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STAR

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Langley Research Center

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- Domestic and foreign dissertations and theses.

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.

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Table of Contents

Subject Divisions

Document citations are grouped first by the following divisions. Select a division title to view the category-level Table of Contents.

A. Aeronautics
B. Astronautics
C. Chemistry and Materials
D. Engineering
E. Geosciences
F. Life Sciences
G. Mathematical and Computer Sciences
H. Physics
I. Social 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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01 Aeronautics (General) 1

02 Aerodynamics 2

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and 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; and aircraft accidents. For related information, see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 Aircraft Communications and Navigation 6

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information, see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *32 Communications Radar.*

05 Aircraft Design, Testing and Performance 10

Includes aircraft simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Urban Technology and Transportation*.

06 Aircraft Instrumentation 19

Includes cockpit and cabin display devices; and flight instruments. For related information, see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 Aircraft Propulsion and Power 21

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 22

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

09 Research and Support Facilities (Air) 25

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information, see also *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.

12 Astronautics (General) 27

For extraterrestrial exploration, see *91 Lunar and Planetary Exploration*.

13 Astrodynamics 27

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

14 Ground Support Systems and Facilities (Space) 29

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

15 Launch Vehicles and Space Vehicles 30

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information, see also *20 Spacecraft Propulsion and Power.*

16 Space Transportation 31

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

17 Space Communications, Spacecraft Communications, Command and Tracking 35

Includes telemetry; space communication networks; astronavigation and guidance; and radio blackout. For related information, see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

18 Spacecraft Design, Testing and Performance 35

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. 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*.

19 Spacecraft Instrumentation 38

For related information, see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 Spacecraft Propulsion and Power 39

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*, *44 Energy Production and Conversion*, and *15 Launch Vehicles and Space Vehicles*.

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) 40

24 Composite Materials 42

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see *27 Nonmetallic Materials*.

25 Inorganic and Physical Chemistry 43

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also *77 Thermodynamics and Statistical Physics*.

26 Metallic Materials 47

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 Nonmetallic Materials 49

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 56

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

29 Materials Processing N.A.

Includes space-based development of products and processes for commercial application. For biological materials see *55 Space Biology.*

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.

31 Engineering (General) 56

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 Communications and Radar 58

Includes radar; land and global communications; communications theory; and optical communications. 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*.

33 Electronics and Electrical Engineering 73

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 Fluid Mechanics and Heat Transfer 76

Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 Instrumentation and Photography 81

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 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 Lasers and Masers 81

Includes parametric amplifiers. For related information see also *76 Solid-State Physics*.

37 Mechanical Engineering 83

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

38 Quality Assurance and Reliability 85

Includes product sampling procedures and techniques; and quality control.

39 Structural Mechanics 86

Includes structural element design and weight analysis; fatigue; and thermal stress. 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) N.A.

43 Earth Resources and Remote Sensing 88

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography.*

44 Energy Production and Conversion 91

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

45 Environment Pollution 91

Includes atmospheric, noise, thermal, and water pollution.

46 Geophysics 98

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see *93 Space Radiation*.

47 Meteorology and Climatology 101

Includes weather forecasting and modification.

48 Oceanography 104

Includes biological, dynamic, and physical oceanography; 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) 107

52 Aerospace Medicine 110

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

53 Behavioral Sciences 116

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

54 Man/System Technology and Life Support 119

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also *16 Space Transportation.*

55 Space Biology N.A.

Includes exobiology; planetary biology; and extraterrestrial life.

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.

59 Mathematical and Computer Sciences (General) 122

60 Computer Operations and Hardware 123

Includes hardware for computer graphics, firmware, and data processing. For components see *33 Electronics and Electrical Engineering*.

61 Computer Programming and Software 123

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

62 Computer Systems 130

Includes computer networks and special application computer systems.

63 Cybernetics 132

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

64 Numerical Analysis 133

Includes iteration, difference equations, and numerical approximation.

65 Statistics and Probability N.A.

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

66 Systems Analysis 136

Includes mathematical modeling; network analysis; and operations research.

67 Theoretical Mathematics 137

Includes topology and number theory.

Subject Categories of the Division H. Physics

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70 Physics (General) 137

For precision time and time interval (PTTI) see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics*, *90 Astrophysics*, or *92 Solar Physics*.

71 Acoustics 138

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution.*

72 Atomic and Molecular Physics 139

Includes atomic structure, electron properties, and molecular spectra.

73 Nuclear and High-Energy Physics 142

Includes elementary and nuclear particles; and reactor theory. For space radiation see *93 Space Radiation.*

74 Optics 143

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

75 Plasma Physics 146

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

76 Solid-State Physics 147

Includes superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 Thermodynamics and Statistical Physics 156

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

Subject Categories of the Division I. Social Sciences

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80 Social Sciences (General) 157

Includes educational matters.

81 Administration and Management 157

Includes management planning and research.

82 Documentation and Information Science 159

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 162

Includes cost effectiveness studies.

84 Law, Political Science and Space Policy N.A.

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 Urban Technology and Transportation N.A.

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion.*

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.

88 Space Sciences (General) N.A.

89 Astronomy 162

Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 Astrophysics 163

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also *75 Plasma Physics*.

91 Lunar and Planetary Exploration 167

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

92 Solar Physics 174

Includes solar activity, solar flares, solar radiation and sunspots. For related information see also *93 Space Radiation.*

93 Space Radiation 175

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics.*

Subject Categories of the Division K. General

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99 General 175

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

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Typical Report Citation and Abstract

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*

Key

1. Document ID Number; Corporate Source
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3. Author(s) and Affiliation(s)
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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

19980033517 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France
Future Aerospace Technology in the Service of the Alliance, Volume 1, Affordable Combat Aircraft and Plenary Sessions ***Les Technologies Aeronautiques et Spatiales du Futur au Service de L'Alliance Atlantique, Volume 1, Le Cout de Possession des Avions de Combat***
Future Aerospace Technology in the Service of the Alliance; Dec. 1997; 310p; In French; In English; Future Aerospace Technology in the Service of the Alliance, 14-17 Apr. 1997, Palaiseau, France; Also announced as 19980033518 through 19980033540
Report No.(s): AGARD-CP-600-Vol-1; ISBN 92-836-0047-9; Copyright Waived; Avail: CASI; A14, Hardcopy; A03, Microfiche

One of three volumes containing the unclassified papers presented at a conference on "Future Aerospace Technology in the Service of the Alliance" organised by AGARD (NATO's Advisory Group for Aerospace Research and Development) at Palaiseau, near Paris, France, 14-17 April 1997. The conference took the form of three parallel symposia and three plenary sessions. This volume contains the papers from the three plenary sessions: Future Directions in Aerospace Systems Future NATO Trends and Mission Scenarios Human Machine Interaction in the Future and the symposium on "Affordable Combat Aircraft", which had sessions on: Affordability of Procurement, Combat Effectiveness, Affordability of Ownership, The Human Element. Volume 2 contains the papers on "Mission Systems Technologies". Volume 3 contains the papers on "Sustained Hypersonic Flight".
Author
Fighter Aircraft; North Atlantic Treaty Organization (NATO); Combat; Hypersonic Flight; Aerospace Systems

19980033535 Dassault Aviation, Saint-Cloud, France
Reducing Maintenance Costs for Combat Aircraft Air Frames ***La Reduction des Couts de Maintenance des Cellules D'Avions de Combat***
Chaumette, Daniel, Dassault Aviation, France; Armando, Patrick, Delegation Generale de l'Armement, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 12p; Summary translated by Schreiber; In French; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Maintaining a fleet of combat aircraft ready for operational employment for a group of missions with a fixed availability rate according to all evidence requires that all aircraft, during their service life, be subject to maintenance and inspection, or to repair or replacement; all of these activities are essential for flight safety. Different maintenance situations arise as a function of the critical nature and reliability of the systems involved, the scope of operations and their periodicity, as well as the required resources and skills. In this case, maintenance will be of the programmed type, i.e., of the planned type, and/or it will be unprogrammed and will focus on the air frame, the engine, the systems, and the equipment.
Derived from text
Aircraft Maintenance; Cost Reduction; Service Life; Reliability; Fighter Aircraft; Airframes

19980035004 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France
Advances in Flight Testing ***Les Avancees Dans le Domaine des essais en vol***
Dec. 1997; 400p; In French; Flight Vehicle Integration Panel Symposium, 23-26 Sep. 1996, Lisbon, Portugal; Also announced as 19980035005 through 19980035034
Report No.(s): AGARD-CP-593; ISBN 92-836-0050-9; Copyright Waived; Avail: CASI; A17, Hardcopy; A04, Microfiche

The Symposium comprised six sessions, each being devoted to a particular field, with one session on Systems Evaluation, including avionics, navigation, propulsion and weapons aspects, two sessions on Technological Advances covering all technical

fields such as avionics software, simulation, instrumentation, aerodynamics, test methods etc., one session devoted to an Overview of Current Programmes, one session on Flight Dynamics, incorporating handling qualities, performance and flight controls, and one session addressing Management Problems in Testing. The symposium closed with a discussion between government representatives and manufacturers on ”The role of governments in development testing in the 21st century”.
Author
Conferences; Computerized Simulation; Aerodynamics; Avionics

19980035005 Flight Test Squadron (418), DOEAC, Edwards AFB, CA USA
C-17A Avionics Flight Test Program
MacLean, William J., Flight Test Squadron (418), USA; Dublenko, A. Lawrence, Aerospace Engineering Test Establishment, Canada; Advances in Flight Testing; Dec. 1997; 16p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

To date, the C-17A is one of the most advanced military airlift aircraft in the world. The corresponding avionics have reduced the number of crew members in the cockpit from four to two, and at the same time have increased the pilot’s awareness of his aircraft’s capabilities. The DT&E avionics program introduced many challenges to efficiently and adequately test the system to a high level of confidence before releasing the capability to the user. The use of effective test team structure helped to make the test program as efficient as possible, and the many lessons learned were incorporated into the program as testing progressed. As complex as the C-17A avionics suite is, it is a highly capable system with room for growth to increase future capability. In December 1979, the USA Department of Defense launched the Cargo-Experimental (CX) program to define the capabilities needed in a new strategic airlift aircraft. The result was the C-17A Globemaster III which incorporates supercritical airfoil technology and winglets for long-range cruise performance as well as large externally blown flaps, full-span leading edge slats, spoilers, high sink-rate landing gear, anti-skid braking, and thrust reversers for rapid tactical descent and enhanced performance at short airfields. Further, the advanced C-17A integrated avionics suite, which consists of more than 60 remote terminals on nine different MIL-STD1553 busses, enables an aircrew of only two pilots and one loadmaster to carry out the C-17A long range heavy airlift mission. Test mission planning, test conduct, and analysis used both traditional and new test techniques to successfully accomplish the test mission. Lessons learned have been mostly m the realm of test planning and preparation. The sheer number of test points for the entire program (8000 total) and the manner in which testing was divided into aircraft systems contributed to inefficiencies in test flights. The C-17A avionics flight test program introduced many challenges to efficiently and adequately test a complex integrated avionics system to a high level of confidence before releasing capability to the user. The use of an effective test team structure and test planning helped to make the test program as efficient as possible, with many lessons learned being incorporated into the program as testing progressed. As complex as the C-17A avionics suite is, it is a highly capable system with room for growth to increase future capability.
Author
Flight Tests; Test Facilities; Mission Planning; Leading Edge Slats; Landing Gear; Flight Crews; Antiskid Devices; Airfoils

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.

19980030782 NASA Langley Research Center, Hampton, VA USA
Mars Pathfider Rarefied Aerodynamics: Computations and Measurements
Moss, James N., NASA Langley Research Center, USA; Blanchard, Robert C., NASA Langley Research Center, USA; Wilmoth, Richard G., NASA Langley Research Center, USA; Braun, Robert D., NASA Langley Research Center, USA; 1998; 20p; In English; 36th; Aerospace Science Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-1998-207312; NAS 1.15:207312; AIAA Paper 98-0298; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On July 4, 1997, after traveling close to 500 million km, the Pathfinder spacecraft successfully completed entry, descent, and landing at Mars. In the present paper, the focus is on the hypersonic rarefied portion of Pathfinder’s atmospheric entry where the synergy of flight measurements, aerodynamic calculations, and atmospheric modeling tools are used to extract Pathfinder’s attitude and the freestream density. Accuracy of the capsule aerodynamics directly impacts the inferred atmospheric properties extracted from deceleration measurements made by on-board accelerometers. The range of rarefaction considered in this study

extends from the free molecular to continuum conditions and angles of attack from O to 30 deg. The aerodynamic computations are made with free-molecular and direct simulation Monte Carlo codes. The calculations show that Pathfinder is statically unstable for much of the transitional rarefied regime. Due to the relatively modest forces and the gyroscopic motion of the spacecraft, the angle of attack excursions were less than 5 deg as inferred from force measurements for the rarefied portion of entry and approached a nominal zero degree trim angle near hypersonic continuum conditions.
Author
Mars Landing; Measuring Instruments; Spacecraft Motion; Meteorological Parameters; Computerized Simulation; Atmospheric Chemistry

19980032586 NASA Ames Research Center, Moffett Field, CA USA
Reduction of Helicopter Blade-Vortex Interaction Noise by Active Rotor Control Technology
Yu, Yung H., NASA Ames Research Center, USA; Gmelin, Bernd, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Splettstoesser, Wolf, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Brooks, Thomas F., NASA Langley Research Center, USA; Philippe, Jean J., Office National d'Etudes et de Recherches Aerospatiales, France; Prieur, Jean, Office National d'Etudes et de Recherches Aerospatiales, France; Progress in Aerospace Sciences; 1997; ISSN 0376-0421; Volume 33, pp. 647-687; In English
Report No.(s): NASA/TM-97-207568; NAS 1.15:207568; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Helicopter blade-vortex interaction noise is one of the most severe noise sources and is very important both in community annoyance and military detection. Research over the decades has substantially improved basic physical understanding of the mechanisms generating rotor blade-vortex interaction noise and also of controlling techniques, particularly using active rotor control technology. This paper reviews active rotor control techniques currently available for rotor blade vortex interaction noise reduction, including higher harmonic pitch control, individual blade control, and on-blade control technologies. Basic physical mechanisms of each active control technique are reviewed in terms of noise reduction mechanism and controlling aerodynamic or structural parameters of a blade. Active rotor control techniques using smart structures/materials are discussed, including distributed smart actuators to induce local torsional or flapping deformations, Published by Elsevier Science Ltd.
Author
Active Control; Blade-Vortex Interaction; Control Systems Design; Smart Structures; Structural Design; Helicopters; Aircraft Noise; Harmonic Control

19980035021 Wright Lab., FFI, Wright-Patterson AFB, OH USA
Forebody vortex control
Walchli, Lawrence A., Wright Lab., USA; Moorhouse, David J., Wright Lab., USA; Advances in Flight Testing; Dec. 1997; 18p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche
Much attention has been focussed in recent years on tactical maneuvering in post-stall flight. Such programs as the X31, VISTA/MATV, and the X-29A have established that tactical supermaneuverability at very high Angles of Attack (AOA) is a potent offensive weapon provided that the adversary can be enticed into close-in combat. Never before have requirements for integrating the pilot and aircraft been so important. The aircraft must have robust control authority in all axes, plenty of excess thrust, and pilot-friendly controls which allow him to fly to the limits of both his and the aircraft capability. Modern fighter aircraft operating above about 25 deg. AOA encounter a destabilizing phenomena caused by the complex three-dimensional separated vortical flowfield surrounding it. It is in this same region of flight that the aircraft wings and fuselage begin blanking the rudder, resulting in both degraded directional stability and control authority. Hence, two requirements emerge; increase directional stability and increase directional control authority. Thrust vectoring has been demonstrated as a means to increase control authority at all angles of attack. A potential way to increase directional stability could be by controlling the forebody vortex flow. The primary object of this paper is to document an attempt to increase the directional stability of an F16 aircraft at all angles of attack into the post-stall regime. A wind tunnel test program had previously shown beneficial effects of forebody chines; additional testing provided stability and control data to support a flight test program. Flight tests were conducted with and without chines as a small adjunct to a program investigating thrust vectoring to very high angles of attack, the F-16 VISTA/MATV program. Specific maneuvers up to C(sub Lmax) (and beyond) were assessed to determine the major effects of forebody chines, although parameter identification was not an objective of the program. This paper describes the results of this effort.
Author
Vortices; Maneuvers; Angle of Attack; Fighter Aircraft; Forebodies; Parameter Identification

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.

19980024029 NERAC, Inc., Tolland, CT USA
Parachutes. (Latest citations from the US Patent Bibliographic File with Exemplary Claims)
Jan. 1998; In English; Page count unavailable.
Report No.(s): PB98-851850; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning design, fabrication, and testing of parachutes and decelerating devices that use aerodynamic drag. Designs for the canopy, shrouds, and hardware, and operating components, including canopy opening, actuators, staging, reefing, maneuvering, and separation and release mechanisms, are reviewed. Applications include deployment from aircraft for escape or air drop missions, aerial delivery of equipment and munitions, and recovery of drones. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Parachutes; Bibliographies; Design; Fabrication; Performance Tests

19980024241 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA
Aviation Safety: Efforts to Implement Flight Operational Quality Assurance Programs. Report to Congressional Requesters
Dec. 1997; 41p; In English
Report No.(s): AD-A334086; GAO/RCED-98-10; B-275990; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The analysis of aircraft data recorded during flight has played a crucial role in determining the causes of crashes. Recently, however, some U.S. airlines have begun to analyze flight data from uneventful airline flights to identify potential problems and correct them before they lead to accidents. GAO was asked examine efforts by the Federal Aviation Administration (FAA) and U.S. airlines to implement Flight Operational Quality Assurance (FOQA) programs. The objective of a FOQA program is to use flight data to detect technical flaws, unsafe practices, or conditions outside of desired operating procedures early enough to allow timely intervention to avert accidents or incidents. These programs are voluntary efforts by airlines that involve equiping aircraft with specialized devices to continuously record up to hundreds of different flight data parameters from aircraft systems and sensors, analyzing the data, identifying trends, and taking action to correct potential problems. The analysis of flight data allows airlines to reconstruct entire flights on the basis of the values over time of flight data parameters, such as heading, altitude, throttle settings, ground speed, and many others. Currently, about 33 foreign airlines and 4 U.S. airlines - United, U.S. Airways, Continental, and Alaska - have implemented FOQA or FOQA-type programs. You requested that we determine (1) how FOQA programs will enhance aviation safety, (2) the costs and benefits of such programs, and (3) the factors that could impede their full implementation and actions that could be taken to overcome any impediments.
DTIC
Aircraft Safety; Airline Operations; Commercial Aircraft; Flight Safety; Quality Control

19980027067 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA
Report to the Honorable Collin C. Peterson, House of Representatives. Aviation Safety: FAA Generally Agrees with but is Slow in Implementing Safety Recommendations
Sep. 1996; 62p; In English
Report No.(s): B-261918; GAO/RCED-96-193; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

FAA generally concurred with the recommendations made by GAO, NTSB, and DOT's Inspector General and had implemented the majority (64 percent) of them as of October 1995. However, FAA met the established implementation time frames only about one-third of the time for GAO's and the DOT Inspector General's recommendations. GAO could not readily measure FAA's on-time performance for NTSB's recommendations because FAA had not included in most of its initial responses to mB the estimated time frames for implementing most of MB's recommendations that GAO reviewed. While FAA's initial responses to NTSB's and the DOT Inspector General's recommendations were almost always made within the required time frames, FAA never met the statutory time frames for responding to the congressional committees on GAO's recommendations included in this review, nor did it establish the required completion dates for some of GAO's and the majority of NTSB's recommendations included in this review. Delays in initially responding to recommendations may slow FAA's progress in taking actions to resolve the issues that led to the recommendations, and without estimated completion dates, there are no milestones against which imple-

mentation progress can be measured. For the 18 specific recommendations on which GAO conducted detailed field work, FAA has taken actions on or had actions in process on 17 of them to improve its aircraft certification process, its airline inspections, its oversight of foreign carriers, and the safety of airport runways. However, GAO found that the status shown in the tracldng systems for some of NTSB'S recommendations did not reflect the actual status of on-the-ground actions. Of the seven recommendations by MB that GAO reviewed in the field, five were listed in the tracking systems as closed (i.e., implemented by FAA). But GAO found that for four of these five recommendations, actions remained to be completed, primarily by affected airports, to fully resolve the problems that gave rise to the recommendations.
Derived from text
Aircraft Safety; Flight Safety; Certification; Runways; Airline Operations

19980032580 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Briefing Report to the Honorable Ike Skelton, Ranking Minority Member, Committee on National Security, House of Representatives. Military Aircraft Safety: Serious Accidents Remain at Historically Low Levels
Mar. 1998; 14p; In English
Report No.(s): B-279205; GAO/NSIAD-98-95BR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flight mishaps involve any reportable damage to an aircraft that is preparing to fly, in flight, or completing a landing. Flight mishaps are classified by DOD according to the severity of resulting injury or property damage. Class A mishaps involve damage of $1 million or more, a destroyed aircraft, or a fatality or permanent total disability. The remaining classes of mishaps are distinguished primarily by their loss value and severity of injury: Class B accidents involve damage ranging from $200,000 to less than $1 million, permanent partial disability, or inpatient hospitalization of five or more people; Class C accidents involve damage ranging from $10,000 to less than $200,000 or a lost-time injury; and Class D accidents involve damage of less than $10,000. Our review focused on Class A flight mishaps only. DOD requires that all mishaps be investigated so that causes can be identified and corrective actions taken to prevent future occurrences. Service safety centers play a key role in maintaining aviation mishap statistics, establishing safety policies, disseminating safety information, reviewing mishap investigation reports.
Author
Aircraft Safety; Congressional Reports; Information Dissemination; Flight Safety

19980032592 NASA Langley Research Center, Hampton, VA USA
Flight Demonstration of Integrated Airport Surface Technologies for Increased Capacity and Safety
Jones, Denise R., NASA Langley Research Center, USA; Young, Steven D., NASA Langley Research Center, USA; Wills, Robert W., NASA Langley Research Center, USA; Smith, Kathryn A., NASA Langley Research Center, USA; Shipman, Floyd S., NASA Langley Research Center, USA; Bryant, Wayne H., NASA Langley Research Center, USA; Eckhardt, Dave E., Jr., NASA Langley Research Center, USA; Feb. 1998; 30p; In English
Contract(s)/Grant(s): RTOP 538-04-13-02
Report No.(s): NASA/TM-1998-206930; NAS 1.15:206930; L-17654; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A flight demonstration was conducted to address airport surface movement area capacity and safety issues by providing pilots with enhanced situational awareness information. The demonstration presented an integration of several technologies to government and industry representatives. These technologies consisted of an electronic moving map display in the cockpit, a Differential Global Positioning system (DGPS) receiver, a high speed very high frequency (VHF) data link, an Airport Surface Detection Equipment (ASDE-3) radar, and the Airport Movement Area Safety System (AMASS). Aircraft identification was presented to an air traffic controller on an AMASS display. The onboard electronic map included the display of taxi routes, hold instructions, and clearances, which were sent to the aircraft via data link by the controller. The map also displayed the positions of other traffic and warning information, which were sent to the aircraft automatically from the ASDE-3/AMASS system. This paper describes the flight demonstration in detail, along with test results.
Author
Flight Tests; Data Links; Global Positioning System; Airports; Systems Integration; Man Machine Systems

19980033537 Defence and Civil Inst. of Environmental Medicine, North York, Ontario Canada
Surviving a Helicopter Ditching: An Engineering challenge
Brooks, C. J., Defence and Civil Inst. of Environmental Medicine, Canada; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 8p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The audience today is primarily engineers, and the first objective is to convince them that flying a helicopter over water is more dangerous than flying a fixed wing aircraft over water. The evidence for this was first reported in 1984 by the UK Civil Aviation Authority (CAA) in the HARP Report (16). It concluded that the accident rate for helicopters operating over the North Sea was 2.0 per 100,000 flying hours compared to 0.4 for fixed wing aircraft. A subsequent review of accident data by the CAA (17) in 1995 reported that ”In the 18 years from 1976 to 1993, the offshore industry has generated 2.2 million helicopter operating hours in the transportation of 38 million passenger for the loss of 85 lives in eight fatal accidents. This represented a fatality rate of 3.86 per 100,000 flying hours.”
Derived from text
Helicopters; Aircraft Configurations; Aircraft Accidents; Helicopter Control; Losses; Civil Aviation

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 17 Space Communications, Spacecraft Communications, Command and Tracking and 32 Communications and Radar.

