penetrators. to meet the mass and volume constraints of deep space missions such as the Europa Ocean Science Station, the distributed units must be fully miniaturized to fully leverage the wide-area exploration approach. However, presently there is a dearth of available options for powering these miniaturized sensors and robots. This group is currently examining miniaturized, solid state batteries as candidates to meet the demand of applications requiring low power, mass, and volume micro-power sources. These applications may include

powering microsensors, battery-backing rad-hard CMOS memory and providing momentary chip back-up power. Additional information is contained in the original extended abstract.
Derived from text
Space Exploration; Miniaturization; Microinstrumentation; Spacecraft Power Supplies; Lithium Batteries

20010041293 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
A Highly Miniaturized Inertial Grade Gyroscope for Space Applications
Wiberg, D. V., Jet Propulsion Lab., California Inst. of Tech., USA; Challoner, A. D., Boeing Space Systems, USA; Shcheglov, K., Jet Propulsion Lab., California Inst. of Tech., USA; Hayworth, K., Jet Propulsion Lab., California Inst. of Tech., USA; Bae, S., Jet Propulsion Lab., California Inst. of Tech., USA; Yee, K., Jet Propulsion Lab., California Inst. of Tech., USA; Blaes, B., Jet Propulsion Lab., California Inst. of Tech., USA; DAgostino, S., Jet Propulsion Lab., California Inst. of Tech., USA; Stock, T., Boeing Space Systems, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 91; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The evolution of inertial grade gyroscopes for space applications represents well over 50 years of technology development and an investment of hundreds of millions of dollars. The workhorse product which represents the current state-of-the art for commercially available high performance devices is the Litton-Hemishperical Resonator Gyro (HRG) Inertial Measurement Unit (IMU). This product has a performance figure of merit of 0.003 deg/hr bias drift, a volume of 567 cubic inches, weighs 19 pounds, draws about 30 watts and costs over $1 million each. Clearly devices of this magnitude are not conducive to the minimized mass, volume, power, and cost constraints of outer planet missions. An approach to breaking these potential barriers is the use of Microelectromechanical Systems (MEMS) based inertial devices. Although substantially reduced in size, mass power and cost, this approach has produced devices in the tactical performance range of greater than 1 deg/hour bias drift. This level of performance satisfies the preponderance of high market volume requirements such as automotive and tactical munitions but does not meet the limited market quantity requirements for the high precision space based market. Because of the very limited size of the space based market, there is little economic incentive for commercial fabricators of tactical grade devices to address the necessary performance improvements. The Jet Propulsion Laboratory (JPL) in conjunction with Boeing Space Systems (BSS) is addressing this void to satisfy our mutual requirements in this area. The project objective to is to achieve 0.01 deg/hr performance in an IMU which is less than 10 cubic inches in volume, weighs less than 0.5 pounds, draws less than 1 watt and is available in volume production for less than $2500. Reductions of this magnitude will be mission enabling capabilities for a variety of anticipated outer planet mission attributes such as autonomous control and docking, formation flying and robotic outposts. The improved performance will be realized using improved relative precision fabrication, enhanced vibratory drive and sense designs, and statistical data analysis.
Derived from text
Microelectromechanical Systems; Gyroscopes; Miniaturization; Space Missions

20010041294 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Toward a Micro Gas Chromatograph/Mass Spectrometer (GC/MS) System
Wiberg, D. V., Jet Propulsion Lab., California Inst. of Tech., USA; Eyre, F. B., Jet Propulsion Lab., California Inst. of Tech., USA; Orient, O., Jet Propulsion Lab., California Inst. of Tech., USA; Chutjian, A., Jet Propulsion Lab., California Inst. of Tech., USA; Garkarian, V., Jet Propulsion Lab., California Inst. of Tech., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 92; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Miniature mass filters (e.g., quadrupoles, ion traps) have been the subject of several miniaturization efforts. A project is currently in progress at JPL to develop a miniaturized Gas Chromatograph/Mass Spectrometer (GC/MS) system, incorporating and/or developing miniature system components including turbomolecular pumps, scroll type roughing pump, quadrupole mass filter, gas chromatograph, precision power supply and other electronic components. The preponderance of the system elements will be fabricated using microelectromechanical systems (MEMS) techniques. The quadrupole mass filter will be fabricated using an X-ray lithography technique producing high precision, 5x5 arrays of quadrupoles with pole lengths of about 3 mm and a total volume of 27 cubic mm. The miniature scroll pump will also be fabricated using X-ray lithography producing arrays of scroll stages about 3 mm in diameter. The target detection range for the mass spectrometer is 1 to 300 atomic mass units (AMU) with are solution of 0.5 AMU. This resolution will allow isotopic characterization for geochronology, atmospheric studies and other science efforts dependant on the understanding of isotope ratios of chemical species. This paper will discuss the design approach, the current state-of-the art regarding the system components and the progress toward development of key elements. The full system is anticipated to be small enough in mass, volume and power consumption to allow in situ chemical analysis on highly

miniaturized science craft for geochronology, atmospheric characterization and detection of life experiments applicable to outer planet roadmap missions.
Derived from text
Gas Chromatography; Miniaturization; Microelectromechanical Systems; Mass Spectroscopy