19980024026 Michigan Univ., Transportation Research Inst, Ann Arbor, MI USA
On-the-Road Human Factors Evaluation of the Ali-Scout Navigation System, ***Oct. 1994 - Mar. 1997***
Katz, S., Michigan Univ., USA; Fleming, J., Michigan Univ., USA; Green, P., Michigan Univ., USA; Hunter, D., Michigan Univ., USA; Damouth, D., Michigan Univ., USA; Mar. 1997; 270p; In Malay-Indonesian
Report No.(s): PB98-119084; UMTRI-96-32; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche
Two experiments examined the safety and usability of the Seimens Ali-Scout navigation system. The in-vehicle interface provides turn-by-turn visual and voice guidance. In the first experiment, 54 drivers varying in age drove to four destinations, twice using the Ali-Scout and once using experimenter verbal guidance. Subjects were tested in the afternoon, at rush hour, and in the evening. In the supplemental experiment, eye fixation data at night for the Ali-Scout was collected for 10 drivers. An additional three drivers used the PathMaster. There were no crashes, near misses, or critical incidents associated with the PathMaster. In contrast to the first experiment, measures of lateral control (lane position) were most sensitive to experimental differences.
NTIS
Navigation Aids; Roads; Safety Factors; Lateral Control; Human Performance; Human Factors Engineering

19980029709 Civil Aeromedical Inst., Oklahoma City, OK USA
Cockpit Integration of GPS: Initial Assessment-Menu Formats and Procedures ***Final Report***
Wreggit, Steven S., Civil Aeromedical Inst., USA; Marsh, Delbert K., II, Civil Aeromedical Inst., USA; Mar. 1998; 30p; In English
Report No.(s): DOT/FAA/AM-98/9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A popular portable Global Positioning System (GPS) unit (Megellan EC-10X), representative of this class of devices, was examined for its usability by general aviation pilots. Nine private pilots participated in the experimentation, which was accomplished in three phases: familiarization and training, usability testing, and post-experiment debriefing. During familiarization and training, participants were asked to study flow diagrams representing GPS interface logic, observed a demonstration of the unit’s features and procedures, and then were allowed to practice with the unit until they could demonstrate proficiency. During the usability testing phase, participants performed 37 GPS-related tasks requiring waypoint setting, GPS navigation, and general GPS-data entry and retrieval. Findings from videotape, questionnaire, and debriefing data indicated that a number of menu structures interfered with the pilots’ successful entry of data, editing of stored data, and activation of functions. For example, one source of confusion resulting in excess button presses was the need to deactivate the flight plan before any editing could be done. Recommendations are made for defining the form of the interface structure in this class of devices, including: A given function should be consistently assigned to one button, feedback should be consistent and meaningful, and an ”undo” or ”back” function would be a very useful way to decrease the number of button presses required by this interface.
Author
Global Positioning System; Cockpits; Flight Plans; Data Retrieval; General Aviation Aircraft

19980033148 Colorado Univ., Colorado Center for Astrodynamic Research, Boulder, CO USA

GPS Based Attitude Determination for Spinning Satellites ***Final Report, 1 Sep. 1994 - 30 Jun. 1997***

Axeirad, Penina, Colorado Univ., USA; Behre, Charles P., Colorado Univ., USA; Dec. 10, 1997; 164p; In English

Contract(s)/Grant(s): N00014-94-I-1158

Report No.(s): AD-A334738; PA-97-060; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report describes the research performed by the Colorado Center for Astrodynamics Research (CCAR) under an AASERT Grant to study Global Positioning System (GPS) based attitude determination for spinning satellite. Two key contributions are discussed- phase-based methods for estimation of the spin axis of a spinning satellite. and signal noise ratio (SNR) based methods for estimation of one or more spacecraft axes. The latter method, which is very robust and widely applicable, is demonstrated on actual flight data from three NASA missions. It provides instantaneous pointing knowledge at the 310 degree level with a single GPS antenna and is useful for attitude initialization, verification, GPS phase ambiguity resolution, and a reliable backup attitude determination sensor.

DTIC

Astrodynamics; Attitude (Inclination); Global Positioning System

19980035006 Centre d'Essais en Vol, Base d'Essais d'Istres, Istres, France

SYTRAM (Systeme de Trajectographie Multimobile): A New Guidance Method for Test of MultiTarget Airplanes ***SYTRAM (SYsteme de TRajectographie Multimobile): Une Nouvelle Methode de Guidage des Avions Pour les Essais Multi-Cibles***

DeMalleray, E., Centre d'Essais en Vol, France; Advances in Flight Testing; Dec. 1997; 16p; In French; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

SYTRAM has been developed based on a need by CEV (Centre d'Essais en Vol) to have an autonomous and precise guidance system for multi target testing. The multi target tests often require the development of precise scenarios that are difficult and even impossible without a high quality and continuous guidance system. Until now, these tests have been conducted with the assistance of guidance systems on the ground, transmitting their orders via radio. They can only follow one airplane with precision, and up to a maximum of 4 airplanes. Beyond that, several guiding systems would be necessary, but the radio would be saturated. SYTRAM is an ascending and descending liaison. The ascending liaison (60 KBIT/sec) of the system SYTRAM allows the conception of a function, named "Autonomous Guidance" which will produce guidance information to the equipment being tested, for autonomous installation, i.e. without the use of radiotelegraphy. Four guidance interfaces have been developed, the HUD, the HDD, and the Classic and Audio Instrumentations. The guidance law, common to all interfaces, was completed in the simulator in 3 weeks. In flight tests started with 3 flights on the ABE Mystere XX. The goal of these tests was to confirm the feasibility of the autonomous guidance function. The interface HDD was chosen for the tests but the capacity to modify the coefficients of the law of in-flight navigation was preserved. Finally, the application of the HDD symbology is under development on a liquid crystal screen.

Author

Flight Tests; Autonomy; Navigation

19980035007 Instituto Superior Tecnico, Lisbon, Portugal

European Flight Experiments on 4-Dimensional Approach and Landing with the CASA 212 Aviocar Aircraft

Azinheira, J. R. C., Instituto Superior Tecnico, Portugal; Fonseca, A. A., Instituto Superior Tecnico, Portugal; Avello, C. Garcia, European Organization for the Safety of Air Navigation, Belgium; Swierstra, S., European Organization for the Safety of Air Navigation, Belgium; Advances in Flight Testing; Dec. 1997; 10p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Over the years a continuing increase in demand for air travel was observed that always surpassed the highest estimates. The capacity limit of the major airports constitutes one of the bottlenecks in the expansion of air transport. In order to maintain a competitive edge, air carriers use aircraft types that offer optimum economy on the routes they fly. In a typical hub operation, this results in a mixture of jet, turbo-prop and prop aircraft, each with a different operational speed range. Today for the main airports, the runway constitutes a major bottleneck. Accordingly the optimisation of the capacity of an airport becomes a very complex task when the stream of inbound aircraft consists of a mixture of aircraft types. The introduction of automated tools to enhance the efficiency of the air traffic controllers is one of the targets of the EATCHIP programme to improve the overall quality of the air traffic control services provided . Research programmes have led to the development of such tools, in particular to assist the air traffic controllers with the problem of optimum Arrivals Management. Meanwhile these tools have been tested and initially validated in simulation environments. The requirement existed to test and demonstrate algorithms developed using a real aircraft, initially in an isolated, well-controlled flight environment. This has led the EUROCONTROL Agency (EHQ, Brussels) and the

Instituto Superior Tecnico (IST, Lisbon) to organize in close co-operation with Aeroportos e Navegacao Aerea (ANA, Lisbon) and Montijo) a live exercise to investigate the feasibility and performance of such a tool. This report describes the flight trials and some of the conclusions drawn. The references at the end of this text give a detail explanation of the different components that were used to perform these trials.
Author
Air Transportation; Airports; Air Traffic Control; Flight Control

19980035009 Technische Univ., Inst. of Flight Guidance, Brunswick, Germany
Ensuring the GNSS Onboard Integrity Function Under Adverse Conditions: Feasibility and Flight Test Results
Butzmuehlen, Carsten, Technische Univ., Germany; Dec. 1997; 10p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

With an increasing system and technology performance of satellite navigation components, the Global Navigation Satellite Systems (GNSS) conquer more and more fields of military and civil applications. Due to the undisputed high level of accuracy and its marginal needs of terrestrial infrastructure, satellite navigation is in principle the most suitable candidate for positioning tasks under adverse environments where conventional radio navigation aids fail. Considering this background, the Institute of Flight Guidance and Control participated recently in a flight test program in Lugano, Switzerland supported by the Swiss Federal Office of Aviation (FOCA). Flight tests were performed under highly dynamic and adverse conditions with the additional use of low-cost inertial information. The landscape in which these test were realized leads to the risk of extensive shadowing of the space vehicles, thus increasing the probability that the GNSS is not available in order to compute a position solution. Additionally, the mountains provide a reflecting surface of the radio frequency signals. Hence, the possibility of multipath reception is given here as well. This paper deals with the current means that are used to achieve the accuracy and the integrity that is necessary for high-precision and safety-critical procedures. The methods are discussed briefly and flight test results are presented.
Author
Feasibility; Flight Tests; Data Acquisition; Navigation Satellites; Navigation Aids

19980035018 National Research Council of Canada, Research Test Pilot, Ottawa, Ontario Canada
Performance and Guidance System Testing Using Differential GPS on a Falcon 20 Aircraft
Croll, John B., National Research Council of Canada, Canada; Advances in Flight Testing; Dec. 1997; 8p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Using a Falcon 20 research aircraft, a program was conducted at the Canadian National Research Council (CNRC) to investigate the use of a differential Global Positioning System (GPS) to: (1) provide aircraft guidance on precision instrument approaches, and (2) measure aircraft performance parameters during typical flight test manoeuvres needed for aircraft certification. The initial series of tests used a differential GPS with NovAtel 95 IR receivers installed in the aircraft and at the ground station, and with a VHF radio link to provide real-time differential corrections. This system fell slightly short of the vertical accuracy criteria needed for precision approaches to Category I limits, and did not meet the accuracy criteria desired for flight test measurement. Following an upgrade to a NovAtel RT-20(trademark) differential GPS, a program was conducted to determine the landing performance of the Falcon 20 on winter contaminated runways (covered with ice or snow). The real-time position and height accuracies of the upgraded system were determined to be less than 20 centimeters, falling well within the accuracy criteria for Category I approaches, and enabling this system to be used as the primary device for measuring aircraft landing distances from a height of 50 feet (15 meters) to a complete stop. During this program, a strong correlation was found between aircraft deceleration during full braking and the runway friction index reported by a ground test vehicle, allowing the aircraft landing distance to be accurately predicted as a function of the runway friction index.
Author
Aircraft Guidance; Aircraft Performance; Certification; Correction; Flight Tests; Ground Tests; Instrument Approach

19980035019 Technische Univ., Inst. of Flight Mechanics and Flight Control, Munich, Germany
Precision Navigation and Synthetic Vision for Poor Visibility Guidance
Sachs, G., Technische Univ., Germany; Dobler, K., Technische Univ., Germany; Schaenzer, G., Technische Univ., Germany; Dieroff, M., Technische Univ., Germany; Dec. 1997; 12p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Computer generated synthetic vision is considered as a means for providing guidance in poor visibility conditions. The synthetic vision comprises as basic elements a 3-dimensional image of the outside world and integrated guidance information like a tunnel display. A precision navigation system is applied which couples differential satellite and inertial sensor data to achieve the required high performance. A flight test program was conceived to cover a wide range of synthetic vision guidance applications

(precision approach and landing, low level flight in narrow river valley, curved/steep/short approaches and terrain following in mountainous areas). Four test series at different areas were conducted. The results of the flight test program show that the synthetic vision enables the pilot to precisely control the aircraft. He successfully performed the flight tasks.
Author
Visual Control; Navigation; Precision; Flight Tests; Display Devices

19980035020 National Research Council of Canada, Flight Research Lab., Ottawa, Ontario Canada
Validation of the Simultaneous Calibration of Aircraft Position Error and Airflow Angles Using a Differential GPS Technique on a Helicopter
Hui, Kenneth, National Research Council of Canada, Canada; Baillie, Stewart, National Research Council of Canada, Canada; Dec. 1997; 8p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper describes the validation of a technique for the simultaneous determination of pitot-static position error and the calibration curves for angle of attack and sideslip sensors. The Simultaneous Calibration of AirData system (SCADS) technique involves flying the aircraft in a 'wind box' pattern while recording a suite of standard flight test parameters and Differential Global Positioning System (DGPS) measurements. This simultaneous calibration technique combines the calibration procedure for both position error and airflow angle calibration, and eliminates the need for flying close to the ground during the tests. During the development of this technique using the NRC Falcon 20 aircraft, the results demonstrated that accurate calibrations could be obtained with reduced flight time and cost over conventional calibration techniques. The present paper describes the application of the SCADS technique to the NRC Bell 206B helicopter. The calibration results are presented and are compared with data from other standard calibration methods and verified with manoeuvres not used in the model development. The results from using the SCADS technique have demonstrated better efficiency and accuracy.
Author
Calibrating; Position Errors; Angle of Attack; Bell Aircraft; Proving

19980036302 Defence Research Establishment Ottawa, Ottawa, Ontario Canada
Measurements of Multipath and Its Effects on Terrestrial VHF Radio Direction Finding
Read, William J., Defence Research Establishment Ottawa, Canada; Dec. 1997; 88p; In English
Report No.(s): AD-A335551; DREO-1325; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report details the investigation of VHF radio direction finding (DF) and the effects of multipath propagation for terrestrial paths. For this investigation, an eight channel DF system was used to make field measurements of a transmitter as it was slowly moved along a designated route. This allowed the fine scale effects of multipath on the measured signal bearing and power to be observed - effects which had been previously observed as being noise like in nature. Computer modeling was also used in order to develop simulations able to reproduce the effects observed in the field measurements. This has lead to the identification of the main sources of multipath, and a statistical assessment of their numbers and distribution. The computer models also allowed other factors affecting DF accuracy to be investigated which include: the transmitter receiver path length, the size of the clearing at the DF site, the DF antenna height, and the DF algorithm. The main conclusions are that multipath is a major impediment to very high accuracy DF for terrestrial VHF DF systems, but that steps can be taken to mitigate its effects.
DTIC
Direction Finding; Multipath Transmission; Very High Frequencies

19980036369 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
User Location Determination Strategy in a Low Earth Orbit Satellite Network
Lee, Jaehee, Air Force Inst. of Tech., USA; Dec. 1997; 80p; In English
Report No.(s): AD-A335745; AFIT/GCS/ENG/97D-06; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Recently, many Low Earth Orbit (LEO) satellite systems have been proposed for the purpose of global communication and one of those systems is planned to start the commercial service in 1998. These LEO satellite systems are providing most of current communication services (voice, fax, data, paging, and even real time video service) without any limitation on place and time. However, little is published about their detail system methodology on user tracking and managing schemes. This thesis presents two user location tracking algorithms in a LEO environment. One (Gateway Approach) is the most likely approach under present system proposals, while the other (Satellite Approach) requires more risk in implementing the proposed scheme. These two approaches are compared via computer simulation in an Iridium-like satellite network system environment. Comparative measures of call setup delay and number of hops needed to establish initial call request are examined, and minimum requirements for the Satellite Approach are discussed. It is concluded that the Satellite Approach performs better than the Gateway Approach when the memory space and computational ability of each satellite can satisfy the minimum conditions discussed in this paper. Also,

the Satellite Approach experienced well balanced message distribution than the Gateway Approach. Moreover, as far as system survivability and service continuity, the Satellite Approach showed more advantageous factors than the Gateway Approach.
DTIC
Low Earth Orbits; Satellite Networks; Satellite Communication; Computerized Simulation; Earth Orbital Environments; Telecommunication

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Urban Technology and Transportation.

19980025468 NASA Langley Research Center, Hampton, VA USA
Engineering Aerothermal Analysis for X-34 Thermal Protection System Design
Wurster, Kathryn E., NASA Langley Research Center, USA; Riley, Christopher J., NASA Langley Research Center, USA; Zoby, E. Vincent, NASA Langley Research Center, USA; 1998; 22p; In English; 36th; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-1998-207439; NAS 1.15:207439; AIAA Paper 98-0882; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Design of the thermal protection system for any hypersonic flight vehicle requires determination of both the peak temperatures over the surface and the heating-rate history along the flight profile. In this paper, the process used to generate the aerothermal environments required for the X-34 Testbed Technology Demonstrator thermal protection system design is described as it has evolved from a relatively simplistic approach based on engineering methods applied to critical areas to one of detailed analyses over the entire vehicle. A brief description of the trajectory development leading to the selection of the thermal protection system design trajectory is included. Comparisons of engineering heating predictions with wind-tunnel test data and with results obtained using a Navier-Stokes flowfield code and an inviscid/boundary layer method are shown. Good agreement is demonstrated among all these methods for both the ground-test condition and the peak heating flight condition. Finally, the detailed analysis using engineering methods to interpolate the surface-heating-rate results from the inviscid/boundary layer method to predict the required thermal environments is described and results presented.
Author
Aerothermodynamics; Thermal Protection; Computational Fluid Dynamics; Wind Tunnel Tests; Flow Distribution; X-34 Reusable Launch Vehicle; Navier-Stokes Equation

19980025558 Naval Postgraduate School, Monterey, CA USA
Structural Design Analysis of the Tail Landing Gear Bay and the Vertical/Horizontal Stabilizers of the RAH-66 Comanche Helicopter
Shoop, Brian P., Naval Postgraduate School, USA; Sep. 1997; 80p; In English
Report No.(s): AD-A333345; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The RAH-66 Comanche's stealth design requires the use of radar-absorbing material (RAM) on the outer skin of the aircraft. The reduced stiffness properties of RAM produce insufficient tail torsional stiffness, necessitating the use of non-radar-absorbing graphite on the outer skin of the tail section. This thesis investigates structural design modifications to increase the tail section's stiffness to allow the use of RAM on the outer skin and still meet all structural requirements. An original model represents the prototype aircraft at first flight. The goal is to create a model using RAM on the outer skin that watches the structural stiffness of the original model. This thesis builds on earlier work conducted at the Naval Postgraduate School (NPS). Two new design modifications to the tailbone are developed. The best modification increases the torsional stiffness of a baseline model by six percent. Integrating earlier NPS modifications increases torsional stiffness by 12 percent. When RAM is applied to the outer skin of the modified model, torsional stiffness is reduced by only six percent from the baseline as compared to a 2 4 percent reduction with no modifications. Additional modifications to the vertical and horizontal stabilizers further increase structural stiffness and reduce weight.
DTIC
Aircraft Models; Design Analysis; Helicopters; Landing Gear; Structural Design; Weight Reduction

19980025562 Naval Postgraduate School, Monterey, CA USA

Development, Correlation and Updating of a Finite Element Model of the OH-6A Helicopter

Pampalone, Michael R., Naval Postgraduate School, USA; Dec. 1996; 111p; In English

Report No.(s): AD-A333338; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis is part of the helicopter research program established at The Naval Postgraduate School (NPS). NPS currently has two OH-6A light observation helicopters which were obtained from the U.S. Army. One of these is dedicated to ground vibration testing and dynamics research. Previous research on the OH-6A at NPS established baseline vibration test data. The data includes natural frequencies, principal mode shapes and damping characteristics. This thesis continues previous research of the OH-6A and develops a detailed finite element model to be used in future helicopter dynamics research at NPS. The model is based on an MSC/NASTRAN finite element model of a similar aircraft obtained from the McDonnell Douglas Helicopter Company. Both the nose and empennage were modified to represent the structural characteristics of the test article. Due to lack of structural design data, model mass updating was performed using previously obtained test data and a design sensitivity approach. The updated model natural frequencies agree well with the test data.

DTIC

Finite Element Method; Helicopters; Vibration Tests; Resonant Frequencies

19980026085 Royal Melbourne Inst. of Tech., Sir Lawrence Wackett Centre for Aerospace Design Technology, Australia

GFRP Glider Fatigue Project *Final Report*

Patching, C. Alan, Royal Melbourne Inst. of Tech., Australia; Loh, Anne, Royal Melbourne Inst. of Tech., Australia; Nov. 1996; 112p; In English

Report No.(s): TR-96/04; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The glider project commenced in 1978 with the acquisition of a Janus B sailplane for the measurement of in flight loads. When it became obvious that it's certified service life of 3000 hours could be reached in only three years by gliders in Australia, a major investigation into the fatigue life of Glass Fibre Reinforced Plastic (GFRP) structures was commenced. The project was jointly funded by the Civil Aviation Safety Authority (CASA), Gliding federation of Australia (GFA), and Royal Melbourne Institute of Technology (RMIT). The DSTO Aeronautical and Maritime Research Laboratory (AMRL) provided considerable technical support. This report describes the acquisition of data for service loadings, fatigue testing of a complete Janus wing including repairs made before and during test, and vibration mode measurements. The results obtained during the wing test are summarized, and showed that when testing ceased at almost 36000 hours the only fatigue critical areas identified were regions of high load transfer in the starboard root rib.

Author

Gliders; Fatigue Tests; Aircraft Safety; Fatigue Life; Wings; Data Acquisition; Aerodynamic Loads; Vibration Mode

19980027034 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia

Comparison of Analytical Crack Growth Modelling and the A-4 Wing Test Experimental Results for a Fatigue Crack in an F-111 Wing Pivot Fitting Fuel Flow Hole Number 58

Murtagh, B. J., Defence Science and Technology Organisation, Australia; Walker, K. F., Defence Science and Technology Organisation, Australia; Sep. 1997; 27p; In English

Report No.(s): AD-A334847; DSTO-TN-0108; DODA-AR-010-319; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report details a series of analyses which were performed to develop expertise and evaluate the performance of several fatigue crack growth prediction computer codes. The analyses were performed for the case of a fatigue crack in the lower plate of the F-111 Wing Pivot Fitting, adjacent to Fuel Flow Hole No 58. This location is a known fatigue critical location and is designated as DI 86. Fatigue cracking leading to failure occurred at this location on the A-4 wing full scale fatigue test after approximately 12,200 hours of testing. An experimentally derived crack growth curve was available from the A-4 wing test. Analytical models were developed using conventional LEFM software codes (FractuREsearch and AFGROW) and the analytical crack closure code, FASTRAN II. The analysis results were compared with the experimental result and also with the analysis originally performed by the manufacturer, General Dynamics. Consistent with previous work, the analytical crack closure code, FASTRAN II, produced the most consistent and accurate results.

DTIC

Crack Propagation; Computer Programs; Mathematical Models; Crack Closure; Fatigue (Materials)

19980027590 Aircraft Research and Development Unit, Edinburg, Australia
AS350BA Squirrel Hydraulics Out Evaluation
Langley, A. J., Aircraft Research and Development Unit, Australia; Sep. 1997; 84p; In English
Report No.(s): AD-A334852; ARDU-TASK-0301; DODA-AR-009-993; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Task 0301 was an evaluation of the Hydraulics OUT characteristics of the AS35OBA Squirrel Helicopter. This report documents the results of that task.
DTIC
Helicopters; Controllability; Hydraulic Equipment; Flight Tests

19980030781 NASA Langley Research Center, Hampton, VA USA
Design of Three-Dimensional Hypersonic Inlets with Rectangular to Elliptical Shape Transition
Smart, M. K., NASA Langley Research Center, USA; 1998; 16p; In English; 36th; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-1998-207311; NAS 1.15:207311; AIAA Paper 98-0960; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A methodology has been devised for the design of three-dimensional hypersonic inlets which include a rectangular to elliptical shape transition. This methodology makes extensive use of inviscid streamtracing techniques to generate a smooth shape transition from a rectangular-like capture to an elliptical throat. Highly swept leading edges and a significantly notched cowl enable use of these inlets in fixed geometry configurations. The design procedure includes a three dimensional displacement thickness calculation and uses established correlations to check for boundary layer separation due to shock wave interactions. Complete details of the design procedure are presented and the characteristics of a modular inlet with rectangular to elliptical shape transition and a design point of Mach 7.1 are examined. Comparison with a classical two-dimensional inlet optimized for maximum total pressure recovery indicates that this three-dimensional inlet demonstrates good performance even well below its design point.
Author
Design Analysis; Three Dimensional Models; Hypersonic Inlets; Elliptical Cylinders; Rectangular Plates; Shapes

19980032587 NASA Langley Research Center, Hampton, VA USA
Subsonic Maneuvering Effectiveness of High Performance Aircraft Which Employ Quasi-Static Shape Change Devices
Montgomery, Raymond C., NASA Langley Research Center, USA; Scott, Michael A., NASA Langley Research Center, USA; Weston, Robert P., NASA Langley Research Center, USA; 1998; 14p; In English; 36th; 5th; Smart Structures and Materials, 1-6 Mar. 1998, San Diego, CA, San Diego, CA, USA, USA; Sponsored by International Society for Optical Engineering, USA
Report No.(s): NASA/TM-1998-207570; NAS 1.15:207570; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper represents an initial study on the use of quasi-static shape change devices in aircraft maneuvering. The macroscopic effects and requirements for these devices in flight control are the focus of this study. Groups of devices are postulated to replace the conventional leading-edge flap (LEF) and the all-moving wing tip (AMT) on the tailless LMTAS-ICE (Lockheed Martin Tactical Aircraft Systems - Innovative Control Effectors) configuration. The maximum quasi-static shape changes are 13.8% and 7.7% of the wing section thickness for the LEF and AMT replacement devices, respectively. A Computational Fluid Dynamics (CFD) panel code is used to determine the control effectiveness of groups of these devices. A preliminary design of a wings-leveler autopilot is presented. Initial evaluation at 0.6 Mach at 15,000 ft. altitude is made through batch simulation. Results show small disturbance stability is achieved, however, an increase in maximum distortion is needed to statically offset five degrees of sideslip. This only applies to the specific device groups studied, encouraging future research on optimal device placement.
Author
Aircraft Maneuvers; Flight Control; Computational Fluid Dynamics; Fighter Aircraft; Control Equipment; Leading Edges

19980033522 Northrop Grumman Corp., Pico Rivera, CA USA
Affordable Structures Through Integrated Design
Wiley, D., Northrop Grumman Corp., USA; Sensburg, O., Daimler-Benz Aerospace A.G., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 10p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Design for Affordability is the new paradigm for the 21st Century. Balancing the conflicting goals of systems superiority and systems affordability is the challenge of the integrated design environment on a larger scale than has ever been done before. This paper discusses the engineering processes and tools of Integrated Design which contribute to affordability of combat aircraft structures. The objectives of integrated design are to ensure a balanced design so that no single performance parameter dominates the

system and to manage the design achieves the optimum in system level performance and affordability. Analyses and simulations reduce the risk in the preliminary design phase, minimizing the amount of testing required for validation prior to production.
Derived from text
Aircraft Structures; Fighter Aircraft; Aircraft Design; Optimization; Balancing

19980033525 Defence Evaluation Research Agency, Systems Integration Dept., Farnborough, UK
Synthetic Environments - A Tool in Combat Aircraft Design
Weeks, R., Defence Evaluation Research Agency, UK; Tomlinson, B., Defence Evaluation Research Agency, UK; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 5p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

Combat aircraft design is a complex task requiring a balance to be struck between potentially conflicting requirements. Most recently the very practical consideration of affordability has come to dominate almost every phase of the process. However, the requirement for effectiveness remains. This paper considers how the application of large scale simulation and modelling - dubbed 'Synthetic Environments' can already assist in understanding the issues and trade-offs and goes on to suggest how the potential of the approach may in due course extend to a far wider range of applications. The paper draws on examples of research into Synthetic Environments as an approach and will address some of the work on SEs and their applications in which the UK Defence Evaluation and Research Agency is involved.
Derived from text
Aircraft Design; Fighter Aircraft; Simulation; Costs; Tradeoffs

19980033526 British Aerospace Defence Ltd., Aerodynamics Dept., Preston, UK
Agility in the Context of Improved Operational Effectiveness
McKay, K., British Aerospace Defence Ltd., UK; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 10p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The environment in which a fighter pilot operates is subject to continual change due to technology advances and the altering world situation. The only prediction which can be made with confidence is that profound change should continue to be expected. The first air to air conflicts occurred in the Great War. Here, aircraft were, for the most part marginal with regard to performance, stability and controllability. Indeed. many combat losses could be attributed to these shortcomings rather than the action of the enemy. However, some of the aircraft were regarded. and still are, as models of the agile fighter, particularly in the hands of an expert pilot, or "ace". The basic skills required were the ability to remain in control and shoot accurately. For subsequent conflicts, the same basic skills were required, although airframes were better stabilised and controlled and had increased power available, resulting in higher speeds. With radar and radio, it became possible to receive guidance towards the targets that the ground control perceived as the prime threat. Weapons remained visual range, however, but regardless of this, the increased speeds and the added information changed the difficulty of the pilot's task due to the implications on his situational awareness and choice of tactics. Increasingly, the combat results became more clouded by the interaction of the systems available to the pilot and his ability to assimilate the information provided.
Author
Combat; System Effectiveness; Ground Based Control; Controllability; Warfare

19980033527 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Aeroelasticity, Goettingen, Germany
The Benefits of the Passive and Active Aeroelastic Design of Aircraft Structures
Hoenlinger, H. G., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Hutin, P. M., Office National d'Etudes et de Recherches Aerospatiales, France; Pendleton, E. W., Wright Lab., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 24p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The increasing performance requirements and the economical pressure to reduce Direct Operational Costs (DOC's) of new aircraft design can no longer be met by traditional and sequential design processes. This is especially true when considering aeroelasticity. The impact of aeroelastic effects on the design of new high performance transport or fighter aircraft demands the use of multidisciplinary design concepts and optimization strategies in the preliminary design phase or earlier to develop flutter-free structures and to ensure excellent multipoint design characteristics. This paper presents selected examples of a variety of aeroelas-

tic design principles for passive primary aircraft structures and for active structures of advanced aircraft with highly sophisticated fly-by-wire flight control systems.
Derived from text
Aeroelasticity; Aircraft Design; Cost Reduction; Aircraft Structures; Fighter Aircraft; Multidisciplinary Design Optimization; Operating Costs; Design Analysis

19980033530 Naval Air Systems Command, Arlington, VA USA
V/STOL and STOVL Design Considerations
McErlean, Donald P., Naval Air Systems Command, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 4p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

As has been noted in many studies of this class of aircraft (cf ”Aircraft Design Integration” L.M.D.C. Campos, Aerospace 2020) full vertical take off and landing of attack type aircraft (non-rotor powered) has been shown to be an unwise design option. This is due primarily to the substantial amount of thrust which must be provided for vertical lift severely limiting gross weight and therefore either payload or range. However, if even a limited amount of forward motion is provided, so that a conventional lifting wing augments the vertical thrust of the propulsion system the situation changes considerably. This combination of wing and propulsion produced lift has been shown to provide both useful payload/range combinations and significantly shortened take-off roll. Upon completion of the mission, with either payload expended or fuel load consumed, the system is now sufficiently lighter so that vertical landing does become possible. This gives rise to a class of aircraft known as ”STOVL” or Short Take Off/ Vertical Landing. Obviously one could also design the aircraft with shortened landing distances but not truly vertical. However, an interesting systems trade comes to bear on the problem.
Derived from text
V/STOL Aircraft; Aircraft Design; Takeoff; Vertical Landing; Attack Aircraft

19980033533 Wright Lab., FIIA, Wright-Patterson AFB, OH USA
A Discussion of a Modular Unmanned Demonstration Air Vehicle
Cherry, Mark C., Wright Lab., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 9p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The idea of an unmanned combat vehicle has existed for many years. We now have the opportunity to capitalize on numerous technologies under development to make an unmanned combat vehicle a viable option for military commanders. The key problems are the issues dealing with the integration of these technologies into a synergistic aeroform, and the human control problems that arise due to these technologies. A modular demonstration platform that can capitalize on new technologies as they mature is a key way to demonstrate the viability of an unmanned combat vehicle, as well as answer some of the questions, and technology challenges, that may arise due to off-board control of a lethal air vehicle. A modular airframe is required in a demonstration platform to flight test and demonstrate various technology sets as they mature. Modularity is important because it provides greater system flexibility and should reduce the life cycle costs of the air vehicles. The demonstration platform must be capable of performing a notional mission similar to what may be envisioned for a combat UAV, in order to show that demonstrated technologies are applicable to production vehicles. The challenges and payoffs of this aggressive vision will be discussed.
Derived from text
Airframes; Cost Reduction; Modularity; Flight Tests; Life Cycle Costs; Combat

19980033534 R-Tec, Rolling Hills Estates, CA USA
Aging Airframes and Engines
Ratwani, Mohan M., R-Tec, USA; Koul, A. K., Institute for Aerospace Research, Canada; Immarigeon, J-P., Institute for Aerospace Research, Canada; Wallace, W., Institute for Aerospace Research, Canada; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 16p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The presence of aging aircraft fleets has been increasing throughout the world due to the global, financial, and political environment. The reduction in the defense budget of many countries has forced them to use their military aircraft well beyond their original design lives. Also, the demand on the performance of these aircraft has been increasing due to increased payload and severe usage. Maintaining the airworthiness of these aircraft and their propulsion systems while at the same time keeping the maintenance costs low is of prime concern to the operators and regulatory authorities. The flight safety requirements and the performance demands are likely to result in higher maintenance costs. However, the unique opportunities provided by the research and development in the areas of new and improved materials, structures, manufacturing, repairs, and Non-Destructive Inspection

(NDI) technologies have made it possible to keep the increase in costs to a minimum and in many cases reduced the overall maintenance costs. This paper discusses the contributions made by research and technology towards lowering the maintenance cost and improving the flight safety of aging airframes and engines.
Derived from text
Airframes; Flight Safety; Aircraft Reliability; Payloads; Inspection; Costs; Propulsion System Performance

19980033536 Defense Advanced Research Projects Agency, Arlington, VA USA
Smart Aircraft Structures
Crowe, C. Robert, Defense Advanced Research Projects Agency, USA; Sater, Janet M., Institute for Defense Analyses, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 16p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The broad but strongly interdisciplinary field of smart structures and materials seeks to apply multi-functional capabilities to existing and new structures. by definition, smart structures and materials are those which can sense external stimuli and respond with active control to that stimuli in real or near-real time. The most common analogy is to a human (Figure 1): the nervous system senses the stimuli; then the brain processes the information causing a muscle (actuator) to respond. For purposes of this paper, smart structures and materials consist of active devices-primarily sensors and actuators either embedded in or attached to a structure. Smart structures analogy to a human. These smart structures technologies are expected to provide new and innovative capabilities in future military aircraft including fighter and transport aircraft, unmanned aerial vehicles (UAVs), and helicopters and tilt rotorcraft. Specific applications are described in terms of system functional capability enhancements (e.g., vibration damping and suppression) and overall system performance benefits (e.g., reduced life cycle costs).
Derived from text
Smart Structures; Aircraft Structures; Cost Reduction; Fighter Aircraft; Real Time Operation; Sensory Perception; Actuators; Embedding

19980035012 Defence Test and Evaluation Organisation, Rotary Wing Aircraft Dept., Boscombe Down, UK
Service Release and 'Safety Critical' Software
Rodger, K. S., Defence Test and Evaluation Organisation, UK; Advances in Flight Testing; Dec. 1997; 10p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

As is well known, software is increasingly used to improve operational effectiveness. It is also well known that every innovative use of technology results in a change to the types of hazard and therefore introduces the potential for reduced safety. This paper considers what is required to recommend release of aircraft into service when safety is dependent on the "correct" operation of software. The paper starts with a general description of a release to service and of how it should be derived and continues with a discussion of testing its and roles, contributions and its limitations. Since software is inevitably associated with electronics the paper next considers how the safety implications of using electronics should be assessed before consideration of how safety critical software should be treated by certifying authorities. The views expressed in this paper are those of the author and are not necessarily DTEO policy.
Author
Computer Programs; System Effectiveness; Flight Safety

19980035013 Tybrin Corp., Edwards AFB, CA USA
C-17 Enhancements to a Flight Test Planning Program
Canody, Cheryl, Tybrin Corp., USA; Hewett, Marle D., G and C Systems, Inc., USA; Advances in Flight Testing; Dec. 1997; 10p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper presents the enhancements incorporated into TEST_PLAN, a commercially available flight test planning program, for the C-17 follow-on test program. TEST_PLAN is a software package for UNIX and VMS based workstation computers that allows Flight Test Engineers (FTE's) to plan and track flight test programs by mapping requirements to test points, flights, and flight test maneuvers. TEST_PLAN is integrated with the Oracle Relational DataBase Management System (RDBMS). Test points and requirements are stored in Oracle tables. The software provides automated tools that allows FTE's to query these tables to obtain lists of test points that can be assigned to maneuvers and flights to construct a flight test plan. The 417th Flight Test Squadron (FLTS) at the Air Force Flight Test Center (AFFTC), Edwards Air Force Base (AFB), funded four major enhancements to TEST_PLAN to support the C-17 follow-on flight test program. These enhancements are: (1) incorporation of the C-17 Test Parameter Requirements (TPR) database into TEST_PLAN; (2) implementation of an Instrumentation Discrepancy Report in TEST_PLAN; (3) integration of FrameMaker with TEST_PLAN to implement an automated flight test card generation facility;

and (4) instituting a requirements compatibility matrix using Oracle tables and compatibility definitions provided by the administrator. The details of these enhancements are presented in this paper.
Author
C-17 Aircraft; Flight Tests; Data Base Management Systems; Applications Programs (Computers); Planing

19980035015 Defence Test and Evaluation Organisation, Rotary Wing Aircraft Dept., Boscombe Down, UK
Helicopter Certification-The Challenge of Testing UK Apache
Finch, Roger S., Defence Test and Evaluation Organisation, UK; Advances in Flight Testing; Dec. 1997; 14p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

In July last year the UK Government announced the eagerly awaited decision on the UK Army's future Attack Helicopter (AH). The UK would purchase 67 WAH-64 APACHE helicopters, a derivative of the McDonnell Douglas Helicopters AH-64D Apache. The aircraft would be produced by GKN Westland Helicopters Ltd, as the Prime Contractor, with McDonnell Douglas Helicopter Systems as the Integrating Sub-Contractor. The WAH-64 would be fitted with a version of the Rolls Royce-Turbomeca RTM 322 engine, currently fitted to the UK's Merlin helicopter. The paper presents an overview of the emergent technologies being considered for the UK Apache, in particular a Defensive Aids Suite (DAS) and Helmet Mounted Displays (HMD). Ideas on a future handling qualities assessment are also presented. Before the first UK Apache arrives at Boscombe Down for clearance testing, the UK Test & Evaluation (T&E) community must develop the required clearance methodologies to evaluate the aircraft as a complete weapons system: preliminary work addressing this issue has already started. Clearance testing will, undoubtably, make greater use of simulation, as well as placing more emphasis on joint testing with Industry. The challenge facing UK T&E is how to acquire the required test data with the minimum amount of testing to generate the evidence necessary for the aircraft's Military Aircraft Release (MAR).
Author
Helicopter Control; Certification; Helmet Mounted Displays; Military Helicopters

19980035017 Arnold Engineering Development Center, DOM, Arnold AFS, TN USA
Balancing Modeling and Simulation With Flight Test in Military Aircraft Development
Norton, William J., Arnold Engineering Development Center, USA; Dec. 1997; 26p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The use of Modeling and Simulation (M&S) in the development of aerospace vehicles has evolved in step with the associated analytical and computational tools. During this evolution M&S has been balanced with necessary levels of flight testing as an integral part of the development process. Now, program managers are being urged to seek dramatic reductions in flight testing and to compensate with much greater reliance on M&S. A strong emphasis on fostering M&S development is essential to extend the aerospace state-of-the-art, and does hold promise for reducing development cost and cycle time. However, recent test programs do not provide confidence that M&S tools are presently of sufficient accuracy to permit a preponderant reliance on them at the expense of flight test. Premature dependency will introduce the risk that the system deficiencies usually found in flight testing will go undiscovered until after the vehicle is in production and operation. However, a concerted effort to research and correct demonstrated M&S failures to predict certain system characteristics will, given time, allow a complementary reduction in flight testing. This would allow the shifting balance of M&S with flight testing to be managed so as to keep program risks acceptable and ensure the high quality of resulting weapons systems.
Author
Balancing; Models; Simulation; Flight Tests; Software Development Tools; Attack Aircraft

19980035022 British Aerospace Defence Ltd., Military Aircraft Div., Preston, UK
The Development and Use of In-Flight Analysis at BAE Warton
Nanson, K. M., British Aerospace Defence Ltd., UK; Ramsay, R. B., British Aerospace Defence Ltd., UK; Dec. 1997; 16p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper describes the development and use of telemetry and in-flight analysis for flight trials at BAe Flight Test Warton. The current status of in-flight aerodynamic analysis techniques for Eurofighter is described, including those used for envelope expansion flutter testing. The cost benefits of monitoring and analysis, and the improvement in timescale of data availability, have been demonstrated to support the extension of the in-flight analysis concept to the complete weapon system flight trails.
Author
Telemetry; Flight Tests; Aerodynamic Characteristics; Technologies

19980035023 Computer Sciences Corp., El Segundo, CA USA

Redefining Flight Testing: Innovative Application of the World Wide Web

Hughes, Michael C., Computer Sciences Corp., USA; Gardner, Lee S., Air Force Flight Test Center, USA; Painter, Darcy S., Air Force Flight Test Center, USA; Dec. 1997; 8p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Application of World Wide Web technology to Flight Test is discussed. Examples of how efficiencies in processing flight test data have been gained using an ”Intranet” are presented. The Air Force Flight Test Center has successfully used an Intranet to reduce the support staff for post-flight data processing by 90% over the past four years. Techniques are discussed, illustrated by examples, to demonstrate that Intranets have broad application to the Flight Test business. The application of Web technology to manage financial data in the EDGE project is discussed.

Author

Flight Tests; Technology Utilization; Data Processing

19980035024 Aerospatiale, Direction des Essais en Vol, Toulouse, France

In-Flight Tests of the A300-600-ST ’Beluga’ ***Essais en Vol de L’A300-600-ST ’Beluga’***

Destarac, Guy, Aerospatiale, France; Dec. 1997; 8p; In French; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

In-flight tests of the A 300-600 ST ’Beluga’, built by Aerospatiale and Daimler Benz Aerospatiale Airbus, were given to the Direction des Essais en Vol of the Branche Anions de l’Aerospatiale. This paper describes the installation of measures and the tools mounted on the first airplane for development and certification in-flight tests. It shows the means utilized for data processing and acquisition. The evaluation at the end of the test campaign shows that: the unexpectedly good behavior of the airplane in flight has compensated for the time required to resolve structural problems, the development of the charging system took longer than expected but did not delay the certification flights which were completed by the end of July 1995.

Author

In-Flight Monitoring; Data Processing; Data Acquisition

19980035025 Divisione Aerea Studi Ricerche e Sperimentazioni, Reparto Sperimentale Volo, Pratica di Mare, Italy

The Certification Process of the OPHER Smart Munition on the AMX Aircraft

Petraroli, E., Divisione Aerea Studi Ricerche e Sperimentazioni, Italy; Israeli, D., Elbit Systems Ltd., Israel; Advances in Flight Testing; Dec. 1997; 12p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Italian Air Force (ITAF) has been seeking a low cost smart munition capable to attack vehicular targets with particular reference to armored vehicles and tanks. Low cost implies a guided weapon such as a laser bomb. The main objections to a laser guided weapon, such as those ones belonging to the Paveway family, derived from two intrinsic limitations: laser bombs require an illuminator (not a fire-and-forget weapon); and overall accuracy decreases dramatically with delivering energy. On the other hand, adoption of a missile would have increased both integration and procurement costs. So, it was decided to test the OPHER system in a different scenario with respect to that one which the system was originally designed for: (1) the Italian scenario, characterized by Mediterranean scrub, could have affected system performance in a different way with respect to Israeli desert; (2) the AMX can deliver weapons with an energy much lower than the F-4, on which this weapon has been employed in the Israeli Air Force; and (3) the AMX is equipped with a twin store carrier and the F-4 version of the OPHER system could not fit on it. The result of the successful testing and analytical work described in this paper led to the certification of the OPHER smart munition on the AMX for the Italian Air Force.

Author

Armed Forces (Foreign); Certification; Laser Weapons; Targets

19980035026 Dassault Aviation, Istres, France

In-Flight Tests of the RAFALE ***Les Essais en Vol du RAFALE***

Castagnos, Patrick, Dassault Aviation, France; Tourtoulon, Marc, Centre d’Essais en Vol, France; Dec. 1997; 22p; In French; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The in-flight tests of the RAFALE presented the opportunity to face difficult challenges, to initiate new testing techniques, and to adopt new organizational approaches. Since 5 years have elapsed since the 1st flight of the RAFALE C01 and the 4 prototypes have logged over 2300 flights, it seemed appropriate to conduct a comparison between inflight tests as planned in 1990, and as they have in fact taken place up to the present. The two articles that follow undertake this analysis. The first is dedicated more

specifically to the aspects of costs, general objectives of the program and the status of technical refinements. The second is more centered on state-industry relations and optimizing skills and resources.
Author
In-Flight Monitoring; Costs; Industries

19980035027 Westland Helicopters Ltd., Flight Test Dept., Yeovil, UK
The EH101 Development Programme
Hazzard, Mark, Westland Helicopters Ltd., UK; Dec. 1997; 8p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper describes the EH101 helicopter flight development programme from initial conception to the present day. Lessons learned during the testing phase are highlighted and significant milestones achieved are detailed. In particular the early development testing is described in some detail.
Author
Helicopters; In-Flight Monitoring; Flight Tests

19980035032 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Flight Mechanics, Brunswick, Germany
X-31A Tactical Utility Flight Testing
Friehmelt, Holger, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Guetter, Richard, Daimler-Benz Aerospace A.G., Germany; Kim, Quirin, Bundesluftwaffe, Germany; Advances in Flight Testing; Dec. 1997; 10p; In English; Also announced as 19980035004; Sponsored in part by FMOD.; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The two X-31A were jointly built by Daimler-Benz Aerospace AG and Rockwell International. These German-American experimental aircraft were designed to explore the new realm of flight far beyond stall by employing advanced technologies like thrust vectoring and sophisticated flight control systems. The X-31A aircraft is equipped with a thrust vectoring system consisting of three aft mounted paddles to deflect the thrust vector in both pitch and yaw axes, thus providing the X-31A in this 'Enhanced Fighter Maneuverability program with an agility and maneuverability never seen before. The tactical utility of the X-31A using post stall technologies has been revealed in an extensive flight test campaign against various current state-of-the-art fighter aircraft in a close-in combat arena. The test philosophy included both simulation and flight test. The tremendous tactical advantage of the X-31A during the tactical utility evaluation flight test phase was accompanied by a deepened insight into post stall tactics its typical maneuvers, impacts on pilot-aircraft interfaces and requirements for future weapons to both engineers and the military community. Some selected aspects of the tactical utility of the X-31A using post stall technologies unveiled by the International Test Organization are presented here.
Author
Flight Tests; X-31 Aircraft; Thrust Vector Control; Design to Cost

19980035033 Eurofighter Jagdflugzeug G.m.b.H., Hallbergmoos, Germany
The European Fighter Aircraft EF2000 Flight Test Programme Overview and Management Concept
Herr, Michael, Eurofighter Jagdflugzeug G.m.b.H., Germany; Butcher, Paul, Eurofighter Jagdflugzeug G.m.b.H., Germany; Dec. 1997; 12p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Eurofighter 2000 (EF2000) Flight Test programme began with first flight in 1994. The aircraft will enter service at the beginning of the next century. In addition to the challenge of basic certification of the airframe with many different Air-to-Air and Air-to-Ground stores configurations, Eurofighter Partner Companies are also conducting testing to fully integrate the new developed Radar (ECR90) and Engine (EJ200). This paper constitutes a description of the EUROFIGHTER Weapon System, the flight test programme management, an overview of the test programme plan and progress to date and discussion of unique challenges during testing. Up to now the EF2000 flight test programme has proceeded as planned and in-service certification should occur on schedule. The achievements reached so far can be attributed to a well designed and built aircraft, a comprehensive test plan, a very reliable data system, and the personal efforts of thousands of people in four different countries.
Author
Fighter Aircraft; Flight Tests; Project Management

19980035034 Information Spectrum, Inc., Falls Church, VA USA
The V-22 Osprey Integrated Test Team: A Perspective on Organizational Development and Teaming
VanderVliet, Gery M., Information Spectrum, Inc., USA; Price, Robert C., Price (Robert C.), USA; Advances in Flight Testing; Dec. 1997; 8p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

In February of 1993 the US Navy's V-22 Osprey Program Management Team established a new way of managing its flight test program. This newly established flight test organization would be a departure from what the Navy Test and Evaluation (T&E) community had been used to, especially for an Acquisition CATegory One (ACAT I) program. It was that February that the V-22 Osprey Program Manager (PMA) would sign into contract the establishment of the Navy's first Integrated Test Team (ITT). The V-22 ITT, following in the path of the Air Force Combined Test Force (CTF) concept, would encounter and overcome many challenges. Soon after the V-22 ITT would be established, the Navy's F-18E/F program would follow suit with its own ITT, validating the worthiness of such an organizational concept. This paper discusses the conception, development, benefits, challenges, and lessons learned associated with the setup and operation of the V-22 Osprey ITT. This paper is written as a perspective from government ITT management only.
Author
V-22 Aircraft; Flight Tests; Management Methods; Management Planning

19980036880 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Salisbury, Australia
A Microprocessor-Based Gradient Analyser for F/A-18 Bulkhead Spectrum Loading
Sponder, Leopold, Defence Science and Technology Organisation, Australia; Sep. 1997; 47p; In English
Report No.(s): AD-A335353; DSTO-TR-0546; DODA-AR-010-250; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes a specially designed instrument that was used during a full scale fatigue test of an F/A-18 bulkhead to support the acquisition and analysis of acoustic emission (AE) data for the investigation of crack initiation and growth. This device, developed by the author, comprises both hardware and software and generates binary data in real time that indicates the sign of the gradient of an applied spectrum load signal. This design overcomes the inherent limitations of conventional analog slope detection methods applied to slowly varying aperiodic waveforms.
DTIC
Microprocessors; Real Time Operation; Binary Data; Acoustic Emission; Crack Propagation

06
AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments. For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.

19980033532 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
Modern Fighter Mission Avionics: The Joint Strike Fighter Avionics Architecture
Lachenmaier, Ralph, Naval Air Warfare Center, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 8p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The Joint Strike Fighter (JSF) program is potentially the largest new military aircraft program in the world today. A preliminary avionics architecture has been defined and published. Several efforts are underway to prototype and demonstrate various aspects of that architecture. The architecture will be refined and updated between now and the beginning of Engineering and Manufacturing Development (EMD) expected to begin in 2001. This paper describes the avionics architecture in its current state, discusses the motivation behind the various areas of the architecture, presents the issues involved, and discusses the results of some of the demonstration efforts. The JSF program is based on the four pillars: affordability, lethality, survivability, and supportability. First and foremost among the pillars is affordability. In order to field a lethal, supportable, survivable aircraft, affordability tradeoffs will be conducted by the prime contractors. Historically, 30-40 percent of weapons system life cycle costs have been attributed to avionics, hence reduction in avionics systems costs are essential in satisfying JSF pillar requirements. An F-22 technology point-of-departure has been used to baseline the avionics architecture planning. The JSF is leveraging that significant technology investment, conducting maturation of new contributing technologies, and implementing, where appropriate, COTS components, standards, and processes to enhance affordability of the next generation strike fighter.
Derived from text
Avionics; Fighter Aircraft; Product Development; Cost Reduction; Lethality; Military Aircraft

19980035008 Flight Test Squadron (40th), DOOB, Eglin AFB, FL USA

AGM-130 Improved Modular Infrared Sensor (IMIRS) Flight Test

Corej, Thomas A., Flight Test Squadron (40th), USA; Kosan, Keith J., Flight Test Squadron (40th), USA; Advances in Flight Testing; Dec. 1997; 8p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The AGM-130/Improved Modular Infrared Sensor (IMIRS) weapon system is operationally compatible with the F-15E and F-111F launch platforms. The addition of a rocket motor to the GBU-15, making it an AGM-130, increases the standoff range of the AGM-130. The IMIRS seeker is an InfraRed (IR) seeker for the AGM-130, and the AGM-130/IMIRS system provides sufficient resolution for target detection in day or night. Using a two-ship scenario (one weapon-carrying aircraft and one controlling aircraft), the controlling aircraft can stand off at an extended classified range and successfully guide the weapon to impact. The aimpoint update feature of the IMIRS seeker allows for small changes to be made in the aimpoint allowing for precisely attacking a specific point on a target. When the Weapon Systems Officer (WHO) locks-on to a target, he can slew to refine the Desired Mean Point of Impact (DMPI) and then lock-on to the new DMPI without breaking the lock on the original aimpoint.
Author

Infrared Detectors; Flight Tests; Infrared Radiation; Target Acquisition

19980035016 Royal Netherlands Air Force, Leeuwarden, Netherlands

A Data Acquisition System for the RNLAF MLU F-16 Requirements and Proposal

Koolstra, H. J., Royal Netherlands Air Force, Netherlands; Hollestelle, P. M. N., National Aerospace Lab., Netherlands; Klijn, J. M., National Aerospace Lab., Netherlands; Advances in Flight Testing; Dec. 1997; 6p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

In 1983 the Royal Netherlands Air Force (RNLAF) requested the National Aerospace Laboratory NLR to design, procure and install a flight test data acquisition system to be used with the F-16 fighter aircraft. The design was heavily based on the systems, which were at that time nearing their completion for flight tests with Fokker aircraft. The system was delivered to the RNLAF in 1984 and has been continuously in use since that time. With the coming introduction of the Mid-Life Update programme of the F-16, it was foreseen that the current system would not be able to fulfill its tasks anymore. The RNLAF together with NLR draw up the requirements for a new data acquisition system. A proposal for the new system was made by NLR, again based on recent developments of flight test instrumentation for Fokker aircraft, but also with future developments in the field of airborne flight test instrumentation in mind. In this paper the requirements for the new system will be given. The proposed system will be described by means of a general concept. Although the final implementation of this general concept is not decided upon yet, the benefits and drawbacks of a possible implementation, based on the Common Airborne Instrumentation System standards, are discussed. It is concluded that there is a preference for this implementation, provided the tight time schedule can be met.
Author

Data Acquisition; F-16 Aircraft; Flight Test Instruments; User Requirements; Airborne Equipment

19980035028 Defence Evaluation Research Agency, Farnborough, UK

Tornado Integrated Avionics Research Aircraft (TIARA)

Brown, A. D., Defence Evaluation Research Agency, UK; Stocks, A. J., Defence Evaluation Research Agency, UK; Dec. 1997; 10p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The paper describes the role, major features and flight trials programme of the Tornado Integrated Avionics Research Aircraft (TIARA). This significantly modified F2A(T) Tornado, ZD902, is the flagship of the trials fleet currently operated by the Defence Evaluation and Research Agency (DERA), an Executive Agency of the UK Ministry of Defence. TIARA is a multi-sensor, multi-role trials facility intended to demonstrate a ”total systems integration” concept. It not only directly supports military customer programmes but also has sufficient capacity for collaborative programmes with other research organisations. Following a major conversion programme, ZD902 is now currently being used for the evaluation of IR sensors and helmet mounted displays. The future installation of the Blue Vixen Al radar will complete TIARA as a research facility and allow trials on sensor data fusion to begin.
Author

Avionics; Flight Tests; Research Aircraft; MRCA Aircraft

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.