20010041295 Los Alamos National Lab., Space and Atmospheric Sciences Div., NM USA
Elemental Composition Measurements Using Laser-induced Breakdown Spectroscopy (LIBS)
Wiens, R. C., Los Alamos National Lab., USA; Cremers, D. A., Los Alamos National Lab., USA; Nordholt, J. E., Los Alamos National Lab., USA; Blacic, J. D., Los Alamos National Lab., USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 93; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

LIBS is an extremely versatile method of determining elemental compositions. It can be used in situ or at distances to approx. 20 m in vacuum or in an atmosphere. It can be easily combined with other optical techniques such as Raman spectroscopy to deliver elemental, mineralogical, and biological information. It can also be used in LIDAR mode to yield information on atmospheric properties. We will present concepts for standoff, in situ, and combined instrumentation. Additional information is contained in the original extended abstract.
Derived from text
Optical Radar; Spectroscopy; In Situ Measurement; Raman Spectroscopy

20010041296 NASA Ames Research Center, Moffett Field, CA USA
Exploration of Titan Using Vertical Lift Aerial Vehicles
Young, L. A., NASA Ames Research Center, USA; Forum on Innovative Approaches to Outer Planetary Exploration 2001-2020; 2001, pp. 94; In English; See also 20010041202; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Autonomous vertical lift aerial vehicles (such as rotorcraft or powered-lift vehicles) hold considerable potential for supporting planetary science and exploration missions. Vertical lift aerial vehicles would have the following advantages/attributes for planetary exploration: (1) low-speed and low-altitude detailed aerial surveys; (2) remote-site sample return to lander platforms; (3) precision placement of scientific probes; (4) soft landing capability for vehicle reuse (multiple flights) and remote-site monitoring; (5) greater range, speed, and access to hazardous terrain than a surface rover; and (6) greater resolution of surface details than an orbiter or balloons. Exploration of Titan presents an excellent opportunity for the development and usage of such vehicles. Additional information is contained in the original extended abstract.
Derived from text
Vertical Takeoff Aircraft; Space Exploration; Powered Lift Aircraft; Rotary Wing Aircraft

20010041347 Colorado Univ., Program in Atmospheric and Oceanic Science, Boulder, CO USA
The Role of Clouds in the Long-Term Habitability of Planets ***Final Report, 1 Nov. 1998 - 31 Dec. 2000***
Toon, Owen B., Colorado Univ., USA; Tolbert, Margaret, Colorado Univ., USA; [2000]; 2p; In English
Contract(s)/Grant(s): NCC2-5300; No Copyright; Avail: Issuing Activity; Abstract Only

We proposed to conduct theoretical and laboratory investigations of the role that clouds play in the long-term climate history of the Earth and other habitable planets. We made significant progress in the first area we proposed to consider- the properties of carbon dioxide clouds in atmospheres that are rich in carbon dioxide. We submitted a modeling paper on the microphysical properties of the clouds to Icarus showing that such clouds are unlikely to play an important role in the early greenhouses on Earth or Mars. The model was based on lab studies of the nucleation and growth of carbon dioxide. We have also submitted a manuscript describing these lab studies to Icarus. These lab studies are critical not only to the ancient Mars atmosphere, but also to the current one. We also submitted a paper to Nature describing modeling of current Martian CO2 clouds. We will also model the properties of water clouds in the early history of Earth. Early in Earth's history the atmosphere contained no free oxygen. Without oxygen, sulfate aerosols that are currently the dominant cloud nuclei, cannot form. Without such nuclei the cloud structure would have been far different than it is now. We initiated studies of the aerosols on Titan as part of this work. We reported these studies in a short paper on nucleation and in several conferences.
Derived from text
Cloud Physics; Habitability; Clouds (Meteorology); Earth Atmosphere; Planetary Atmospheres

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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.

20010041300 Air Univ., Maxwell AFB, AL USA
The War in the Air 1914-1994, *1914-1999*
Stephens, Alan, Editor, Air Univ., USA; Jan. 2001; 439p; In English
Report No.(s): AD-A387223; ISBN 1-58566-087-6; No Copyright; Avail: CASI; A04, Microfiche; A19, Hardcopy

This book contains the proceedings of a conference held by the Royal Australian Air Force (RAAF) in Canberra in 1994. Since its publication by the RAAF's Air Power Studies Center in that year, the book has become a widely used reference at universities, military academies, and other educational institutions around the world. The application of aerospace power has seen significant developments since 1994, most notably through American-led operations in Central Europe and continuing technological advances with weapons, uninhabited vehicles, space-based systems, and information systems. But notwithstanding those developments and the passing of six years, the value of this anthology of airpower in the twentieth century seems undiminished.
DTIC
Navy; Military Operations; Military Technology; Conferences; Weapon Systems

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