19980031730 NYMA, Inc., Brook Park, OH USA
An Experiment on Losses in a Three-Port Wave Rotor ***Final Report***
Wilson, Jack, NYMA, Inc., USA; Aug. 1997; 44p; In English
Contract(s)/Grant(s): NAS3-27186; RTOP 523-26-33
Report No.(s): NASA-CR-198508; E-10364; NAS 1.26:198508; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Wave rotors used in a gas turbine topping cycle, offer a potential route to higher specific power and lower specific fuel consumption. In order to exploit this potential properly, it is necessary to have some realistic means of calculating wave rotor performance, taking losses into account, so that wave rotors can be designed for good performance. This, in turn, requires a knowledge of the loss mechanisms. The experiment reported here was designed as a statistical experiment to identify the losses due to finite passage opening time, boundary layers, and leakage. On analyzing the data, incidence loss was also determined to be an important loss. For simplicity, the experiment used a three-port, flow divider, wave cycle, but the results are applicable to other cycles. A 12-in.-diameter rotor was used with two different lengths, 9 and 18 in., and two different passage widths, 0.25 and 0.54 in., in order to vary the boundary layer thicknesses and the opening time. to vary leakage, moveable end walls were provided so that the rotor to end-wall gap could be adjusted. The experiment is described and the results are presented together with a parametric fit to the data. The fit shows that there will be an optimum passage width for a given wave rotor since, as the passage width increases, boundary layer losses decrease, but opening-time losses increase and vice-versa. Leakage losses can be made small at reasonable gap sizes. Inlet ports should be designed to minimize incidence losses.
Author
Gas Turbine Engines; Engine Design; Gas Turbines; Wave Rotors; Topping Cycle Engines; Losses

19980033528 General Electric Co., Aircraft Engines, Cincinnati, OH USA
Balancing Affordability and Performance in Aircraft Engines
Williams, J. C., General Electric Co., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 6p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The historical measure of performance of an aircraft gas turbine engine has been simply the thrust it produces divided by its weight (T/W). While this measure is still appropriate, as the aircraft engine has matured, the rate of change of thrust to weight has begun to decrease and other factors such as costs have become increasingly important relative to performance. Therefore, it can be argued today that performance should have a broader, more comprehensive definition that includes other factors such as durability and reliability. Further, most modern military aircraft have some degree of ”signature” treatment incorporated into the system. ”Signature” is the radar (RF) or infrared (IR) signal that either emanates from or is created by an aircraft that allows its detection. The F-117 and B-2 systems are well known examples of low signature or ”stealthy” systems. It is neither appropriate nor relevant to discuss signature control technology in detail here, but it is important to mention several points in connection with this subject. First, signature control is accomplished through a combination of the use of special design methods and materials with special physical properties. Second, any form of signature treatment adds weight and cost to the system. Third, the engine inlet and exhaust structures are a significant source of signature (both RF and IR) and require special attention if a given level is to be achieved. These areas of a system also represent the interface between the engine and the airframe and the responsibility for them typically is shared between the airframe and the engine manufacturers. Finally, retention of low signature usually requires additional maintenance and this also affects the affordability of a system.
Derived from text
Aircraft Engines; Gas Turbine Engines; Balancing; Costs; Durability; Reliability

19980033529 Wright Lab., POTA, Wright-Patterson AFB, OH USA
Reducing Costs for Aircraft Gas Turbine Engines
Skira, Charles A., Wright Lab., USA; Philpot, Mike, Defence Research Agency, UK; Hauvette, Jacquesa, Societe Nationale d’Etudes et de Construction de Moteurs Aeronautiques, France; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 10p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Current military budget constraints are highlighting the cost issues in procuring and maintaining adequate defense forces. Aircraft and their engines are typical examples where costs are more and more expensive from one generation to the other. However, at the same time, it is recognized that the correlated increase in performance is necessary to keep the pace with the potential of adverse weaponry. Due to the historic and dramatic changes in recent global events, the USA military services have been undergoing a drawdown in size. Since 1989, our military forces have been reduced by 30%. Over this period of declining budgets the DoD has slowed down the modernization of our forces in order to concentrate on maintaining force readiness and quality of life. However, by the year 2010, more than half of the US Air Force fighter fleet will consist of existing F-15's, F-16's and F-117A's, well beyond the expected service life of these systems. DoD and other defense departments must address the modernization of their forces to ensure readiness into the next century. This modernization will only be possible within the era of reduced defense budgets when the S&T community begins to focus on increasing the effectiveness of a user-identified capability while decreasing the costs of the necessary technology, and improving material through planned upgrades.
Derived from text
Aircraft Engines; Gas Turbine Engines; Cost Reduction; Service Life

19980035010 Alenia Aeronautica, Alenia Flight Test, Turin, Italy
Alenia Approach to EF2000 Propulsion System Flight Test: Methodology and Test Results
Bellero, Lucio, Alenia Aeronautica, Italy; Dogliatti, Francesco, Alenia Aeronautica, Italy; Girolami, Claudio, Alenia Aeronautica, Italy; Dec. 1997; 12p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

EUROFIGHTER 2000 is a single seat, aerodynamically unstable delta-canard fighter aircraft which embodies latest technologies in structures, systems, engine and avionics. The aircraft is powered by two EJ 200, a new engine specifically tailored to meet EF2000 mission requirements. Eurofighter Jagdflugzeug GmbH consortium is the prime contractor for the development of the complete weapon system. It is composed of the four national aircraft companies involved in the program, namely British Aerospace (BAe), Daimler-Benz Aerospace (DASA), Alenia (ALN) and CASA . Within this program, Alenia is tasked (among the other responsibilities) with the propulsion system development, that has been initially flight-tested by Alenia prototype DA3; it has been the first one fitted with the new EJ200 engines (built by Eurojet consortium). DA7, the second Alenia prototype, will be tasked (among other tasks like avionics/navigation testing) of final aircraft/engines performance verification. The first phase of the development programme has been successfully completed and the following phase, with the uprated engines standard, is already in progress. This paper summarizes: (1) the overall EF2000 flight test philosophy; (2) the approach to EJ200 engine flight test, including relight; (3) test organization, test methods, flight test instrumentation, data analysis, data management and (4) early test results.
Author
Propulsion; Flight Test Instruments; Fighter Aircraft; Engine Tests

19980035011 Centre d'Essais en Vol, Base d'Essais d'Istres, Istres, France
Flight Ticket M 88-2 ***Bon de Vol M 88-2***
Nicolet, Eric, Centre d'Essais en Vol, France; Dec. 1997; 10p; In French; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The M88-2 is the engine installed in the multi-purpose fighter Rafale. The in-flight qualification method of the regulation consists of having a representative engine of the worst engine mass produced and to verify that its performance is sound, within all aspects of flight.
Author
Fighter Aircraft; Engine Noise; Performance Tests

08
AIRCRAFT STABILITY AND CONTROL

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

19980025559 Moscow Inst. of Aviation Technology, Pilot-Vehicle Lab., USSR
Development of Criteria For Prediction of Handling Qualities of New Generation of Aircraft ***Final Report***
Efremov, Alexander, Moscow Inst. of Aviation Technology, USSR; Nov. 1997; 167p; In English
Contract(s)/Grant(s): F61708-96-W-0275

Report No.(s): AD-A333344; EOARD-SPC-96-4073; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report results from a contract tasking Moscow Aviation Institute (MAI) as follows: Discuss the context of the problem in standardization of flying qualities and formulate the system approach for its solution.

DTIC

Controllability; Flight Characteristics

19980027605 NASA Ames Research Center, Moffett Field, CA USA

Optimization of Supersonic Transport Trajectories

Ardema, Mark D., Santa Clara Univ., USA; Windhorst, Robert, Santa Clara Univ., USA; Phillips, James, NASA Ames Research Center, USA; Mar. 1998; 58p; In English

Contract(s)/Grant(s): RTOP 522-41-42

Report No.(s): NASA/TM-1998-112223; NAS 1.15:112223; A-98-09997; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This paper develops a near-optimal guidance law for generating minimum fuel, time, or cost fixed-range trajectories for supersonic transport aircraft. The approach uses a choice of new state variables along with singular perturbation techniques to time-scale decouple the dynamic equations into multiple equations of single order (second order for the fast dynamics). Application of the maximum principle to each of the decoupled equations, as opposed to application to the original coupled equations, avoids the two point boundary value problem and transforms the problem from one of a functional optimization to one of multiple function optimizations. It is shown that such an approach produces well known aircraft performance results such as minimizing the Brequet factor for minimum fuel consumption and the energy climb path. Furthermore, the new state variables produce a consistent calculation of flight path angle along the trajectory, eliminating one of the deficiencies in the traditional energy state approximation. In addition, jumps in the energy climb path are smoothed out by integration of the original dynamic equations at constant load factor. Numerical results performed for a supersonic transport design show that a pushover dive followed by a pull-out at nominal load factors are sufficient maneuvers to smooth the jump.

Author

Supersonic Transports; Trajectory Optimization; Transport Aircraft

19980028446 NASA Dryden Flight Research Center, Edwards, CA USA

Wavelet Filtering to Reduce Conservatism in Aeroservoelastic Robust Stability Margins

Brenner, Marty, NASA Dryden Flight Research Center, USA; Lind, Rick, NASA Dryden Flight Research Center, USA; Mar. 1998; 16p; In English; Structures, Structural Dynamics and Materials Conference, 20-23 Apr. 1998, Long Beach, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 529-50-04

Report No.(s): NASA/TM-1998-206545; NAS 1.15:206545; H-2222; AIAA Paper 98-1896; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Wavelet analysis for filtering and system identification was used to improve the estimation of aeroservoelastic stability margins. The conservatism of the robust stability margins was reduced with parametric and nonparametric time-frequency analysis of flight data in the model validation process. Nonparametric wavelet processing of data was used to reduce the effects of external desirableness and unmodeled dynamics. Parametric estimates of modal stability were also extracted using the wavelet transform. Computation of robust stability margins for stability boundary prediction depends on uncertainty descriptions derived from the data for model validation. F-18 high Alpha Research Vehicle aeroservoelastic flight test data demonstrated improved robust stability prediction by extension of the stability boundary beyond the flight regime.

Author

Wavelet Analysis; Aeroservoelasticity; Transfer Functions

19980028448 Lockheed Martin Corp., Hampton, VA USA

Implementation and Testing of Turbulence Models for the F18-HARV Simulation

Yeager, Jessie C., Lockheed Martin Corp., USA; Mar. 1998; 146p; In English

Contract(s)/Grant(s): NAS1-96014; RTOP 522-35-11-03

Report No.(s): NASA/CR-1998-206937; NAS 1.26:206937; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report presents three methods of implementing the Dryden power spectral density model for atmospheric turbulence. Included are the equations which define the three methods and computer source code written in Advanced Continuous Simulation Language to implement the equations. Time-history plots and sample statistics of simulated turbulence results from executing the code in a test program are also presented. Power spectral densities were computed for sample sequences of turbulence and are

plotted for comparison with the Dryden spectra. The three model implementations were installed in a nonlinear six-degree-of-freedom simulation of the High Alpha Research Vehicle airplane. Aircraft simulation responses to turbulence generated with the three implementations are presented as plots.
Author
Turbulence Models; Atmospheric Turbulence; Atmospheric Models; Flight Characteristics; Aircraft Performance

19980031520 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA
A Theory for the Roll-Ratchet Phenomenon in High Performance Aircraft
Hess, Ronald A., California Univ., USA; 1997; 10p; In English
Contract(s)/Grant(s): NAG1-1744
Report No.(s): NASA/CR-97-207289; NAS 1.26:207289; AIAA Paper 97-3498; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Roll-ratchet refers to a high frequency oscillation which can occur in pilot-in-the-loop control of roll attitude in high performance aircraft. The frequencies of oscillation are typically well beyond those associated with the more familiar pilot-induced oscillation. A structural model of the human pilot which has been employed to provide a unified theory for aircraft handling qualities and pilot-induced oscillations is employed here to provide a theory for the existence of roll-ratchet. It is hypothesized and demonstrated using the structural model that the pilot's inappropriate use of vestibular acceleration feedback can cause this phenomenon, a possibility which has been discussed previously by other researchers. The possible influence of biodynamic feedback on roll ratchet is also discussed.
Author
Aircraft Control; Attitude (Inclination); Roll; Pilot Induced Oscillation; Feedback; Controllability

19980035029 Daimler-Benz Aerospace A.G., Military Aircraft Div., Manching, Germany
Investigations on Handling Qualities and Aerodynamic Characteristics of EUROFIGHTER 2000 at DAIMLER-BENZ AEROSPACE Flight Test Centre
Oelker, Hans-Christoph, Daimler-Benz Aerospace A.G., Germany; Muthsam, Erfried W., Daimler-Benz Aerospace A.G., Germany; Dec. 1997; 12p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Currently the development flight test evaluation of EUROFIGHTER 2000 is under way. The present paper emphasizes on analysis methods for flight mechanical and aerodynamical evaluation suitable for a very agile, highly unstable fighter aircraft at DAIMLER-BENZ AEROSPACE flight test centre. Methods are summarized and illustrated with some representative results. Analysis methods in the time domain such as simulation of flown manoevres and in the frequency domain such as Z-transformation and Fourier analysis methods for system stability evaluations are presented. DASA's aerodynamic parameter identification method is presented. It resembles a unique equation decoupling approach to cope with the problems arising from the analysis of unstable aircraft. Representative results are given, which demonstrate the analysis capabilities of the presented methods.
Author
Qualitative Analysis; Aerodynamic Characteristics; Flight Tests; Fighter Aircraft

19980035030 Daimler-Benz Aerospace A.G., Flight Guidance and Control, Hamburg, Germany
Flight Testing of Manual Flight Control Functions for a Small Transport Aircraft (Project ATTAS-SAFIR)
Heintsch, Thomas, Daimler-Benz Aerospace A.G., Germany; Luckner, Robert, Daimler-Benz Aerospace A.G., Germany; Hahn, Klaus-Uwe, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Dec. 1997; 10p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

In a technology programme DASA has developed Flight Control Laws (FCL) for an electronic flight control system of a small transport aircraft (100-seater). In a cooperation between DASA and DLR, the flight control functions were tested on DLR's VFW614/ATTAS test aircraft. This paper gives an overview of the flight control law development and testing within the SAFIR (Small Airliner Flight Control Law Investigation and Refinement) flight test project. Design objectives of the flight control system for the 100-seater are reviewed, a system overview is given, the flight control law functions are briefly explained and the development process is described. The testing procedure comprises the Small Airliner Flight Investigation and Refinement (SAFIR) experiment integration into the ATTAS test system, the definition of the flight tasks, the flight testing and the evaluation of the flight test results.
Author
Flight Tests; Electronic Control; Transport Aircraft

19980035031 NASA Dryden Flight Research Center, Edwards, CA USA

Evaluation of High-Angle-of-Attack Handling Qualities for the X-31A Using Standard Evaluation Maneuvers

Stoliker, Patrick C., NASA Dryden Flight Research Center, USA; Bosworth, John T., NASA Dryden Flight Research Center, USA; Dec. 1997; 24p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

The X-31A aircraft gross-acquisition and fine-tracking handling qualities have been evaluated using standard evaluation maneuvers developed by Wright Laboratory, Wright Patterson Air Force Base. The emphasis of the testing is in the angle-of-attack range between 30 deg. and 70 deg. Longitudinal gross-acquisition handling qualities results show borderline Level l/Level 2 performance. Lateral gross-acquisition testing results in Level l/Level 2 ratings below 45 deg. angle of attack, degrading into Level 3 as angle of attack increases. The fine tracking performance in both longitudinal and lateral axes also receives Level 1 ratings near 30 deg. angle of attack, with the ratings tending towards Level 3 at angles of attack greater than 50 deg. These ratings do not match the expectations from the extensive close-in combat testing where the X-31A aircraft demonstrated fair to good handling qualities maneuvering for high angles of attack. This paper presents the results of the high-angle-of-attack handling qualities flight testing of the X-31A aircraft. Discussion of the preparation for the maneuvers, the pilot ratings, and selected pilot comments are included. Evaluation of the results is made in conjunction with existing Neal Smith, bandwidth, Smith-Geddes, and military specifications.

Author

Evaluation; Angle of Attack; X-31 Aircraft; Flight Tests; Q Factors

19980036976 NASA Dryden Flight Research Center, Edwards, CA USA

Worst-Case Flutter Margins from F/A-18 Aircraft Aeroelastic Data

Lind, Rick, NASA Dryden Flight Research Center, USA; Brenner, Marty, NASA Dryden Flight Research Center, USA; Apr. 1997; 11p; In English; Structures, Structural Dynamics and Materials Conference, Apr. 1997, Orlando, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA/TM-97-207564; NAS 1.15:207564; AIAA Paper 97-1266; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An approach for computing worst-case flutter margins has been formulated in a robust stability framework. Uncertainty operators are included with a linear model to describe modeling errors and flight variations. The structured singular value, micron, computes a stability margin which directly accounts for these uncertainties. This approach introduces a new method of computing flutter margins and an associated new parameter for describing these margins. The micron margins are robust margins which indicate worst-case stability estimates with respect to the defined uncertainty. Worst-case flutter margins are computed for the F/A-18 SRA using uncertainty sets generated by flight data analysis. The robust margins demonstrate flight conditions for flutter may lie closer to the flight envelope than previously estimated by p-k analysis.

Author

Flutter; Aeroelasticity; Models; Unsteady Aerodynamics; Fourier Analysis

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information see also 14 Ground Support Systems and Facilities (Space).

19980023494 NASA Langley Research Center, Hampton, VA USA

Technical Assessment of the National Full Scale Aerodynamic Complex Fan Blades Repair

Young, Clarence P., Jr., Vigyan Research Associates, Inc., USA; Dixon, Peter G., Advanced Technologies, Inc., USA; St.Clair, Terry L., NASA Langley Research Center, USA; Johns, William E., Washington State Univ., USA; Jan. 1998; 44p; In English

Contract(s)/Grant(s): RTOP 282-10-01-01

Report No.(s): NASA/TM-1998-206932; NAS 1.15:206932; L-17701; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the principal activities of a technical review team formed to address National Full Scale Aerodynamic Complex (NFAC) blade repair problems. In particular, the problem of lack of good adhesive bonding of the composite overwrap to the Hyduliginum wood blade material was studied extensively. Description of action plans and technical elements of the plans are provided. Results of experiments designed to optimize the bonding process and bonding strengths obtained on a full scale blade using a two-step cure process with adhesive primers are presented. Consensus recommendations developed by the review team

in conjunction with the NASA Ames Fan Blade Repair Project Team are provided along with lessons learned on this program. Implementation of recommendations resulted in achieving good adhesive bonds between the composite materials and wooden blades, thereby providing assurance that the repaired fan blades will meet or exceed operational life requirements.
Author
Fan Blades; Adhesive Bonding; Composite Wrapping; Wind Tunnels

19980031728 NASA Lewis Research Center, ClevelandOH USA
Design and Checkout of a High Speed Research Nozzle Evaluation Rig
Castner, Raymond S., NASA Lewis Research Center, USA; Wolter, John D., NASA Lewis Research Center, USA; Oct. 1997; 15p; In English; 36th; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 537-05-21
Report No.(s): NASA-TM-113179; E-10943; NAS 1.15:113179; AIAA Paper 98-0711; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The High Flow Jet Exit Rig (HFJER) was designed to provide simulated mixed flow turbojet engine exhaust for one-seventh scale models of advanced High Speed Research test nozzles. The new rig was designed to be used at NASA Lewis Research Center in the Nozzle Acoustic Test Rig and the 8 x 6 Supersonic Wind Tunnel. Capabilities were also designed to collect nozzle thrust measurement, aerodynamic measurements, and acoustic measurements when installed at the Nozzle Acoustic Test Rig. Simulated engine exhaust can be supplied from a high pressure air source at 33 pounds of air per second at 530 degrees Rankine and nozzle pressure ratios of 4.0. In addition, a combustion unit was designed from a J-58 aircraft engine burner to provide 20 pounds of air per second at 2000 degrees Rankine, also at nozzle pressure ratios of 4.0. These airflow capacities were designed to test High Speed Research nozzles with exhaust areas from eighteen square inches to twenty-two square inches. Nozzle inlet flow measurement is available through pressure and temperature sensors installed in the rig. Research instrumentation on High Speed Research nozzles is available with a maximum of 200 individual pressure and 100 individual temperature measurements. Checkout testing was performed in May 1997 with a 22 square inch ASME long radius flow nozzle. Checkout test results will be summarized and compared to the stated design goals.
Author
Nozzle Flow; Rigging; Exhaust Flow Simulation; Exhaust Nozzles; Multiphase Flow; Flow Measurement; Aircraft Engines; Turbojet Engines; Air Flow; Fixtures; Design Analysis

19980033520 Wright Lab., FII, Wright-Patterson AFB, OH USA
The Use of Technology Demonstrators to Reduce System Acquisition Cost
Moorhouse, David J., Wright Lab., USA; Paul, Donald B., Wright Lab., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 12p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

In the definition and design of a new aircraft system, the choice of technologies to be incorporated is a major decision. Although the latest technology usually yields the maximum (predicted) performance, the readiness of each technology must be carefully assessed. The less the readiness or maturity, the greater the risk to development schedule and cost. There is a premium therefore, on demonstrations that validate the appropriate maturity of each technology. For some things ground demonstration is adequate to reduce the risk to an acceptable level. Some technologies, on the other hand, can only be validated through flight demonstration. Technology flight demonstration programs have been accomplished in many forms, explicit prototype vehicles, the X-plane series from the X-1 to the X-31 and technology demonstrations with an explicit military objective.
Derived from text
Aircraft Design; Flight Tests; Cost Reduction; Prototypes; Costs

19980034683 Naval Postgraduate School, Monterey, CA USA
A Methodology For Improving the Usability of the ANVIS/HUD Computer Based Trainer
Rozelle, Daniel R., Naval Postgraduate School, USA; Mar. 1997; 108p; In English
Report No.(s): AD-A333324; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Computer software has taken an increasingly larger role in the U.S. Navy. It is used in nearly every facet of naval operations, from administrative chores to controlling complex weapons systems. Because of the high cost of software and the potential for inadvertent misuse, it is important that software be easy to use and understand. This thesis explores the methods and techniques available for conducting software usability evaluations. Using one of the methods described in this thesis, actual software usability testing is done on a recently developed computer-based training (CBT) program. The CBT program evaluated in this study is

designed to instruct helicopter pilots in the use of the AN/AVS-7 ANVIS/HUD. The device is an advanced night vision goggle system that is comprised of the AN/AVS-6 ANVIS night vision goggle (NVG) set and a Heads-Up Display (HUD). This thesis describes the usability test conducted on the ANVIS/HUD CBT and establishes a methodology that can be used, not only on future versions of the ANVIS/HUD CBT, but on other PC oriented software. The result of this usability test show that improvement can be made to the navigation method used by the CBT and the presentation of instructional material.
DTIC
Complex Systems; Computer Programs; Computer Techniques; Head-Up Displays; Night Vision; Program Verification (Computers); Training Devices

12
ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

19980024369 NASA Washington, Washington, DC USA
The Cooperative US/Ukrainian Experiment: An Overview
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 290-294; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

In this session, Session FA1, the discussion is focuses on the following topics: History of the Cooperative US/Ukrainian Experiment (CUE); The Collaborative Ukrainian Experiment, Science Overview; Double Fertilization of Inquiring Minds, Teachers and Students Investigating Plants in Space for the Collaborative Ukrainian Experiment; and Mission Operations for the Collaborative Ukrainian Experiment.
CASI
Spaceborne Experiments; Life Sciences; Education

19980025486 Research Inst. for Advanced Computer Science, Moffett Field, CA USA
Automating Mission Scheduling for Space-Based Observatories
Pell, Barney, Research Inst. for Advanced Computer Science, USA; Muscettola, Nicola, RECOM Technologies, Inc., USA; Hansson, Othar, Heuristicrats Research, Inc., USA; Mohan, Sunil, RECOM Technologies, Inc., USA; Mar. 1998; 18p; In English
Contract(s)/Grant(s): NCC2-1006
Report No.(s): NASA/CR-1998-207559; NAS 1.26:207559; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper we describe the use of our planning and scheduling framework, HSTS, to reduce the complexity of science mission planning. This work is part of an overall project to enable a small team of scientists to control the operations of a spacecraft. The present process is highly labor intensive. Users (scientists and operators) rely on a non-codified understanding of the different spacecraft subsystems and of their operating constraints. They use a variety of software tools to support their decision making process. This paper considers the types of decision making that need to be supported/automated, the nature of the domain constraints and the capabilities needed to address them successfully, and the nature of external software systems with which the core planning/scheduling engine needs to interact. HSTS has been applied to science scheduling for EUVE and Cassini and is being adapted to support autonomous spacecraft operations in the New Millennium initiative.
Author
Extreme Ultraviolet Explorer Satellite; Scheduling; Mission Planning

13
ASTRODYNAMICS

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

19980029680 George Washington Univ., Joint Inst. for Advancement of Flight Sciences, Hampton, VA USA
Methods to Improve the Maintenance of the Earth Catalog of Satellites During Severe Solar Storms
Wilkin, Paul G., George Washington Univ., USA; Tolson, Robert H., George Washington Univ., USA; Mar. 1998; 124p; In English
Contract(s)/Grant(s): NCC1-104; RTOP 963-89-00-01
Report No.(s): NASA/CR-1998-206934; NAS 1.26:206934; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The objective of this thesis is to investigate methods to improve the ability to maintain the inventory of orbital elements of Earth satellites during periods of atmospheric disturbance brought on by severe solar activity. Existing techniques do not account

for such atmospheric dynamics, resulting in tracking errors of several seconds in predicted crossing time. Two techniques are examined to reduce of these tracking errors. First, density predicted from various atmospheric models is fit to the orbital decay rate for a number of satellites. An orbital decay model is then developed that could be used to reduce tracking errors by accounting for atmospheric changes. The second approach utilizes a Kalman filter to estimate the orbital decay rate of a satellite after every observation. The new information is used to predict the next observation. Results from the first approach demonstrated the feasibility of building an orbital decay model based on predicted atmospheric density. Correlation of atmospheric density to orbital decay was as high as 0.88. However, it is clear that contemporary: atmospheric models need further improvement in modeling density perturbations polar region brought on by solar activity. The second approach resulted in a dramatic reduction in tracking errors for certain satellites during severe solar Storms. For example, in the limited cases studied, the reduction in tracking errors ranged from 79 to 25 percent.
Author
Catalogs (Publications); Orbital Elements; Atmospheric Models; Satellites; Atmospheric Physics; Solar Activity

19980035472 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA
Orbit Estimation Using Track Compression and Least Squares Differential Correction
Chioma, Vincent J., Air Force Inst. of Tech., USA; Dec. 1997; 152p; In English
Report No.(s): AD-A335600; AFIT/GA/ENY/97D-1; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This thesis develops two methods of compressing a track of radar observations of a satellite into a single state vector and associated covariance matrix, and a method of estimating orbits using results from multiple tracks. The track compression uses least squares differential correction to determine a state vector at the central observation time. The resulting state vectors and covariance matrices are then used to estimate the satellite's orbit, also using least squares differential correction. Numerical integration using two-body, J2 and an atmospheric drag model is used to represent the dynamics. This orbit estimation produces a state vector which includes the ballistic coefficient, as well as an associated covariance matrix. Finally, a one-fiftieth scale demonstration of the full AFSPC catalog of satellites and debris is conducted to demonstrate the improvement in accuracy over current practice which results. The truth model includes J2 zonal harmonic effects and an atmospheric drag model. This demonstration shows that the orbits of 90% of the entire catalog of objects can be estimated with sufficient accuracy to allow position determination within one kilometer after only two days of tracking. Within four days, most satellite positions are determined within fifty meters.
DTIC
Orbit Calculation; Radar Tracking; State Vectors; Artificial Satellites; Least Squares Method

19980036922 National Space Development Agency, Systems Engineering Dept., Tokyo, Japan
Design and Analysis of Phobos-Rendezvous Orbit
Utashima, Masayoshi,, National Space Development Agency, Japan; Journal of the Japan Society for Aeronautical and Space Sciences; Dec. 1997; Volume 44, No. 506; 24p; In English; Translated into English by NASDA
Report No.(s): NASDA-ETR-970005; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

A new orbit for the global observation of Phobos, the first satellite of Mars, is presented in this paper. It is shown that the global survey of Phobos with both the high resolution of about 1 m and various solar phase angles can be made during the period of one Martian year from this new orbit. That orbit is named here as "Phobos-Rendezvous Orbit." The gravity from Phobos plays a significant role for the global observation with almost no fuel. This orbit, however, is adjacent to an instable one. Increment of the inclination of the rendezvous orbit puts the orbit into the instable region. Simulation of the stabilization maneuvers indicates that the Phobos-Rendezvous Orbit can be maintained with small amount of fuel.
Author
Design Analysis; Phobos; Orbit Calculation; High Resolution

19980036923 National Space Development Agency, On-orbit Systems Lab., Tokyo, Japan
Study on Orbits of Spacecraft Around Asteroids
Utashima, Masayoshi, National Space Development Agency, Japan; Dec. 1997; 44p; In English; Translated into English by NASDA
Report No.(s): NASDA-ETR-970003; NASDA-TMR-960002; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

This paper presents the first step results of the study on orbits around asteroids, primary purpose of which is to observe asteroids globally with high resolution. In this paper, all the asteroids, whose sizes (maximum radii) are below 100 km and whose orbit

radii are between 1.5 AU and 3 AU, are the objects for the study. The orbits of asteroids are approximated to be circular. The altitude of the spacecraft's orbit is limited to be greater than 2 times of the radius of asteroids in order to avoid the significant instability due to the irregular shape of asteroids. At first, the feasible region of the frozen orbit, which can be realized in case that the solar radiation pressure alone is the perturbation, was studied. There exist two kinds of the frozen orbits, one is the orbit in the orbital plane of the asteroid and feasible for the asteroid's radius of 20 km - 50 km, the other is the solar plane-of- sky orbit and feasible for the asteroid's radius below 2 or 3 km. The orbit in the orbital plane is not adequate for the observation with high resolution because of the large altitude. To lessen the altitude makes the effects of the asteroid's oblateness large, and breaks the frozen orbit. It is possible to maintain the frozen orbit by cancelling the orbital change due to the oblateness by maneuvers. About 100 m/s is necessary for the orbital maintenance during one year in the orbit with the semi-major axis of 3 times asteroid's radius. The polar orbit which is adequate for the global observation of asteroids was studied. The polar orbit has the merit that the effects of the oblateness disappear. The maintenance of the polar orbit requires only making the eccentricity zero, and the necessary velocity increment for one year maintenance is less than 1 m/s. The polar orbit is superior in the sense of observation, fuel cost, and operations. The polar orbit maintenance was investigated by the numerical integrations of the variation rate of the averaged orbital elements due to the radiation pressure and the oblateness. When C(sup p)/(C(sub s)(e(sub limit)))(C(sub p) is the characteristic angular velocity by the radiation pressure, C(sub s) is the characteristic angular velocity by the oblateness, and e(sub limit) is the maintenance limit of the eccentricity) is larger than about one, the eccentricity maneuvers whose intervals are about 50 - 150 days (in case of e(sub limit) = 0.1) can maintain the polar orbit. When C(sub p)/(C(sub s)e(sub limit)) is smaller than about one, the change of the eccentricity is small and the maintenance maneuvers are not necessary. When the eccentricity maneuvers are necessary, it is possible to realize that the ascending node returns to the initial value at the next maneuver time. The inclination, however, does not return and the deviation of the inclination will increase. The orbital plane maintenance of about one year interval may be required. When the eccentricity maneuvers are not necessary, the deviation of the orbital plane during 1000 days is about several degrees and the orbital plane maintenance is not necessary.
Author
Orbital Elements; Spacecraft Guidance; Asteroids; Experimentation

19980036987 Texas Univ., Austin, TX USA
Global Resonance Effects On Deep Space Orbits
Szebehely, V., Texas Univ., USA; Zare, K., Texas Univ., USA; Boyce, W., Texas Univ., USA; Mar. 10, 1997; 8p; In English
Contract(s)/Grant(s): F49620-96-I-0002
Report No.(s): AD-A336150; AFRL-SR-BL-TR-98-0122; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The initial objective was the proof of the concept, which was accomplished with the following steps: (1) Assume a potential model as the truth potential, e.g., a simple potential with 1000 mass points; (2) Generate truth satellite orbits from the potential of Step 1; (3) Using the orbits from Step 2, extract observations. These observations of the truth model may be used to calculate a best alternate potential model in a least squares sense. The alternate model is a point mass model with 100, 200, 500, etc. total mass pointsand (4) Compare the orbits generated from the model potential with the orbits generated from the truth potential. As was reported in September 1996, the proof of the concept phase did validate or refine most of the basic ideas and suggested a clearer future course of action.
DTIC
Satellite Orbits; Deep Space; Resonance; Solar Orbits; Elliptical Orbits

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment; e.g., mobile transporters; and simulators. For related information see also 09 Research and Support Facilities (Air).

19980036920 National Space Development Agency, Space Experiment Dept., Tokyo, Japan
Electrostatic Levitator Furnace for Japanese Experiment Module
Tsuchiya, Yoshikazu, National Space Development Agency, Japan; Murakami, Keiji, National Space Development Agency, Japan; Yuzawa, Mari, Mitsubishi Electric Corp., Japan; Awa, Yuji, Mitsubishi Electric Corp., Japan; Gotoh, Yoshifumi, Mitsubishi Electric Corp., Japan; Shimada, Sadanori, Mitsubishi Electric Corp., Japan; Yoshizawa, Kenji, Mitsubishi Electric Corp., Japan; Tsukishima, Chihiro, Mitsubishi Electric Corp., Japan; Shimoji, Haruhiko, Mitsubishi Electric Corp., Japan; Tamagawa, Yasuhisa, Mitsubishi Electric Corp., Japan; Journal of the Japan Society of Microgravity Application; Dec. 1997; Volume 13, No. 1; 12p; In English; Translated into English by NASDA

Report No.(s): NASDA-ETR-970015; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

An electrostatic Levitator Furnace (ELF) for Japanese Experiment Module of Space Station is now under development. This electrostatic levitator furnace consists of heating section, positioning section, observation section, atmosphere control section and automatic sample-exchange robotics. In ELF, samples will be heated by four lasers, and each laser power can be controlled independently, which enables both uniform and nonuniform heating. The charged samples are positioned between electrodes, and their position-control is achieved by changing electrode voltages in accordance with position signals from detectors. ELF has three equipments for observing samples during processing, which are a pyrometer, a thermal imaging system and a video camera. ELF can provide containerless processing under micro-gravity environment for various materials including metals, glass, ceramics, and so on. This report describes the features, expected environment for processing and development status of ELF.
Author

Electrostatics; Cameras; Levitation; Japanese Space Program; Space Processing; Spacecraft Modules; Furnaces

15
LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information see also 20 Spacecraft Propulsion and Power.

19980025465 NASA Marshall Space Flight Center, Huntsville, AL USA
Low Cost Large Core Vehicle Structures Assessment ***Final Report, Nov. 1997 - Mar. 1998***
Hahn, Steven E., NASA Marshall Space Flight Center, USA; Mar. 13, 1998; 114p; In English
Contract(s)/Grant(s): NASA Order H-28971-D
Report No.(s): NASA/CR-1998-207345; NAS 1.26:207345; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Boeing Information, Space, and Defense Systems executed a Low Cost Large Core Vehicle Structures Assessment (LCLCVSA) under contract to NASA Marshall Space Flight Center (MSFC) between November 1997 and March 1998. NASA is interested in a low-cost launch vehicle, code named Magnum, to place heavy payloads into low earth orbit for missions such as a manned mission to Mars, a Next Generation Space Telescope, a lunar-based telescope, the Air Force's proposed space based laser, and large commercial satellites. In this study, structural concepts with the potential to reduce fabrication costs were evaluated in application to the Magnum Launch Vehicle (MLV) and the Liquid Fly Back Booster (LFBB) shuttle upgrade program. Seventeen concepts were qualitatively evaluated to select four concepts for more in-depth study. The four structural concepts selected were: an aluminum-lithium monocoque structure, an aluminum-lithium machined isogrid structure, a unitized composite sandwich structure, and a unitized composite grid structure. These were compared against a baseline concept based on the Space Shuttle External Tank (ET) construction. It was found that unitized composite structures offer significant cost and weight benefits to MLV structures. The limited study of application to LFBB structures indicated lower, but still significant benefits. Technology and facilities development roadmaps to prepare the approaches studied for application to MLV and LFBB were constructed. It was found that the cost and schedule to develop these approaches were in line with both MLV and LFBB development schedules. Current Government and Boeing programs which address elements of the development of the technologies identified are underway. It is recommended that NASA devote resources in a timely fashion to address the specific elements related to MLV and LFBB structures.
Author

Launch Vehicles; Low Cost; Composite Structures; Spacecraft Structures

19980025467 New Technology, Inc., Huntsville, AL USA
Bantam System Technology Project ***Final Report, 19 Aug. 1997 - 19 Feb. 1998***
Moon, J. M., New Technology, Inc., USA; Beveridge, J. R., New Technology, Inc., USA; Feb. 19, 1998; 54p; In English
Contract(s)/Grant(s): NAS8-97319
Report No.(s): NASA/CR-1998-207436; NAS 1.26:207436; FR1005; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report focuses on determining a best value, low risk, low cost and highly reliable Data and Command System for support of the launch of low cost vehicles which are to carry small payloads into low earth orbit. The ground-based DCS is considered as a component of the overall ground and flight support system which includes the DCS, flight computer, mission planning system and simulator. Interfaces between the DCS and these other component systems are considered. Consideration is also given to the operational aspects of the mission and of the DCS selected. This project involved: defining requirements, defining an efficient

operations concept, defining a DCS architecture which satisfies the requirements and concept, conducting a market survey of commercial and government off-the-shelf DCS candidate systems and rating the candidate systems against the requirements/concept. The primary conclusions are that several low cost, off-the-shelf DCS solutions exist and these can be employed to provide for very low cost operations and low recurring maintenance cost. The primary recommendation is that the DCS design/specification should be integrated within the ground and flight support system design as early as possible to ensure ease of interoperability and efficient allocation of automation functions among the component systems.
Author
Spacecraft Launching; Ground Support Systems; Data Systems

19980030797 NERAC, Inc., Tolland, CT USA
Launch Vehicles. (Latest citations from the NTIS Bibliographic Database)
Dec. 1997; In English; Page count unavailable.
Report No.(s): PB98-851447; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, development, manufacture, and performance of launch vehicles used to transport a variety of military and commercial satellites for weather, navigation, communication, and surveillance. Topics include extendable launch vehicles, flight evaluation reports, flight problems and solutions, flight control and stability, space shuttles and missions, and the development of advanced launch vehicles. References also discuss cost and weight reduction, economic aspects, chemical contamination, launch vehicle accidents, and natural hazards. Reusable launch vehicles are reviewed in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Launch Vehicles

19980036643 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Optimal Non-Coplanar Launch to Quick Rendezvous
Sears, Gregory B., Air Force Inst. of Tech., USA; Dec. 1997; 79p; In English
Report No.(s): AD-A335740; AFIT/GSO/ENY/97D-03; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this study was to determine the feasibility of launching a Delta Clipper-like vehicle on an optimal, non-coplanar trajectory to rendezvous with an earth orbiting object in one orbit or less. The focus of the research was to determine what such a trajectory would look like, and to determine the cost, in payload mass, of flying such a trajectory. A model for the ascent trajectory was developed using the dynamics equations of motion, an atmosphere model, and an aerodynamic model for the DC-Y concept vehicle. A boundary value problem was posed and solved for a coplanar rendezvous. The non-coplanar solutions were obtained through extrapolation from the coplanar solution.
DTIC
Rendezvous Trajectories; Delta Clipper; Earth Orbits; Equations of Motion; Boundary Value Problems; Launching

16
SPACE TRANSPORTATION

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

19980027610 NASA Kennedy Space Center, Cocoa Beach, FL USA
Debris/Ice/TPS Assessment and Integrated Photographic Analysis of Shuttle Mission STS-89 ***Final Report, 20-31 Jan. 1998***
Katnik, Gregory N., NASA Kennedy Space Center, USA; Mar. 1998; 110p; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj. OMRSOOUO
Report No.(s): NASA/TM-1998-207684; NAS 1.15:207684; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A debris/ice/thermal protection system assessment and integrated photographic analysis was conducted for Shuttle mission STS-89. Debris inspections of the flight element and launch pad were performed before and after launch. Icing conditions on the External Tank were assessed by the use of computer programs and infrared scanned data during cryogenic loading of the vehicle, followed by on-pad visual inspection. High speed photography of the launch was analyzed to identify ice/debris sources and evalu-

ate potential vehicle damage and/or in-flight anomalies. This report documents the ice/debris/thermal protection systems conditions and integrated photographic analysis of Space Shuttle mission STS-89 and the resulting effect on the Space Shuttle Program. Author

Ice Formation; Space Debris; External Tanks; Postflight Analysis; Preflight Analysis; Thermal Protection; Photographic Recording; Space Shuttle Boosters; Space Shuttles; Damage Assessment; Spacecraft Launching; Endeavour (Orbiter)

19980032333 NASA Johnson Space Center, Houston, TX USA

STS-89 Day 01 Highlights

Jan. 23, 1998; In English; Videotape: 15 min. 7 sec. in playing time, in color, with sound

Report No.(s): NASA/TM-98-207507; BRF-1413A; NONP-NASA-VT-1998074671; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this first day of the STS-89 mission, the flight crew, Cmdr. Terrence W. Wilcutt, Pilot Frank Edwards, and Mission Specialists Michael P. Anderson, James F. Reilly, Bonnie J. Dunbar, Salizhan Shakirovich Sharipov, David A. Wolf and Andrew S.W. Thomas, can be seen performing pre-launch activities such as eating the traditional breakfast, crew suit-up, and the ride out to the launch pad. Also, included are various panoramic views of the shuttle on the pad. The crew is readied in the 'white room' for their mission. After the closing of the hatch and arm retraction, launch activities are shown including countdown, engine ignition, launch, and the separation of the Solid Rocket Boosters.

CASI

Space Transportation System Flights; Spacecrews; Launching; Booster Rocket Engines; Space Flight; Space Missions; Space Shuttles

19980032959 NASA Johnson Space Center, Houston, TX USA

STS-89 Day 09 Highlights

Jan. 30, 1998; In English; Videotape: 13 min. 31 sec. playing time, in color, with sound

Report No.(s): NASA/TM-98-207506; BRF-1413I; NONP-NASA-VT-1998074670; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this ninth day of the STS-89 mission, the flight crew, Cmdr. Terrence W. Wilcutt, Pilot Frank Edwards, and Mission Specialists Michael P. Anderson, James F. Reilly, Bonnie J. Dunbar, Salizhan Shakirovich Sharipov, David A. Wolf and Andrew S.W. Thomas, prepare for the reentry phase of their mission. Bonnie Dunbar than gives a tour of the space shuttle.

CASI

Space Shuttle Missions; Space Transportation System Flights; Space Transportation System; Spacecrews; Microgravity

19980032960 NASA Johnson Space Center, Houston, TX USA

STS-89 Day 03 Highlights

Jan. 24, 1998; In English; Videotape: 19 min. 5 sec. playing time, in color, with sound

Report No.(s): NASA/TM-98-207509; BRF-1413C; NONP-NASA-VT-1998074673; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this third day of the STS-89 mission, the flight crew, Cmdr. Terrence W. Wilcutt, Pilot Frank Edwards, and Mission Specialists Michael P. Anderson, James F. Reilly, Bonnie J. Dunbar, Salizhan Shakirovich Sharipov, David A. Wolf and Andrew S.W. Thomas, can be seen performing a flawless docking with the Mir. The linkup occurred while the two spaceships flew over southeastern Russia, west of Kazakhstan. After the docking the two crews open the entry hatch and great each other.

CASI

Space Transportation System Flights; Spacecraft Docking; Spacecrews; Space Rendezvous; Mir Space Station; Crew Experiment Stations

19980033342 NASA Johnson Space Center, Houston, TX USA

STS-85 Mission Highlights Resources Tape

Nov. 12, 1997; In English; Videotape: 57 min. 13 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-206067; JSC-1666; NONP-NASA-VT-1997087432; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

The flight crew of STS-85, Cmdr. Curtis L. Brown, Jr., Pilot Kent V. Rominger, Payload Cmdr. N. Jan Davis (Ph.D.), Mission Specialists Robert L. Curbeam, Jr. and Stephen K. Robinson (Ph.D.), and Payload Specialist Bjarni V. Tryggvason, present an

overview of their mission. During the pre-launch activities the shuttle is shown being mated to the external tank and Solid Rocket Boosters (SRBs). Also included: is the arrival of the crew at the Kennedy Space Center (KSC), their suit-up, the crew being transported to the pad, being strapped in, and launch control activities. The launch includes the count down, main engine start-up, SRB start-up, the launch, the roll maneuver and SRB separation. Once the crew is in orbit, they deploy the CRISTA-SPAS payload and conduct various micro-gravity experiments. In the last part of the video the crew is seen preparing for the landing phase of the mission.
CASI
Space Shuttle Missions; Space Shuttle Orbiters; Space Transportation System Flights; Solid Propellant Rocket Engines; Payload Retrieval (STS); Payload Delivery (STS)

19980033343 NASA Johnson Space Center, Houston, TX USA
STS-85 Postflight Presentation
Sep. 20, 1997; In English; Videotape: 52 min. 30 sec. playing time, in color, with sound
Report No.(s): NASA/TM-97-206204; JSC-1665; NONP-NASA-VT-1997058833; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

The flight crew of STS-85, Cmdr. Curtis L. Brown, Jr., Pilot Kent V. Rominger, Payload Cmdr. N. Jan Davis (Ph.D.), Mission Specialists Robert L. Curbeam, Jr. and Stephen K. Robinson (Ph.D.), and Payload Specialist Bjarni V. Tryggvason, present an overview of their mission. Events shown include pre-launch preparations, launch activities, on orbit activation of various experiments, and the return and landing of the shuttle at Kennedy Space Center (KSC). In the second part of the presentation the astronauts describe the still pictures that were taken during the mission.
CASI
Space Shuttle Missions; Space Shuttle Orbiters; Space Transportation System; Space Shuttle Payloads; Space Transportation System Flights

19980033933 NASA Johnson Space Center, Houston, TX USA
STS-89 Day 08 Highlights
Jan. 29, 1998; In English; Videotape: 12 min. 48 sec. playing time, in color, with sound
Report No.(s): NASA/TM-98-207505; BRF-1413H; NONP-NASA-VT-1998074669; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this eighth day of the STS-89 mission, the flight crew, Cmdr. Terrence W. Wilcutt, Pilot Frank Edwards, and Mission Specialists Michael P. Anderson, James F. Reilly, Bonnie J. Dunbar, Salizhan Shakirovich Sharipov, David A. Wolf and Andrew S.W. Thomas, prepare to conclude their joint mission with the crew of the Mir. Endeavour separates from the Russian Space Station with a gentle push from springs in the docking mechanism attaching it to the Space Station. Following a flyaround of the station to gather additional photography of the outpost, Pilot Joe Edwards conducts a final separation maneuver to allow Endeavour to drift away from the Mir.
CASI
Space Transportation System Flights; Spacecraft Docking; Spacecrews; Space Shuttle Missions; Mir Space Station; Earth Observations (From Space)

19980034852 NASA Johnson Space Center, Houston, TX USA
STS-89 Day 02 Highlights
Jan. 23, 1998; In English; Videotape: 14 min. 5 sec. playing time, in color, with sound
Report No.(s): NASA/TM-98-207508; BRF-1413B; NONP-NASA-VT-1998074672; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this second day of the STS-89 mission, the flight crew, Cmdr. Terrence W. Wilcutt, Pilot Frank Edwards, and Mission Specialists Michael P. Anderson, James F. Reilly, Bonnie J. Dunbar, Salizhan Shakirovich Sharipov, David A. Wolf and Andrew S.W. Thomas, take time from their schedule to discuss with radio station KNX of Los Angeles the STS-89 mission and Thomas' transfer to the Mir Space Station.
CASI
Space Transportation System Flights; Mir Space Station; Space Flight; Spacecrews; Orbital Maneuvers; Orbital Rendezvous

19980036925 National Space Development Agency, Office of Space Transportation Systems, Tokyo, Japan

Wind Tunnel Testing for Spaceplane Development

Hozumi, Kohichi, National Aerospace Lab., Japan; Akimoti, Toshio, National Space Development Agency, Japan; Katsurahara, Tadashi, Mitsubishi Heavy Industries Ltd., Japan; Design Engineering; Dec. 1997; Volume 30, No. 9; 30p; In English; Translated into English by NASDA

Report No.(s): NASDA-ETR-970009; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

In Japan, the National Space Development Agency and National Aerospace Laboratory take the initiative in studying the development of a spaceplane named HOPE (standing for H-II Orbiting Plane) which they aim to fly sometime between the late 1990s and early 2000s. The HOPE is an unmanned winged spaceplane to be launched by an H-II rocket or an enhanced H-II evolution type rocket; its major tasks are transporting supplies to and recovering space stations in earth orbits. It is a reusable airframe that, after finishing these tasks, reenters the atmosphere, glides in and lands at a ground landing site like an airplane. The HOPE is mounted at the tip of an H-II rocket and launched; after completing its tasks in orbit, it reenters the atmosphere and ultimately lands on a runway by gliding like an ordinary airplane. For this reason, an airframe must be embodied that meets various design requirements corresponding to these flight phases. In addition, the conventional airplane development approach in which the flight domain is enlarged step-by-step by confirming the airplane's performance through preliminary flight tests cannot be applied to the HOPE; instead, it is required to exclude as many uncertain elements related to flight as possible at the development stage or to construct an autopilot system in anticipation of these elements. The flight domain extends from the ground to space, and the flight velocity covers a wide range from a hypersonic velocity immediately after the reentry into the atmosphere, reaching about Mach 30, to subsonic velocities. Experience of developing a hypersonic winged airplane is virtually nonexistent in Japan. The precision of estimating aerodynamic characteristics and aerodynamic heating characteristics of an actual spaceplane affects the integrity of an airframe system; therefore, the research and development activities have been focused on this area. In the present paper, the authors specifically describe the roles that wind tunnel testing plays in developing a spaceplane and the progress of designing a spaceplane, including aspects of computational fluid dynamics (CFD) and flight experiments and enumeration of technological problems to be addressed in the future.

Author

Wind Tunnel Tests; Aerodynamic Characteristics; Temperature Effects; Computational Fluid Dynamics; Automatic Pilots

19980036962 NASA Langley Research Center, Hampton, VA USA

Nonlinear Analysis of the Space Shuttle Superlightweight LO2 Tank, Part 2, Behavior Under 3g End-of-Flight Loads

Nemeth, Michael P., NASA Langley Research Center, USA; Young, Richard D., NASA Langley Research Center, USA; Collins, Timothy J., NASA Langley Research Center, USA; Starnes, James H.,Jr., NASA Langley Research Center, USA; 1998; 14p; In English; Structures, Structural Dynamics, and Material Conference, 20-23 Apr. 1998, Long Beach, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA/TM-1998-207287; NAS 1.15:207287; AIAA Paper 98-1839; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results of linear bifurcation and nonlinear analyses of the Space Shuttle super lightweight (SLWT) external liquid-oxygen (LO2) tank are presented for an important end-of-flight loading condition. These results illustrate an important type of response mode for thin-walled shells, that are subjected to combined mechanical and thermal loads, that may be encountered in the design of other liquid-fuel launch vehicles. Linear bifurcation analyses are presented that predict several nearly equal eigenvalues that correspond to local buckling modes in the aft dome of the LO2 tank. In contrast, the nonlinear response phenomenon is shown to consist of a short-wavelength bending deformation in the aft elliptical dome of the LO2 tank that grows in amplitude in a stable manner with increasing load. Imperfection sensitivity analyses are presented that show that the presence of several nearly equal eigenvalues does not lead to a premature general instability mode for the aft dome. For the linear bifurcation and nonlinear analyses, the results show that accurate predictions of the response of the shell generally require a large-scale, high fidelity finite-element model. Results are also presented that show that the SLWT LO2 tank can support loads in excess of approximately 1.9 times the values of the operational loads considered.

Official Gazzette of the U.S. Patent and Trademark

Nonlinearity; Space Shuttles; External Tanks; Liquid Oxygen; Deformation; Defects; Bending

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout. For related information see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

19980036340 NASA Langley Research Center, Hampton, VA USA
Application of Finite Element Method to Analyze Inflatable Waveguide Structures
Deshpande, M. D., Vigyan Research Associates, Inc., USA; Feb. 1998; 60p; In English
Contract(s)/Grant(s): NAS1-19341; RTOP 522-11-41-02
Report No.(s): NASA/CR-1998-206928; NAS 1.26:206928; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A Finite Element Method (FEM) is presented to determine propagation characteristics of deformed inflatable rectangular waveguide. Various deformations that might be present in an inflatable waveguide are analyzed using the FEM. The FEM procedure and the code developed here are so general that they can be used for any other deformations that are not considered in this report. The code is validated by applying the present code to rectangular waveguide without any deformations and comparing the numerical results with earlier published results. The effect of the deformation in an inflatable waveguide on the radiation pattern of linear rectangular slot array is also studied.
Author
Finite Element Method; Rectangular Waveguides; Inflatable Structures; Electromagnetic Fields; Waveguide Antennas

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. 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.

19980024671 Meteorological Satellite Center, Tokyo, Japan
Meteorological Satellite Center Technical Note, No. 34
Dec. 1997; ISSN 0388-9653; 48p; In English; In Japanese
Report No.(s): MSC-TN-34; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Multi-functional Transport Satellite (MTSAT) will be launched in geostationary orbit at 140 east longitude around August 1999. MTSAT has two functions; one is for meteorological services in Japan Meteorological Agency (JMA) and the other for air-traffic control services in the Civil Aviation Bureau, Ministry of Transport of Japan. The Preliminary Design Review of MTSAT was held in December 1995 and the Critical Design Review was held in October 1996. This report describes the design performance of the imaging function of MTSAT.
Author
Meteorological Satellites; Geosynchronous Orbits; Design Analysis; Imaging Techniques; Air Traffic Control; Civil Aviation

19980025560 RAND Corp., Santa Monica, CA USA
Proceedings of the RAND Project AIR FORCE Workshop on Transatmospheric Vehicles
Gonzalez, Daniel, RAND Corp., USA; Eisman, Mel, RAND Corp., USA; Shipbaugh, Calvin, RAND Corp., USA; Bonds, Timothy, RAND Corp., USA; Le, Anh Tuan, RAND Corp., USA; Jan. 1997; 115p; In English; AIR FORCE Workshop on Transatmospheric Vehicles, 18-19 Apr. 1995, Santa Monica, CA, USA
Report No.(s): AD-A333343; RAND-MR-890-AF; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Transatmospheric vehicles (TAVs) are envisioned as a new type of reusable launch vehicle that could insert payloads into low earth orbit or deliver them to distant targets within minutes. Such a vehicle may be able to carry out several types of military, civil, and commercial missions. In past decades, a number of military TAV concepts have been proposed, but a complete operational vehicle has never been built. The promise of TAVs is that because of their reusability they could launch payloads at much lower cost than existing rockets. In addition, if they were operated more like aircraft and less like rockets, they could enable respon-

sive and flexible space operations, features that would be useful for a number of military missions. This report summarizes the proceedings of a workshop and subsequent research into questions raised at the workshop. We examine potential missions and their implications for vehicle design, cost, and size. A variety of contractor TAV design concepts were presented and discussed, including designs currently being developed for the N ASA X-33 and X-34 programs.
DTIC
Transatmospheric Vehicles; Design to Cost; Low Earth Orbits; Reusable Launch Vehicles

19980027029 Massachusetts Inst. of Tech., Space Engineering Research Center, Cambridge, MA USA
Uncertainty Modeling for Structural Control Analysis and Synthesis
Campbell, Mark E., Massachusetts Inst. of Tech., USA; Crawley, Edward F., Massachusetts Inst. of Tech., USA; Jan. 1996; 162p; In English
Contract(s)/Grant(s): NAS1-18690; NAS1-19622; NAG1-1717
Report No.(s): NASA/CR-96-207556; NAS 1.26:207556; SERC-2-96; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The development of an accurate model of uncertainties for the control of structures that undergo a change in operational environment, based solely on modeling and experimentation in the original environment is studied. The application used throughout this work is the development of an on-orbit uncertainty model based on ground modeling and experimentation. A ground based uncertainty model consisting of mean errors and bounds on critical structural parameters is developed. The uncertainty model is created using multiple data sets to observe all relevant uncertainties in the system. The Discrete Extended Kalman Filter is used as an identification/parameter estimation method for each data set, in addition to providing a covariance matrix which aids in the development of the uncertainty model. Once ground based modal uncertainties have been developed, they are localized to specific degrees of freedom in the form of mass and stiffness uncertainties. Two techniques are presented: a matrix method which develops the mass and stiffness uncertainties in a mathematical manner; and a sensitivity method which assumes a form for the mass and stiffness uncertainties in macroelements and scaling factors. This form allows the derivation of mass and stiffness uncertainties in a more physical manner. The mass and stiffness uncertainties of the ground based system are then mapped onto the on-orbit system, and projected to create an analogous on-orbit uncertainty model in the form of mean errors and bounds on critical parameters. The Middeck Active Control Experiment is introduced as experimental verification for the localization and projection methods developed. In addition, closed loop results from on-orbit operations of the experiment verify the use of the uncertainty model for control analysis and synthesis in space.
Author
Structural Analysis; Structural Design; Feedback Control; Matrices (Mathematics); Matrix Methods; Active Control; Error Analysis

19980027604 George Washington Univ., Joint Inst. for Advancement of Flight Sciences, Hampton, VA USA
Development of a Simulation Capability for the Space Station Active Rack Isolation System
Johnson, Terry L., George Washington Univ., USA; Tolson, Robert H., George Washington Univ., USA; Mar. 1998; 190p; In English
Contract(s)/Grant(s): NCC1-104; RTOP 963-89-00-01
Report No.(s): NASA/CR-1998-206942; NAS 1.26:206942; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

To realize quality microgravity science on the International Space Station, many microgravity facilities will utilize the Active Rack Isolation System (ARIS). Simulation capabilities for ARIS will be needed to predict the microgravity environment. This paper discusses the development of a simulation model for use in predicting the performance of the ARIS in attenuating disturbances with frequency content between 0.01 Hz and 10 Hz. The derivation of the model utilizes an energy-based approach. The complete simulation includes the dynamic model of the ISPR integrated with the model for the ARIS controller so that the entire closed-loop system is simulated. Preliminary performance predictions are made for the ARIS in attenuating both off-board disturbances as well as disturbances from hardware mounted onboard the microgravity facility. These predictions suggest that the ARIS does eliminate resonant behavior detrimental to microgravity experimentation. A limited comparison is made between the simulation predictions of ARIS attenuation of off-board disturbances and results from the ARIS flight test. These comparisons show promise, but further tuning of the simulation is needed.
Author
Microgravity; Vibration Damping; Computerized Simulation; Platforms

19980029679 George Washington Univ., Joint Inst. for Advancement of Flight Sciences, Hampton, VA USA

Magellan Aerodynamic Characteristics During the Termination Experiment Including Thruster Plume-Free Stream Interaction

Cestero, Francisco J., George Washington Univ., USA; Tolson, Robert H., George Washington Univ., USA; Mar. 1998; 117p; In English

Contract(s)/Grant(s): NCC1-104; RTOP 242-80-01-01

Report No.(s): NASA/CR-1998-206940; NAS 1.26:206940; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Results are presented on the aerodynamic characteristics of the Magellan spacecraft during the October 1994 Termination Experiment, including the effects of the thruster engine exhaust plumes upon the molecular free stream around the spacecraft and upon the aerodynamics coefficients. As Magellan passed through the Venusian atmosphere, the solar arrays were turned in opposite directions relative to the free stream creating a torque on the spacecraft. The spacecraft control system was programmed to counter the effects of this torque with attitude control engines to maintain an inertially fixed attitude. The orientation and reaction engine telemetry returned from Magellan are used to create a model of the aerodynamic torques. Geometric models of the Magellan spacecraft are analyzed with the aid of both free molecular and Direct Simulation Monte Carlo codes. The simulated aerodynamic torques determined are compared to the measured torques. The Direct Simulation Monte Carlo method is also used to model the attitude engine exhaust plumes, the free stream disturbance caused by these plumes, and the resulting torques acting on the spacecraft compared to no-exhaust plume cases. The effect of the exhaust plumes was found to be sufficiently large that thrust reversal is possible.

Author

Magellan Spacecraft (NASA); Aerodynamic Characteristics; Turbulent Flow; Exhaust Gases; Thrust Reversal; Free Flow; Plumes

19980031729 NASA Lewis Research Center, ClevelandOH USA

Effect of Intercalation in Graphite Epoxy Composites on the Shielding of High Energy Radiation

Gaier, James R., NASA Lewis Research Center, USA; Hardebeck, Wendie, Manchester Coll., USA; Bunch, Jennifer R. Terry, Manchester Coll., USA; Davidson, Michelle L., Manchester Coll., USA; Beery, Dwight B., Manchester Coll., USA; Jul. 1997; 10p; In English

Contract(s)/Grant(s): NCC3-317; RTOP 233-1A-1K

Report No.(s): NASA-TM-107413; E-10648; NAS 1.15: 107413; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The mass absorption coefficients of 13.0 keV x-rays, 46.5 keV gamma-rays, and 1.16 MeV beta particles have been measured for aluminum and for pristine and intercalated pitch-based graphite fiber composites. Intercalation was found to increase the mass absorption coefficient for ionizing radiation from 40 percent of the mass absorption of aluminum to 170 percent for bromine intercalation and 300 percent for iodine monobromide intercalation. The mass absorption coefficient for beta particles of both the composites and aluminum was found to be 17.8 +/- 0.9 sq cm/g. Inelastic scattering processes were significant in beta particle shielding, and similar in all of the materials.

Author

Radiation Absorption; Beta Particles; Gamma Rays; X Rays; Aluminum; Graphite-Epoxy Composites; Intercalation; Ionizing Radiation; Radiation Shielding; Absorptivity

19980032591 National Space Development Agency, Tokyo, Japan

International Space Station and JEM Utilization Plan

Junichiro, Shimizu, National Space Development Agency, Japan; Lecture Papers: The Recent Trend in Space Utilization; Dec. 1997; 22p; In English; Translated into English by NASDA

Report No.(s): NASDA-ETR-970012; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

In the International Space Station Program, in which the USA, Japan, member countries of the European Space Agency (nine countries), Canada, and Russia participate, individual participating countries share the task of developing component elements of a space station. With the on-orbit assembling work scheduled to start in 1997 and to be completed around 2002, the program is a large scale international cooperative project aiming at operating and utilizing the space station under international cooperation and sharing for more than 10 years after its completion. The operation and utilization of the space station opens a new domain in the field of space environment utilization; the results of the utilization of the space that will follow the meteorological observation, the communications and broadcasting, and the positioning will provide important elements in developing the space activities of the 21st centuries. Outlined in this paper are the program, the major features of the system as viewed from the viewpoint of space utilization, progress in examining the JEM (Japan Experiment Module) utilization plan including preparation for utilization

of the module, and specifically, progress in examining the utilization of the JEM exposed facilities in the space technology development field.
Author
International Space Station; International Cooperation; Space Programs

19980036333 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA
The Virtual Spaceplane: Integrating Multiple Motion Models and Hypertext in a Virtual Environment
Johnson, Troy D., Air Force Inst. of Tech., USA; Dec. 1997; 121p; In English
Report No.(s): AD-A335555; AFIT/GM/ENG/97D-01; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Air Force is currently investigating the possibility of developing a manned vehicle capable of operating in space. This Military Spaceplane (MSP) will be capable of ascent to low-earth orbit and maneuvering while in orbit. The goal of this research involved creating the Virtual SpacePlane (VSP), a Virtual Environment (VE) simulator for the MSP. This thesis examines two ideas significant to virtual environments and cockpit design: multiple motion models and hypertext in a VE. Movement in a VE has traditionally be en modeled using a single motion model. Little work has been done to allow a change of the motion model used during the simulation. This thesis suggests partitioning simulation entities into two sections: the geometry model and the propagation model. This approach is demonstrated in the VSP using multiple propagation models as it transitions from runway to orbit. This thesis also examines the use of hypertext within a VE. Hypertext has been shown useful for readers to quickly locate information. This thesis will discuss the integration of a hypertext interface into the VSP. The hypertext interface provides checklists, systems status, and consumables status. Hypertext provides the spaceplane pilot with an effective means of referencing large amounts of data.
DTIC
Models; Environment Simulators; Virtual Reality; Manned Spacecraft; Space Flight; Aerospace Planes

19980036928 National Space Development Agency, Tokyo, Japan
Developments of Space Station
Hashimoto, Hidekazu, National Space Development Agency, Japan; Journal of the Japan Society of Aeronautical and Space Sciences; Dec. 1997; Volume 44, No. 506; 18p; In English; Translated into English by NASDA
Report No.(s): NASDA-ETR-970007; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The International Space Station Program is a joint international project initiated in response to the request for participation made by President Reagan of the USA. Initial participants in this development program were National Aeronautics and Space Administration(NASA) of the USA, European Space Agency(ESA), Canadian Space Agency(CSA), and Japan. The year 1993 saw two great changes, President Clinton's instruction for redesigning and the joining of Russia. At present, the development of a space station is in progress under broader international cooperation. With the aim of promoting space environment utilization, developing space science, and acquiring advanced space technologies including manned technologies through the development activities for the space station, the National Space Development Agency(NASDA) has been in charge of developing the Japanese Experiment Module(JEM) and payload experiment equipment. In the current presentation, the author presents, with emphasis on JEM, the current state of development of a space station and the outline of the Space Station Center under construction at Tsukuba Space Center.
Author
Space Programs; Construction; Japanese Space Program; International Space Station; International Cooperation

19
SPACECRAFT INSTRUMENTATION

For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

19980027609 Massachusetts Inst. of Tech., Space Engineering Research Center, Cambridge, MA USA
A Comparison of Structurally Connected and Multiple Spacecraft Interferometers
Surka, Derek M., Massachusetts Inst. of Tech., USA; Crawley, Edward F., Massachusetts Inst. of Tech., USA; Dec. 1996; 232p; In English
Contract(s)/Grant(s): NAG1-1717; NAGw-1335
Report No.(s): NASA/CR-96-207557; NAS 1.26:207557; SERC-9-96; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Structurally connected and multiple spacecraft interferometers are compared in an attempt to establish the maximum baseline (referred to as the ”cross-over baseline”) for which it is preferable to operate a single-structure interferometer in space rather than an interferometer composed of numerous, smaller spacecraft. This comparison is made using the total launched mass of each configuration as the comparison metric. A framework of study within which structurally connected and multiple spacecraft interferometers can be compared is presented in block diagram form. This methodology is then applied to twenty-two different combinations of trade space parameters to investigate the effects of different orbits, orientations, truss materials, propellants, attitude control actuators, onboard disturbance sources, and performance requirements on the cross-over baseline. Rotating interferometers and the potential advantages of adding active structural control to the connected truss of the structurally connected interferometer are also examined. The minimum mass design of the structurally connected interferometer that meets all performance-requirements and satisfies all imposed constraints is determined as a function of baseline. This minimum mass design is then compared to the design of the multiple spacecraft interferometer. It is discovered that the design of the minimum mass structurally connected interferometer that meets all performance requirements and constraints in solar orbit is limited by the minimum allowable aspect ratio, areal density, and gage of the struts. In the formulation of the problem used in this study, there is no advantage to adding active structural control to the truss for interferometers in solar orbit. The cross-over baseline for missions of practical duration (ranging from one week to thirty years) in solar orbit is approximately 400 m for non-rotating interferometers and 650 m for rotating interferometers.
Author
Interferometers; Structural Stability; Actuators; Aspect Ratio; Attitude Control; Crossovers

19980036999 National Oceanic and Atmospheric Administration, Satellite Research Lab., Washington, DC USA
Calibration of the AVHRR Shortwave Channels, 2, Application to NOAA 11 during Early 1991
Mitchell, R. M., National Oceanic and Atmospheric Administration, USA; OBrien, D. M., Commonwealth Scientific and Industrial Research Organization, Australia; Forgan, B. W., Bureau of Meteorology, Australia; Remote Sensing of the Environment; 1996; ISSN 0034-4257; Volume 55, pp. 139-152; In English; Copyright; Avail: Issuing Activity (Elsevier Science, Inc., 655 Ave. of the Americas, New York, NY 10010), Hardcopy, Microfiche

This article extends the calibration method of Mitchell, O’Brien, and Forgan (1992) to the calibration of the Advanced Very High Resolution Radiometer (AVHRR) on NOAA 11 using a data set obtained over the period January to May 1991. The method correlates AVHRR response against radiances computed from a radiative transfer model whose parameters are constrained by surface measurements. The data consist of cloud free AVHRR images over the ocean west of Tasmania and simultaneous sun photometer measurements of aerosol optical depth at Cape Grim, some 50 km from the ocean target. Ancilliary surface meteorological data are also employed. The best estimate of the mean gain in Channel 1 over the first half of 1991 is 1.75 +/- 0.09 counts per W/sq m micron sr, in good agreement with several other determinations using a variety of techniques. However, differences among results from the various methods suggests that ultimate accuracy in the determination of sensor gain is limited to approx. +/- 5%. Spurious results are obtained when the aerosol depth measured at Cape Grim does not characterize the airmass over the ocean target. This situation can arise when winds are light and variable in direction during the observing period. Under these circumstances it is not valid to use the sun photometer aerosol optical depths to model the upwelling radiance over the ocean. In addition, uncertainty in wind speed over the target site introduces significant error into the method. The technique is found to be unreliable in Channel 2 due to problems connected with water vapour absorption.
Author
Calibrating; Advanced Very High Resolution Radiometer; Short Wave Radio Transmission; Accuracy; Errors

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, 44 Energy Production and Conversion, and 15 Launch Vehicles and Space Vehicles.

19980036943 National Space Development Agency, Structure and Propulsion Systems Dept., Tokyo, Japan
Hydraulics and Pneumatics in a Rocket
Konno, Akira, National Space Development Agency, Japan; Nagao, Ryuji, National Space Development Agency, Japan; Journal of the Japan Hydraulics and Pneumatics Society; Dec. 1997; Volume 27, No. 5; 14p; In English; Translated into English by NASDA

Report No.(s): NASDA-ETR-970011; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Launch vehicles, including the H-II rocket, ordinarily use hydraulics for gimbal control of rocket engines and pneumatics control (by nitrogen gas or helium gas) for driving valves that control both liquid and gas flow in the propulsion (fuel/oxidizer) system. The present description takes up the H-II rocket developed by the National Space development Agency of Japan as an example by way of presenting practical hydraulics and pneumatics used for a rocket.
Author
Pneumatics; Rocket Engine Control; Hydraulic Equipment

23
CHEMISTRY AND MATERIALS (GENERAL)

19980030794 NASA Langley Research Center, Hampton, VA USA
Phenylethynyl Phthalic Anhydride
Hergenrother, Paul M., Inventor, NASA Langley Research Center, USA; Smith, Joseph G., Jr., Inventor, NASA Langley Research Center, USA; Oct. 28, 1997; 16p; In English; Division of US-Patent-Appl-SN-330773, filed 28 Oct. 1994
Patent Info.: Filed 21 Oct. 1996; NASA-Case-LAR-15176-3; US-Patent-5,681,967; US-Patent-Appl-SN-739350; US-Patent-Appl-SN-330773; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

Controlled molecular weight PhenylEthynyl Terminated Imide oligomers (PETIs) have been prepared by the cyclodehydration of precursor phenylethynyl terminated amic acid oligomers. Amino terminated amic acid oligomers are prepared from the reaction of dianhydride(s) with an excess of diamine(s) and subsequently endcapped with PhenylEthynyl Phthalic Anhydride(s) (PEPA). The polymerizations are carried out in polar aprotic solvents such as N-methyl-2pyrrolidinone or N N-dimethylacetamide under nitrogen at room temperature. The amic acid oligomers are subsequently cyclodehydrated either thermally or chemically to the corresponding imide oligomers. Direct preparation of PETIs from the reaction of dianhydride(s) with an excess of diamine(s) and endcapped with phenylethynyl phthalic anhydride(s) has been performed in m-cresol. Phenylethynyl phthalic anhydrides are synthesized by the palladium catalyzed reaction of phenylacetylene with bromo substituted phthalic anhydrides in triethylamine. These new materials exhibit excellent properties and are potentially useful as adhesives, coatings, films, moldings and composite matrices.
Official Gazzette of the U.S. Patent and Trademark
Methyl Compounds; Molecular Weight; Amino Acids; Oligomers

19980030795 NASA Langley Research Center, Hampton, VA USA
Copolyimides Prepared from 3,4'-Oxydianiline and 1,3-bis(3-Aminophenoxy) Benzene with 3,3'-4,4'-Biphenylcarboxylic Dianhydride Having Reactive Endgroups
Jensen, Brian J., Inventor, NASA Langley Research Center, USA; Jul. 01, 1997; 5p; In English
Patent Info.: Filed 14 Feb. 1998; NASA-Case-LAR-15208-1; US-Patent-5,644,022; US-Patent-Appl-SN-388090; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

Polyimide copolymers were prepared by reacting different ratios of 3.4'-OxyDiAniline (ODA) and 1.3-bis(3-AminoPhenoxy)Benzene (APB) with 3.3'.4.4'BiPhenylcarboxylic DiAnhydride (BPDA). and terminating with an effective amount of a reactive endcapper. The reactive endcappers employed include 4-PhenylEthynyl Phthalic Anhydride (PEPA). 3-Aminophenoxy-4'PhenylEthynylBenzophenone (3-APEB). Maleic Anhydride (MA) and Nadic Anhydride (5-norbornene-23-dicarboxylic anhydride) (NA). Within a relatively narrow ratio of diamines. from approx. 50% ODA/50% APB to approx. 95% ODA/5% APB. the copolyimides prepared with BPDA and terminated with reactive endgroups have a unique combination of properties that make them very attractive for a number of applications. This unique combination of properties includes low pressure processing (200 psi and below), long term melt stability (several hours at 300 C. for the phenylethynyl terminated polymers), high toughness, improved solvent resistance, improved adhesive properties and improved composite mechanical properties.
Official Gazzette of the U.S. Patent and Trademark
Mechanical Properties; Polyimides; Anhydrides

19980031000 California Inst. of Tech., Pasadena, CA USA
Chemistry of Aromatic Hydrocarbons 2: Secondary Organic Aerosol Formation ***Final Report***
Odum, J. R., California Inst. of Tech., USA; Forstner, H. J. L., California Inst. of Tech., USA; Andino, J. M., California Inst. of

Tech., USA; Jungkamp, T. P. W., California Inst. of Tech., USA; Griffin, R., California Inst. of Tech., USA; Nov. 05, 1997; 118p; In English
Report No.(s): PB98-117435; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The first approach of this study involves developing direct/indirect methods by which the amount of SOA present in ambient atmospheric samples can be quantified. Direct methods involve identifying and quantifying all of the secondary organic reaction present in ambient samples. A number of indirect methods have been developed to obtain estimates of Secondary Organic Aerosol (SOA) contributions. The second type of approach involves using atmospheric models-employing both direct and indirect methods to estimate SOA contributions. A direct approach involves including the complete chemistry of each of the primary organic species that contribute to SOA formation along with the correct physics to emulate gas-to-particle conversion.
Author
Air Sampling; Atmospheric Models; Estimates; Identifying; Hydrocarbons; Atmospheric Chemistry; Chemical Reactions; Air Pollution

19980032329 ManTech Environmental Technology, Inc., Research Triangle Park, NC USA
Chemistry of Aromatic Hydrocarbons 2 ***Final Report***
Kleindienst, T. E., ManTech Environmental Technology, Inc., USA; Smith, D. F., ManTech Environmental Technology, Inc., USA; Nov. 20, 1997; 118p; In English
Report No.(s): PB98-117021; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study was conducted to examine and address three of the major problems encountered in studying the product distribution from the degradation of aromatic compounds initiated by hydroxyl radicals (OH): (1) Many of the primary products formed in aromatic systems (particularly toluene) reactor more rapidly than the parent compounds itself. This makes it extremely difficult to distinguish primary from secondary products in the system. (2) Many of the products formed from the primary reactions can be extremely difficult to detect and quantify. (3) Whereas most previous experiments have been conducted at NO2 concentrations 1-2 orders of magnitude higher than that observed in urban environments, the experiments in this study are designed to be conducted at NO2 concentrations within a factor of 2 or 3 times that of high urban levels. It is expected that the reaction processes will be the same as those at the lower concentrations.
NTIS
Hydrocarbons; Hydroxyl Radicals; Atmospheric Chemistry

19980036876 Missouri Univ., Dept. of Chemistry, Kansas City, MO USA
Solids-NMR Apparatus for Materials Characterization ***Final Report, 15 Sep. 1996 - 14 Sep. 1997***
Sandreczki, T. C., Missouri Univ., USA; Dec. 14, 1997; 9p; In English
Contract(s)/Grant(s): F49620-96-I-0204; AF Proj. 3484
Report No.(s): AD-A335739; AFRL-SR-BL-TR-98-0080; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Acquire solids-nuclear magnetic resonance (solids-NMR) capability to enable characterization of polymers and other solid-state materials of relevance to DoD. Instrumentation Acquired: A solids-NMR accessory was acquired for an existing Bruker AC250 (1H resonance at 250 MHz) liquids-NMR spectrometer. The acquired equipment included: (a) 35 W buffer amplifier, (b) 120 W radio frequency (RF) amplifier for 1H decoupling, (c) 300 W broadband rf amplifier for non-1H nuclei, and (d) 7 mm-sample-diameter (0.300 ml sample volume) cross polarization/magic-angle spinning (CP/MAS) probe with pneumatic control unit. The apparatus was installed and tested by specialists from Bruker Instruments, Billerica, MA. Research Supported by Instrumentation: The first solid sample investigated using the newly acquired apparatus was the monomer 1,5,7,11-tetraoxospiro[5,5]undecane, commonly called spiroorthocarbonate(0,0). This is an example of a monomer that polymerize without reduction in volume. Research to be Supported by Instrumentation: Solids-NMR will be used to help determine the structures of organic polymers and inorganic solid-state materials of relevance to DoD. The polymers include ladder- and semi-ladder-shaped highly conjugated polymers, and their monomers, and polyurethane coating materials. The inorganic solids include catalytic zeolites and ferrierites. Relevant nuclei are: Al-27 (65 MHz), C-13 (63 MHz), Si-29 (50 MHz) and N-15 (25 MHz).
DTIC
Nuclear Magnetic Resonance; Composite Materials; Polymerization; Solids; Control Equipment; Coating

19980036966 California Univ., Coll. of Engineering, Riverside, CA USA
Tuning Biphenyl Dioxygenase for Extended Substrate Specificity and Enhanced Activity ***Final Report***
Chen, Wilfred, California Univ., USA; Sep. 30, 1997; 5p; In English
Contract(s)/Grant(s): N00014-96-I-0599
Report No.(s): AD-A335315; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

At the time when public concern about PCBs contamination in the environment is increasing, there is also an increasing interest in the development of novel biodegradation processes that can rapidly and effectively remove PCB's. However, some of the PCB congeners are known to be very resistant to aerobic biodegradation, particularly in the initial attack by the biphenyl dioxygenases. We seek to broaden the substrate specificity of biphenyl dioxygenase from Pseudomonas sp.
DTIC
Biodegradation; Polychlorinated Biphenyls; Aerobes

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.

19980024025 University of Central Florida, Dept. of Civil and Environmental Engineering, Orlando, FL USA
FRP-Concrete Composite Column and Pile Jacket Splicing, Phase 2 ***Final Report, 22 Aug. 1995 - 31 Aug. 1997***
Mirmiran, A., University of Central Florida, USA; Aug. 31, 1997; 178p; In English
Report No.(s): PB98-117658; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
A new and innovative use of fiber composites has been introduced which consists of concrete-filled FRP tubes as structural columns, piles and piers. The tube acts as the poor form, protective and confining jacket, shear stirrups, and flexural reinforcement. Feasibility of this system was shown under Phase 1 of this project. Phase 2 has been focused on several issues including; shear capacity of hybrid strength and ductility of column, optimization of hybrid columns, and acoustic emission testing of hybrid systems. Results of extensive tests and analytical work have been reported in detail.
NTIS
Fiber Composites; Shear Strength; Columns (Supports); Tubes

19980036345 Alabama Univ., Center for Automation and Robotics, Huntsville, AL USA
Study Acoustic Emissions from Composites ***Final Report No. 3***
Walker, James, Alabama Univ., USA; Workman,Gary, Alabama Univ., USA; Jan. 1998; 105p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS8-38609
Report No.(s): NASA/CR-1998-207483; NAS 1.26:207483; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The purpose of this work will be to develop techniques for monitoring the acoustic emissions from carbon epoxy composite structures at cryogenic temperatures. Performance of transducers at temperatures ranging from ambient to cryogenic and the characteristics of acoustic emission from composite structures will be studied and documented. This entire effort is directed towards characterization of structures used in NASA propulsion programs such as the X-33.
Author
Epoxy Resins; Acoustic Emission; Cryogenic Temperature; Composite Structures

19980036981 Tennessee Univ., Dept. of Mechanical and Aerospace Engineering, Knoxville, TN USA
Transverse Cracking and Delamination in Cross-Ply GR/EP Composites under Dry, Saturated and Immersed Fatigue
Selvarathinam, Alex S., Tennessee Univ., USA; Weitsman, Y. J., Tennessee Univ., USA; Nov. 18, 1997; 18p; In English
Contract(s)/Grant(s): N00014-96-I-0821
Report No.(s): AD-A333425; MAES-97-4.0-CM; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Motivated by experimental observations, the finite element method is employed to model the competition between the transverse cracking and delamination modes of failure that occur in cross-ply AS4/3501-6 gr/ep coupons subjected to fatigue. The results explain the extensive delaminations and reduced crack densities that arise under immersed fatigue, as compared with fatigue in air.
DTIC
Cracks; Delaminating; Finite Element Method; Composite Materials

19980036985 Greene (Eric) Associates, Inc., Annapolis, MD USA
Design Guide for Marine Applications of Composites ***Final Report***
Greene, E., Greene (Eric) Associates, Inc., USA; Nov. 1997; 350p; In English
Report No.(s): PB98-111651; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

The goal of this Design Guide is to familiarize the reader with methodology and information required to design safe marine composite structures. Emphasis is placed on concepts, methodology and design equations. Reference sources that provide mathematical derivations for specific geometries and load cases are cited throughout the text. Here, the reader is encourage to develop an understanding of how a composite structure responds to loads in the marine environment.
NTIS
Composite Structures; Marine Environments; Marine Technology; Micromechanics; Fiber Composites

25
INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

19980024028 New Mexico State Univ., New Mexico Water Resources Research Inst., Las Cruces, NM USA
Geologic Membrane Controls on Saturated Zone Heavy Metal Transport
Whitworth, T. M., New Mexico Bureau of Mines and Mineral Resources, USA; DeRosa, G., New Mexico Bureau of Mines and Mineral Resources, USA; Nov. 1997; 102p; In English
Report No.(s): PB98-119571; TECHNICAL COMPLETION-303; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The purpose of this research was threefold: (1) to demonstrate experimentally that membrane-induce precipitation of heavy metals can occur in the laboratory, (2) to attempt to develop a routine method for measuring membrane coefficients of shales, and (3) to develop a steady-state mathematical model which can be used to assess potential membrane effects at specific sites. The pressure differential across bounding shales can be measured when needed at specific contaminated sites. The model developed in this research will predict both the lack of membrane effects as well as quantitatively define them when the needed parameters are input.
NTIS
Membranes; Metals; Clays; Precipitation; Physiochemistry

19980024035 Pennsylvania State Univ., Dept. of Chemistry, University Park, PA USA
Supramolecular Organization Using a Synthetic Analogue of Biomineralization ***Final Report, 1 Jun. 1995 - 31 May 1997***
Bianconi, Patricia A., Pennsylvania State Univ., USA; Dec. 15, 1997; 10p; In English
Contract(s)/Grant(s): F49620-95-I-0225; AF Proj. 2303
Report No.(s): AD-A334869; AFRL-SR-BL-TR-98-0071; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The objective of this research program is to develop the chemistry and applications of a new biomimetic in situ synthetic system for the fabrication of inorganic/organic composite materials. The research focuses on understanding the mechanisms of the solid-state syntheses which give rise to composites in which the crystals of the inorganic phase are identical in size, morphology, and crystallographic orientation, the determining characteristics of naturally-formed biological composites. Synthesis of a new class of ordered composites, the high pressure lead sulfide phases, was carried out, and evaluation of these new materials' optoelectronic properties will be attempted. Synthesis of high-pressure phases of refractory ceramics such as boron nitride, will be attempted. An extension of the biomimetic synthetic process, an analogue of the solution sol-gel synthetic scheme for oxide ceramics, will also be studied in order to optimize a previously unknown process, the production of nonoxide ceramics by a solution sol-gel route.
DTIC
Composite Materials; Sol-Gel Processes; Synthesis (Chemistry)

19980024674 Naval Research Lab., Molecular Dynamics Sect., Washington, DC USA
Particle Size and Surface Area Analysis of Amorphous and Crystalline Boron ***Interim Report***
Rice, Jane K., Naval Research Lab., USA; Dec. 10, 1997; 33p; In English
Report No.(s): AD-A333346; NRL/MR/6111--97-8116; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Surface areas were measured and scanning electron microscopy (SEM) photographs were obtained from seven boron particle samples used in recent boron particle combustion experiments. Some significant differences were seen between the manufacturer claimed particle sizes and the distributions obtained from the SEM photographs. In those samples with large particle size distributions, calculated surface areas differed significantly from measured surface areas and it is clear that a single particle diameter parameter is inadequate to describe the corresponding surface area of the true particle size distribution. In general, the particle size distribution estimates taken from SEM yield lower surface areas than were measured. Further data on the purity of the samples

are necessary to determine whether the phase or purity of the boron particle has an effect on the efficiency of boron particle combustion.
DTIC
Amorphous Materials; Crystallinity; Metal Combustion; Particle Size Distribution; Scanning Electron Microscopy

19980025552 Naval Research Lab., Surface Chemistry Branch, Washington, DC USA
Vanadate-Sulfate Melt Thermochemistry Relating to Hot Corrosion of Thermal Barrier Coatings ***Final Report***
Jones, Robert L., Naval Research Lab., USA; Oct. 30, 1997; 23p; In English
Report No.(s): AD-A333486; NRL/MR/6170-97-8103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The gas turbine industry is moving strongly toward the use of ZrO2-based thermal barrier coatings (TBCs) on hot section vanes/blades to increase engine efficiency and durability. In some applications (e.g., ship propulsion or electricity generation), such TBCs may be corroded by molten vanadate-sulfate deposits from fuel impurities. This Report provides a synopsis of vanadate-sulfate thermochemistry relating to TBC hot corrosion, and summarizes research conducted on this topic at the Naval Research Laboratory. The interactions of Na2O, V2O5 and SO3, the melt components which determine the composition of the vanadate-sulfate deposits, were examined and clarified. Vanadate-sulfate melts were shown to be nonideal rather than ideal a point of some contention in the past literature and, for melts of Na/V = 1, to have a V205 activity coefficient (gamma) that ranges from 5 x 10(exp -4) up to essentially 1, depending on the S03 overpressure. Different NaVO3/Na2SO4 mixtures gave a detectable but small change in gamma(V2O5), suggesting that the Na/V ratio is relatively unimportant, for melts equilibrated with SO3, in determining gamma(V2O5). The reactions of several candidate ZrO2 stabilizers (MgO, CeO2, Sc2O3, In2O3, SnO2) with vanadate-sulfate melts are categorized and discussed.
DTIC
Thermal Control Coatings; Thermochemistry; Vanadates; Hot Corrosion

19980030796 NASA Pasadena Office, CA USA
Method for Trace Oxygen Detection
Man, Kim Fung, Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Boumsellek, Said, Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Chutjian, Ara, Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Sep. 23, 1997; 5p; In English
Patent Info.: Filed 23 Feb. 1998; NASA-Case-NPO-19098-1-CU; US-Patent-5,670,378; US-Patent-Appl-SN-392575; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

Trace levels of molecular oxygen are measured by introducing a gas containing the molecular oxygen into a target zone, and impacting the molecular oxygen in the target zone with electrons at the O(-) resonant energy level for dissociative electron attachment to produce O(-) ions. Preferably, the electrons have an energy of about 4 to about 10 eV. The amount of O(-) ions produced is measured, and is correlated with the molecular oxygen content in the target zone. The technique is effective for measuring levels of oxygen below 50 ppb. and even less than 1 ppb. The amount of O(-) can be measured in a quadrupole mass analyzer. Best results are obtained when the electrons have an energy of about 6 to about 8 eV. and preferably about 6.8 eV. The method can be used for other species by selecting the appropriate electron energy level.
Official Gazzette of the U.S. Patent and Trademark
Oxygen; Detection; Energy Levels; Ions

19980031010 NERAC, Inc., Tolland, CT USA
Waste Treatment by Ion-Exchange. (Latest citations from Pollution Abstracts)
Jan. 1998; In English; Page count unavailable.
Report No.(s): PB98-851827; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning wastewater treatment by ion-exchange techniques. Methods for removing metals, nitrates, phosphates, fluorides, and organic pollutants are described. Applications of this technology to the electroplating, metal finishing, pulp, paper, and other industries are included. The citations examine the commercial feasibility of using ion-exchange methods for pollutant reduction when the process is used alone or in combination with various pretreatment techniques. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Waste Treatment; Waste Water; Industrial Wastes

19980033942 Texas Research Inst., Inc., Austin, TX USA
Chemical and Thermal Analysis ***Final Report***
Bulluck, J. W., Texas Research Inst., Inc., USA; Rushing, R. A., Texas Research Inst., Inc., USA; Jul. 02, 1997; 54p; In English
Contract(s)/Grant(s): NAG10-153
Report No.(s): NASA/CR-97-207609; NAS 1.26:207609; CAPP/T.F.; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Work during the past three years has included significant research in several areas aimed at further clarification of the aging and chemical failure mechanism of thermoplastics (PVDF or Tefzel) for pipes. Among the areas investigated were the crystallinity changes associated with both the Coflon and Tefzel after various simulated environmental exposures using X-Ray diffraction analysis. We have found that significant changes in polymer crystallinity levels occur as a function of the exposures. These crystallinity changes may have important consequences on the fracture, fatigue, tensile, and chemical resistance of the materials. We have also noted changes in the molecular weight distribution and the increased crosslinking of the Coflon material using Gel Permeation Chromatographic Analysis. Again these changes may result in variations in the mechanical and chemical properties in the material. We conducted numerous analytical studies with methods including X-ray Diffraction, Gel Permeation Chromatography, Fourier Transform Infrared Spectroscopy, and Differential Scanning Calorimetry. We investigated a plethora of aged samples of both Tefzel and Coflon that were forwarded from MERL. Pressurized tests were performed on powdered PVDF in a modified Fluid A, which we will call A-2. In this case the ethylene diamine concentration was increased to 3 percent in methanol. Coflon pipe sections and powdered Coflon were exposed in pressure cells at 1700 psi at three separate test temperatures.
Derived from text
Chemical Analysis; Thermal Analysis; Infrared Spectroscopy; Reaction Kinetics; Chemical Properties; X Ray Diffraction; Liquid Chromatography

19980034680 Montana State Univ., Dept. of Chemistry, Bozeman, MT USA
Technology and Bloom's Taxonomy: Tools to Facilitate Higher-Level Learning in Chemistry
Morgan, Matthew E., Montana State Univ., USA; Dec. 15, 1997; 288p; In English
Report No.(s): AD-A333388; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This research project ties together chemistry data acquisition technology, introductory chemistry laboratory experiments, and Bloom's Taxonomy of Educational Objectives into a unified learning model. The goal is to provide faculty and introductory chemistry students with the tools and exercises to experience higher levels of learning, as defined by Bloom's taxonomy. The tools developed as part of this project include data acquisition hardware and software, communications software, and computer simulations that enable higher level learning situations. A series of five experiments using a discovery-based teaching model are developed as part of the learning model. The experiments bring together the hardware tools, software tools, and learning model to place students in situations that require students to use critical thinking skills and experience higher level learning. Content-related application problems are also included in the experiments. The experiments are divided into three chemistry units of instruction that build on each other, but can also be used independently. Instructor training is an important part of this project. The successful integration of technology into educational situations cannot be accomplished without the support and understanding of faculty, staff, and teaching assistants. This aspect of the project focuses on shifting teaching and learning paradigms to encourage appropriate technology use and allow technology to become a major aspect of the high level learning environment. Finally, students were surveyed in an attempt to measure the effectiveness of the learning model. Students were evaluated on chemistry concept retention, as well as their perception of learning. They were also asked how well they enjoyed this form of learning. Along with the tools themselves, this project provides templates that can launch future work in this area.
DTIC
Taxonomy; Data Acquisition; Technology Utilization

19980036320 SRI International Corp., Menlo Park, CA USA
Theory of Indium Thallium Phosphide ***Final Report***
Krishnamurthy, S., SRI International Corp., USA; Jan. 15, 1998; 52p; In English
Contract(s)/Grant(s): F49620-95-C-0010; AF Proj. 2305
Report No.(s): AD-A335799; SRI-TR-6457FR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We have used a combination of first principles and empirical band structures to study various properties of new classes of IR materials, the III-V alloys In(1-x)TlxQ, where Q = P, As, or Sb: temperature variation of the band gap, absorption coefficient, minority carrier lifetimes, thermodynamic phase diagram, low-field electron and hole mobilities, native point defect (such as vacancies and antisites) concentrations, parameters needed for modeling MBE growth. We found that, in the case of the LWIR InTlP alloy, the band gap increases with temperature, growth requires very high P vapor pressures, the electron mobility and

absorption coefficients are comparable to those of LWIR HgCdTe, and the minority carrier lifetimes are about one-third of that in HgCdTe. The overall conclusion is that InTlP has serious growth-related problems that can be overcome only with novel non-equilibrium growth methods or high pressure LPE growth. InTlAs is a more promising candidate to be grown because the Tl concentration needed to attain an LWIR response is lower and the vapor pressure needed to grow it is also much lower. Moreover its Auger lifetime is predicted to be about a factor of 10 larger than that of HgCdTe.
DTIC
Indium Phosphides; Energy Gaps (Solid State); Thallium Compounds; Band Structure of Solids

19980036321 Illinois Univ., Dept. of Mechanical Engineering, Chicago, IL USA
Spray Vaporization and Combustion in Large Vortical Structures ***Final Report, 1 Jun. 1993 - 31 Jul. 1997***
Aggarwal, Suresh K., Illinois Univ., USA; Sep. 30, 1997; 94p; In English
Contract(s)/Grant(s): F49620-93-I-0400; AF Proj. 3484
Report No.(s): AD-A335808; AFRL-SR-BL-TR-98-0102; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Numerical studies were performed to investigate interactions between large scale vortical structures and droplets in two phase shear flows. A generic configuration consisting of a droplet laden heated air jet in a coflowing air stream was used to analyze several two phase flows. A time accurate, axisymmetric, two phase algorithm was developed for the simulations. Detailed numerical experiments were used to examine the dispersion of evaporating droplets in the presence of vortex structures, the effects of droplet vortex interactions on the dynamic and steady structure of nonevaporating and evaporating sprays, and the transient and time averaged structure of a swirling two phase jet. Results demonstrated that the dispersion of evaporating droplets can be characterized in terms of their lifetimes and Stokes numbers. In addition, it was shown that for a dispersed to gas phase mass loading ratio of unity, the shear layer stability and mixing behavior can be modulated by changing the droplet injection characteristics. Finally, the simulations of a droplet laden swirling jet revealed that the dynamics of large scale structures was strongly affected by the amount of swirl imparted to the incoming flow, and that the effects of two way momentum coupling on jet dynamics and mixing were markedly different for nonswirling and swirling jets.
DTIC
Two Phase Flow; Shear Flow; Combustion; Vortices; Computational Fluid Dynamics; Fuel Sprays

19980036997 NASA Ames Research Center, Moffett Field, CA USA
The Heat of Formation of HNO
Lee, Timothy J., NASA Ames Research Center, USA; Dateo, Christopher E., Thermoscience Inst., USA; Journal of Chemical Physics; Aug. 22, 1995; ISSN 0021-9606; Volume 103, No. 20, pp. 9110-9111; In English
Contract(s)/Grant(s): NAS2-14031
Report No.(s): NASA/TM-95-207250; NAS 1.15:207250; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

The HNO molecule is of interest in both combustion and atmospheric chemistry. For example, Guadagnini et al. have recently presented ab initio potential energy surfaces for the three lowest lying electronic states of HNO and then used these in examining several chemical reactions that take place in the combustion of nitrogen containing fuels and in the oxidation of atmospheric nitrogen. We have previously studied the ground state potential energy surface (i.e., stationary points along the HNO reversible reaction HON path), vibrational spectrum (using an accurate quartic force field), zero-point energy, and bonding of HNO using coupled-cluster ab initio methods. HNO is also very interesting because of the unique nature of its bonding characteristics. That is, the potential energy surface is very flat along the H-N bonding coordinate thereby giving unusual harmonic and fundamental vibrational frequencies, and the H-N bond energy is rather weak in comparison to other H-N bond energies. In fact, using experimental heats of formation for HNO, H, and NO, the H- bond energy is computed to be only 49.9 kcal/ mol (298 K). However, ab initio calculations of isodesmic reaction energies involving HNO, FNO, ClNO, and several other molecules have shown that there is an inconsistency in the experimental heats of formation of the XNO (X double bond H, F, and Cl) species. Hence the motivation for this study was to determine a very accurate (Delta)H(sub f, sup o) value for HNO using state-of-the-art ab initio methods. Based on many recent studies it is evident that the singles and doubles coupled-cluster method that includes a perturbational estimate of the effects of connected triple excitations, denoted CCSD(T), in conjunction with large one-particle basis sets should be reliable to better than +/- 0.8 kcal/mol for this quantity. The computational methodology is described in the next section followed by our results and discussion. Conclusions are presented in the final section.
Author
Heat of Formation; Molecules; Nitrogen; Oxidation; Hydrogen Compounds; Chemical Reactions

26
METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

19980025561 Mississippi Univ., University, MS USA
The Electrodeposition of Cobalt, Iron, and Antimony and their Aluminum Alloys from Room-Temperature Aluminum Chloride 1-Methyl-3-Ethylimidazolium Chloride Molten Salt
Mitchell, John A., Mississippi Univ., USA; Dec. 15, 1997; 151p; In English
Report No.(s): AD-A333340; AFIT-97-035D; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The electrodeposition of cobalt, iron, antimony, and their aluminum alloys was investigated in the room-temperature molten salt, aluminum chloride 1-methyl-3-eth ylimidazolium chloride (A1Cl3-MeEtimCl). Solutions of Co(II), Fe(II), and Sb(III) were prepared by controlled-potential coulometric anodization of the respective metal in Lewis acidic melt. The plating and stripping of these metals was investigated using cyclic voltammetry, rotating disk and rotating ring-disk electrode voltammetry, controlled potential coulometry, and potential step chronoamperometry. Bulk deposits of the pure and aluminum-alloyed metals were analyzed using scanning electron microscopy, energy dispersive x-ray spectroscopy, atomic absorption spectroscopy, and x-ray diffraction methods.
DTIC
Absorption Spectroscopy; Anodizing; Antimony; Electrochemistry; Electrodeposition; Electrodes; Molten Salts; Scanning Electron Microscopy

19980027090 Japan Atomic Energy Research Inst., Dept. of Fusion Engineering Research, Tokyo, Japan
Development of HIP bonding procedure and mechanical properties of HIP bonded joints for reduced activation ferritic steel F-82H
Oda, Masahiro, Nagoya Univ., Japan; Kurasawa, Toshimasa, Japan Atomic Energy Research Inst., Japan; Kuroda, Toshimasa, Japan Atomic Energy Research Inst., Japan; Hatano, Toshihisa, Japan Atomic Energy Research Inst., Japan; Takatsu, Hideyuki, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 148p; In Japanese
Report No.(s): JAERI-Tech-97-013; DE97-750697; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Structural materials of blanket components in fusion DEMO reactors will receive a neutron wall load more than 3-5 MW/m(exp 2) as well as exposed by surface heat flux more than 0.5 MW/m(exp 2). A reduced activation ferritic steel F-82H has been developed by JAERI in collaboration with NKK from viewpoints of resistance for high temperature and neutron loads and lower radioactivity. This study intends to obtain basic performance of F-82H to establish the fabrication procedure of the first wall and blanket box by using Hot Isostatic Pressing (HIP) bonding. Before HIP bonding tests, effects of heat treatment temperature and surface roughness on mechanical properties of joints were investigated in the heat treatment tests and diffusion bonding tests, respectively. From these results, the optimum HIP bonding conditions and the post heat treatment were selected. Using these conditions, the HIP bonding tests were carried out to evaluate HIP bondability and to obtain mechanical properties of the joints. Sufficient HIP bonding performance was obtained under the temperature of 1040 C, the compressive stress of 150 MPa, the holding time of 2h, and the surface roughness approx. micron. Mechanical properties of HIP bonded joints with these conditions were similar to those of as-received base metal. An oxide formation on the surface to be bonded would need to be avoided for sufficient bonding. The bonding ratio, Charpy impact value and fatigue performance of the joints strongly depended on the HIP conditions, especially temperature, while micro-structure, Vickers hardness and tensile properties had little dependence on the HIP temperature. The surface roughness strongly affected the bonding ratio and would be required to be in the level of a few micron. In the HIP bonding test of the welded material, the once-melted surface could be jointed by the HIP bonding under the above-mentioned procedure.
DOE
Hot Isostatic Pressing; Bonded Joints; Ferritic Stainless Steels; Tensile Properties; Metal Bonding; Charpy Impact Test; Tensile Tests; Tokamak Devices

19980029708 Clarkson Univ., Potsdam, NY USA
Use of Microgravity to Control the Microstructure of Eutectics *Progress Report*
Wilcox, William R., Clarkson Univ., USA; Regel, Liya L., Clarkson Univ., USA; Smith, Reginald W., Queens Univ., Canada; Mar. 01, 1998; 31p; In English
Contract(s)/Grant(s): NAG8-1266
Report No.(s): NASA/CR-1998-207561; NAS 1.26:207561; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This grant began in June of 1996. Its long term goal is to be able to control the microstructure of directionally solidified eutectic alloys, through an improved understanding of the influence of convection. The primary objective of the present projects is to test hypotheses for the reported influence of microgravity on the microstructure of three fibrous eutectics (MnBi-Bi, InSb-NiSb, Al3Ni-Al). A secondary objective is to determine the influence of convection on the microstructure of other eutectic alloys. Two doctoral students and a masters student supported as a teaching assistant were recruited for this research. Techniques were developed for directional solidification of MnBi-Bi eutectics with periodic application of current pulses to produce an oscillatory freezing rate. Image analysis techniques were developed to obtain the variation in MnBi fiber spacing, which was found to be normally distributed. The mean and standard deviation of fiber spacing were obtained for several freezing conditions. Eighteen ampoules were prepared for use in the gradient freeze furnace QUELD developed at Queen's University for use in microgravity. Nine of these ampoules will be solidified soon at Queen's in a ground-based model. We hope to solidify the other nine in the QUELD that is mounted on the Canadian Microgravity Isolation Mount on MIR. Techniques are being developed for directional solidification of the Al-Si eutectic at different freezing rates, with and without application of accelerated crucible rotation to induce convection. For the first time, theoretical methods are being developed to analyze eutectic solidification with an oscillatory freezing rate. In a classical sharp-interface model, we found that an oscillatory freezing rate increases the deviation of the average interfacial composition from the eutectic, and increases the undercooling of the two phases by different amounts. This would be expected to change the volume fraction solidifying and the fiber spacing. Because of difficulties in tracking the freezing interfaces of the two solid phases, a phase-field model is also being developed. A paper demonstrating application of phase field methods to periodic structures has been submitted for publication.
Derived from text
Microgravity; Eutectics; Microstructure; Oscillations; Freezing; Directional Solidification (Crystals); Aluminum Alloys; Nickel Alloys

19980031011 NERAC, Inc., Tolland, CT USA
Corrosion Prevention: Conversion Coatings and Coating Processes. (Latest citations from the US Patent Bibliographic File with Exemplary Claims)
Jan. 1998; In English; Page count unavailable.
Report No.(s): PB98-851843; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning conversion coatings and coating processes for the prevention of metal corrosion in various environments. Conversion coating patents for the application of phosphates and chromates to the surfaces of aluminum, zinc, ferrous metals, titanium, cadmium, iron, steels, and various alloys are presented. Topics include coating compositions, surface preparations and pretreatments prior to coating applications, post-treatment of coated metal surfaces, coating quality control, and sacrificial coatings for jet engines. Specific patents concerning protective coatings are excluded and covered in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Corrosion Prevention; Bibliographies; Coating; Coatings

19980036372 Ufa State Technical Aviation Univ., Inst. of Physics of Advanced Materials, Russia
Superplasticity of Ultra-Fine Grained Aluminium Alloys *Final Report*
Valiev, R. Z., Ufa State Technical Aviation Univ., Russia; Islamgaliev, R. K., Ufa State Technical Aviation Univ., Russia; Tsenev, N. K., Ufa State Technical Aviation Univ., Russia; Dec. 1997; 16p; In English
Contract(s)/Grant(s): F61871-97-C-9006
Report No.(s): AD-A335381; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Superplasticity requires a fine grain size, typically in the range of 1-10 microns. Experiments have established that much finer grain sizes, in the near-nanometer range, may be achieved in Al-based alloys by using an intense plastic straining technique such as equal-channel angular (ECA) pressing. This report presents the microstructural characteristics and mechanical properties of several ultrafine-grained Al-based alloys processed by ECA pressing. The first demonstration of enhanced superplasticity at low temperatures and high strain rates revealed in commercial Al-alloys, having ultrafine-grained structure, are described.
DTIC
Superplasticity; Aluminum Alloys; Grain Size; Microstructure

19980036917 LaQue Center for Corrosion Technology, Inc., Wrightsville Beach, NC USA
Surface Treatment of High Performance Marine Alloys to Enhance Crevice Corrosion Resistance in Critical Seawater Applications ***Final Report, 1 Feb. 1995 - 30 Sep. 1996***
Kain, Robert M., LaQue Center for Corrosion Technology, Inc., USA; Jan. 1998; 79p; In English
Contract(s)/Grant(s): N00014-95-C-0001
Report No.(s): AD-A335385; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Electropolishing and applied cerium surface treatments to enhance the crevice corrosion resistance of high performance marine alloys used for critical seawater applications have been investigated. Because of its known susceptibility to crevice corrosion under certain adverse geometrical conditions, Ni-base alloy UNS N06625 was selected as the test material. Crevice corrosion tests were performed in natural and chlorinated seawater over a wide range of ambient temperatures for up to 180 days. Testing comprised the use of two different crevice conditions which previously contributed to crevice corrosion of the test alloys in the as-produced condition. Flowing seawater tests results were complemented by the results of electrochemical tests and SEM/EDS analysis. While both surface treatments markedly improved crevice corrosion resistance, electropolishing provided the greatest improvement in the seawater tests and enhanced performance during anodic potentiodynamic polarization testing in a low pH simulated crevice solution. The role of surface chromium depletion in the as-produced material is discussed.
DTIC
Corrosion Resistance; Corrosion Tests; Nickel Alloys; Electropolishing; Surface 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.

19980024244 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Materials Degradation and Fatigue Under Extreme Conditions ***Final Report, 1 Apr. 1994 - 31 Aug. 1997***
Jonas, Jiri, Illinois Univ. at Urbana-Champaign, USA; Oct. 29, 1997; 93p; In English
Contract(s)/Grant(s): F49620-93-I-0241; AF Proj. 3484
Report No.(s): AD-A334785; AFRL-SR-BL-TR-98-0061; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This AFOSR URI addressed complex research problems of materials degradation and fatigue in aerospace structures in severe or extreme environments. A better understanding of materials degradation and flaw initiation dynamics was achieved through a multi-disciplinary research program encompassing chemistry, surface physics, materials science and mechanics, both experimental and theoretical. The Subprojects were as follows: (1) Surface Induced Degradation of Fluorocarbon Lubricants; (2) Molecular Tribology of Perfluoroether Lubricants; (3) Fluids, Including Lubricants Under Extreme Conditions of High Pressure/ High Temperature and Confinement; (4) Surface Crack Propagation Under Combined Mechanical and High Pressure Fluid Loading; and (5) Lubricant Assisted Fatigue Crack Growth in Ceramics.
DTIC
Aircraft Structures; Fatigue (Materials); Multidisciplinary Research; Crack Propagation

19980024306 NERAC, Inc., Tolland, CT USA
Coating Adhesion Analysis and Testing. (Latest citations from World Surface Coatings Abstracts)
Dec. 1997; In English; Page count unavailable.
Report No.(s): PB98-851496; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning adhesion analysis and testing of coatings on metal and non-metal substrates. Topics include adhesion studies of organic and metallic coatings, spectroscopic and acoustic evaluations of coatings, causes of adhesion failure, adhesion promoters, corrosion-induced adhesion loss, adverse effects of environmental factors on coatings, design and development of testing methods and equipment, and coating materials and additives. Adhesion evaluations and assessment of pipeline and automotive coatings are included.(Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Adhesion; Adhesion Tests; Bibliographies; Coatings

19980027027 Akron Univ., Chemistry Dept., Akron, OH USA

Organometallic Polymeric Conductors ***Final Report***

Youngs, Wiley J., Akron Univ., USA; 1997; 33p; In English

Contract(s)/Grant(s): NCC3- 225

Report No.(s): NASA/CR-97-207499; NAS 1.26:207499; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

For aerospace applications, the use of polymers can result in tremendous weight savings over metals. Suitable polymeric materials for some applications like EMI shielding, spacecraft grounding, and charge dissipation must combine high electrical conductivity with long-term environmental stability, good processability, and good mechanical properties. Recently, other investigators have reported hybrid films made from an electrically conductive polymer combined with insulating polymers. In all of these instances, the films were prepared by infiltrating an insulating polymer with a precursor for a conductive polymer (either polypyrrole or polythiophene), and oxidatively polymerizing the precursor in situ. The resulting composite films have good electrical conductivity, while overcoming the brittleness inherent in most conductive polymers. Many aerospace applications require a combination of properties. Thus, hybrid films made from polyimides or other engineering resins are of primary interest, but only if conductivities on the same order as those obtained with a polystyrene base could be obtained. Hence, a series of experiments was performed to optimize the conductivity of polyimide-based composite films. The polyimide base chosen for this study was Kapton. 3-MethylThiophene (3MT) was used for the conductive phase. Three processing variables were identified for producing these composite films, namely time, temperature, and oxidant concentration for the in situ oxidation. Statistically designed experiments were used to examine the effects of these variables and synergistic/interactive effects among variables on the electrical conductivity and mechanical strength of the films. Multiple linear regression analysis of the tensile data revealed that temperature and time have the greatest effect on maximum stress. The response surface of maximum stress vs. temperature and time (for oxidant concentration at 1.2 M) is shown. Conductivity of the composite films was measured for over 150 days in air at ambient temperature. The conductivity of the films dropped only half an order of magnitude in that time. Films aged under vacuum at ambient temperature diminished slightly in conductivity in the first day, but did not change thereafter. An experimental design approach will be applied to maximize the efficiency of the laboratory effort. The material properties (initial and long term) will also be monitored and assessed. The experimental results will add to the existing database for electrically conductive polymer materials. Attachments: 1) Synthesis Crystal Structure, and Polymerization of 1,2:5,6:9,10-Tribenzo-3,7,11,13-tetradehydro(14) annulene. 2) Reinvestigation of the Photocyclization of 1,4-Phenylene Bis(phenylmaleic anhydride): Preparation and Structure of (5)Helicene 5,6:9,10-Dianhydride. 3) Preparation and Structure Charecterization of a Platinum Catecholate Complex Containing Two 3-Ethynyltheophone Groups. and 4) Rigid-Rod Polymers Based on Noncoplanar 4,4'-Biphenyldiamines: A Review of Polymer Properties vs Configuration of Diamines.

Derived from text

Conductors; Polyimides; Aerospace Engineering; Crystal Structure; Organometallic Compounds; Regression Analysis

19980027028 National Inst. for Fusion Science, Theory and Computer Simulation Center, Toki, Japan

Molecular Dynamics Simulation of Structural Formation of Short Polymer Chains

Fujiwara, Susumu, National Inst. for Fusion Science, Japan; Sato, Tetsuya, National Inst. for Fusion Science, Japan; Aug. 1997; ISSN 0915-633X; 20p; In English; Original contains color illustrations

Report No.(s): NIFS-504; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Molecular dynamics simulations are carried out to study the structural formation of 100 short polymer chains, each of which consists of 20 CH2 groups. Our simulations show that the orientationally ordered structure at 400 K is formed from a random structure at 700 K by cooling. The essentially extended chains form a monolayer structure with a hexagonal packing. It is ascertained that the formation of the ordered structure proceeds stepwise in connection with the manner in which the local ordered regions grow. The stepwise behavior is also found in the time variation of the van der Waals energy.

Author

Molecular Dynamics; Simulation; Polymer Chemistry; Dynamic Structural Analysis

19980027608 Texas Research Inst., Inc., Austin, TX USA

Correlation of Chemical and Physical Test Data for the Environmental Ageing of Tefzel (ETFE)

Morgan, G. J., Texas Research Inst., Inc., USA; Campion, R. P., Texas Research Inst., Inc., USA; Dec. 04, 1996; 20p; In English

Contract(s)/Grant(s): NAG10-153

Report No.(s): NASA/CR-96-207622; NAS 1.26:207622; CAPP/M.13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In a similar approach to that used for the previously issued correlation report for Coflon (CAPP/M.10), this report aims to identify any correlations between mechanical property changes and chemical/morphological changes for Tefzel, using information supplied in other MERL and TRI project reports (plus latest data which will be included in final reports for Phase 1). Differences identified with Coflon behaviour will be of scientific interest as well as appropriate to project applications, as Tefzel and Coflon are chemical isomers. Owing to the considerable chemical resistance of Tefzel, much of its testing so far has been based on mechanical properties. Where changes have occurred, chemical analysis can now be targeted more effectively. Relevant test data collated here include: tensile modulus and related properties, permeation coefficients, % crystallinity, and other observations where significant. Fluids based on methanol and amine (Fluid G), a mixture of methane, carbon dioxide and hydrogen sulphide gases plus an aqueous amine solution (Fluid F), and an aromatic oil mix of heptane, cyclohexane, toluene and I-propanol (Fluid 1) have affected Tefzel to varying degrees, and are discussed in some detail herein.
Derived from text
Aging (Materials); Mechanical Properties; Chemical Analysis; Permeating; Correlation; Methane; Hydrogen

19980029710 Texas Research Inst., Inc., Materials Engineering Research Lab., Austin, TX USA
Flexible Pipes-Permeation of Methane, Carbon Dioxide and Water Through Tefzel ETFE: Experiments 1996
Wang, Per Arne, Texas Research Inst., Inc., USA; Hydro, Norsk, Texas Research Inst., Inc., USA; Apr. 18, 1997; 22p; In English
Contract(s)/Grant(s): NAG10-153
Report No.(s): NASA/CR-97-207615; NAS 1.26:207615; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The permeation of a mixture of CH4 and CO2 (97% CH4 and 3% CO2) saturated with water vapour through Tefzel has been studied at 950 C and 25 and 50 bars. Tefzel is the Du Pont trademark of an ETFE (ethylenetetrafluorethylene) which is a copolymer of ethylene and tetrafluorethylene. This material might be used as inner plastic lining of flexible pipes. For methane and carbon dioxide, the permeability of Tefzel is higher than the deplasticized PVDF (Polyvinylidenefluoride), but lower than the plasticized PVDF. For water, the situation seems to be the other way round; Tefzel has a lower permeability than deplasticized PVDF. Whether the permeability tests on Tefzel at higher temperatures and pressures will be pursued or not, will be considered by the steering committee of the CAPP project in May.
Derived from text
Methane; Carbon Dioxide; Copolymers; Permeability; Permeating; Ethylene

19980029711 Mission Research Corp., Nashua, NH USA
Penetration Electric Fields and Inner Magnetosphere Dynamics: A Model and Data Comparison ***Annual Report No. 2, 6 Mar. 1997 - 5 Mar. 1998***
Maynard, Nelson C., Mission Research Corp., USA; Feb. 27, 1998; 53p; In English
Contract(s)/Grant(s): NASw-5036
Report No.(s): NASA/CR-1998-207461; NAS 1.26:207461; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Significant progress has been made on the analysis of the June, 1991 storm. We have completed the analysis of the CRRES and DMSP data sets. We have been able to follow the evolution during the storm of the inner edge of the electric field patterns in the dusk sector and its relation to electron boundaries, ion boundaries and the ring current. Whereas the CRRES data provide radial cuts out through the plasmasphere every I 0 hours, DMSP provides snapshots every orbit of the potential and particle boundaries. Electric field and energetic particle measurements from CRRES and ion drifts and energetic particle measurements from DMSP provide the principal data sets. The combined data set provides high resolution definition of the boundary motions over the phases of the storm. L shell differences between the DMSP and CRRES particle boundaries are easily explained by inflation of the dusk sector by the ring current. The electric field boundaries are typically associated with the ion boundary and the inner edge of the ring current except during rapid increases in the cross-polar cap potential. A significant fraction of the dusk cell potential is found inside the plasmasheet electron inner edge. Twice during the storm this potential exceeded 60 kV. A paper (copy attached) has been prepared (Burke et al., 1998) and submitted to JGR. An invited paper will be presented by Burke at the spring AGU meeting. An abstract has also been submitted to the COSPAR meeting for presentation by Maynard. New simulations have been carried out with the Rice Convection Model for the magnetic storm of June 4-5, 1991, and comparisons have been made with CRRES and DMSP data.
Derived from text
Electric Fields; Dynamic Models; Models; Data Processing; Earth Magnetosphere

19980029713 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

High Temperature Degradation Mechanisms in Polymer Matrix Composites ***Final Report***

Cunningham, Ronan A., Massachusetts Inst. of Tech., USA; McManus, Hugh L., Massachusetts Inst. of Tech., USA; Jan. 1997; 3p; In English

Contract(s)/Grant(s): NAG3-1893

Report No.(s): NASA/CR-97-207470; NAS 1.26:207470; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Polymer matrix composites are increasingly used in demanding structural applications in which they may be exposed to harsh environments. The durability of such materials is a major concern, potentially limiting both the integrity of the structures and their useful lifetimes. The goal of the current investigation is to develop a mechanism-based model of the chemical degradation which occurs, such that given the external chemical environment and temperatures throughout the laminate, laminate geometry, and ply and/or constituent material properties, we can calculate the concentration of diffusing substances and extent of chemical degradation as functions of time and position throughout the laminate. This objective is met through the development and use of analytical models, coupled to an analysis-driven experimental program which offers both quantitative and qualitative information on the degradation mechanism. Preliminary analyses using coupled diffusion/reaction model are used to gain insight into the physics of the degradation mechanisms and to identify crucial material parameters. An experimental program is defined based on the results of the preliminary analysis which allows the determination of the necessary material coefficients. Thermogravimetric analyses are carried out in nitrogen, air, and oxygen to provide quantitative information on thermal and oxidative reactions. Powdered samples are used to eliminate diffusion effects. Tests in both inert and oxidative environments allow the separation of thermal and oxidative contributions to specimen mass loss. The concentration dependency of the oxidative reactions is determined from the tests in pure oxygen. Short term isothermal tests at different temperatures are carried out on neat resin and unidirectional macroscopic specimens to identify diffusion effects. Mass loss, specimen shrinkage, the formation of degraded surface layers and surface cracking are recorded as functions of exposure time. Geometry effects in the neat resin, and anisotropic diffusion effects in the composites, are identified through the use of specimens with different aspect ratios. The data is used with the model to determine reaction coefficients and effective diffusion coefficients. The empirical and analytical correlations confirm the preliminary model results which suggest that mass loss at lower temperatures is dominated by oxidative reactions and that these reaction are limited by diffusion of oxygen from the surface. The mechanism-based model is able to successfully capture the basic physics of the degradation phenomena under a wide range of test conditions. The analysis-based test design is successful in separating out oxidative, thermal, and diffusion effects to allow the determination of material coefficients. This success confirms the basic picture of the process; however, a more complete understanding of some aspects of the physics are required before truly predictive capability can be achieved.

Author

Degradation; High Temperature; Polymer Matrix Composites; Chemical Properties; Surface Cracks; Thermal Diffusion; Structural Design; Time Functions

19980031003 NASA Pasadena Office, CA USA

Diamond Composite Films for Protective Coatings on Metals and Method of Formation

Ong, Tiong P., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Shing, Yuh-Han, Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Jul. 08, 1997; 4p; In English; Continuation of abandoned US-Patent-Appl-SN-052419, filed 22 Apr. 1993

Patent Info.: Filed 25 Oct. 1994; NASA-Case-NPO-18501-1; US-Patent-Appl-SN-328947; US-Patent-Appl-SN-052419; US-Patent-5,645,900; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

Composite films consisting of diamond crystallites and hard amorphous films such as diamond-like carbon, titanium nitride, and titanium oxide are provided as protective coatings for metal substrates against extremely harsh environments. A composite layer having diamond crystallites and a hard amorphous film is affixed to a metal substrate via an interlayer including a bottom metal silicide film and a top silicon carbide film. The interlayer is formed either by depositing metal silicide and silicon carbide directly onto the metal substrate, or by first depositing an amorphous silicon film, then allowing top and bottom portions of the amorphous silicon to react during deposition of the diamond crystallites, to yield the desired interlayer structure.

Official Gazzette of the U.S. Patent and Trademark

Diamond Films; Protective Coatings; Technologies; Carbon; Composite Materials; Metal Films

19980031009 NERAC, Inc., Tolland, CT USA

Piezoelectric and Pyroelectric Polymers (Excluding Vinylidene Fluoride Polymers). (Latest citations from the INSPEC Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851686; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning piezoelectric and pyroelectric properties and applications of polymers and polymer composites. The citations explore epoxy, styrene, methyl methacrylate, tetrafluoroethylene, urethane-reinforced and non-reinforced polymers, copolymers, PZT/polymer composites, and synthetic rubbers that are primarily in the form of polymer films and solutions. Applications in electronic transducers include microphones, hydrophones, loudspeakers, and biomedical devices. Polyvinylidene fluoride is discussed in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Polymers

19980031012 NERAC, Inc., Tolland, CT USA

Adhesive Bonding of Aluminum and Aluminum Alloys. (Latest citations from the Ei Compendex*Plus database)

Jan. 1998; In English; Page count unavailable.

Report No.(s): PB98-851868; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, testing, and evaluation of adhesive bonding of aluminum and aluminum alloys. Topics include adhesively bonded joints, bond durability, aluminum structures, environmental effects, aging effects, and laminated materials. Citations also discuss applications in automobile, construction, and aircraft industries.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Adhesive Bonding; Bibliographies; Aluminum Alloys; Aluminum

19980033147 Wisconsin Univ., Dept. of Materials Science and Engineering, Madison, WI USA

Laterally Defined Nanoscale Structures: Film Growth, Chemistry, and Transport ***Final Report, 1 Jan. 1994 - 30 Sep. 1997***

Lagally, Max G., Wisconsin Univ., USA; Sep. 1997; 8p; In English

Contract(s)/Grant(s): F49620-94-I-0113; AF Proj. 2303

Report No.(s): AD-A334742; AFRL-SR-BL-TR-98-0065; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The research aims were to investigate film growth, chemistry, and electronic and atomic transport on laterally defined nanostructures. The objective of this research was to develop methodologies for creating nanoscale patterns in surfaces using scanned-probe techniques, either through assembly of molecules on surfaces or by the removal of atoms or molecules from an existing structure. Because of initial success in our laboratories in increasing the speed of operation of scanned probes, the emphasis changed in the last 1-1/2 years to explorations of the viability of high-speed parallel nanolithography for creating patterns.

DTIC

Transport Properties; Chemistry; Semiconductor Devices; Thin Films

19980033351 General Electric Co., Research and Development, Schenectady, NY USA

Non-Toxic, Self Cleaning Silicone Foul Release Coatings ***Progress Report, Oct. - Dec. 1997***

Cella, James, General Electric Co., USA; Dec. 1997; 9p; In English

Contract(s)/Grant(s): N00014-96-C-0145

Report No.(s): AD-A334815; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Data collection continues on about 50 screening panels at FIT, and about 70 panels at MMRTS. A set of downselected compositions was deployed by the subcontractors in July 1997. A set of bilge keel panels is in preparation. We are in the planning stage for the next set of downselect panels. Task 1.1.1: Quantitative foul release performance of new materials (FIT). Static Immersion of Test Coatings. The test coatings are applied to screening panels (4”x10”) for short term evaluation and down select panels (10”x12”) for long term appraisal. A total of 130 screening panels have been exposed to barnacle fouling at the Florida Institute of Technology static immersion site since January 1997 (Table 1). These were caged to prevent loss of barnacles by fish predation.

DTIC

Fishes; Fouling; Shellfish; Toxicity; Cleaning

19980035774 Naval Postgraduate School, Monterey, CA USA
Pressure-Sensitive Paint Measurements on a Rotor Disk Surface at High Speeds
Gahagan, Shane G., Naval Postgraduate School, USA; Jun. 1997; 61p; In English
Report No.(s): AD-A333428; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Measurement of the static-pressure distribution over the surface of a rotor disk was attempted using pressure sensitive paint (PSP). A uniform stress, high speed rotor disk, fitted with a shock generator, was built, installed and operated at speeds in excess of 20,000 RPM by a Hamilton Standard turbine driven fuel pump. A once per revolution trigger signal was converted to a transistor to transistor logic (TTL) format and used to gate an intensified charged coupled device (CCD) video camera. Multiple low intensity level camera exposures were integrated and captured to produce a single usable image. Ten captured images were averaged to increase the image's signal to noise ratio and the result was used to produce an image ratio with respect to a static reference condition. Finally, a pseudo coloring process was used to develop a color image that related intensities to both temperature and pressure distributions in accordance with the Stern-Volmer relation. Paint stripping and temperature dependence prevented the measurement of pressure at transonic speeds. The test bed facility and acquisition techniques developed here could now be used to overcome those limitations.
DTIC
CCD Cameras; Fuel Pumps; High Speed; Paint Removal; Pressure Distribution; Pressure Measurement; Signal to Noise Ratios; Static Pressure; Temperature Dependence; Transistor Logic; Turbine Pumps

19980036329 University of Central Florida, Center for Research and Education in Optics and Lasers, Orlando, FL USA
Novel Frequency Conversion Phenomena Based on Poled Polymers ***Final Report, Jan. 1995 - Dec. 1997***
Stegeman, G. I., University of Central Florida, USA; Dec. 18, 1997; 12p; In English
Contract(s)/Grant(s): F49620-95-I-0147
Report No.(s): AD-A335640; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The technology of second harmonic generation in channel waveguides made from poled polymers was developed for interaction geometries appropriate for: (1) cascading and wavelength shifting, and (2) for wavelength demultiplexing. For fundamental beams which generate a harmonic along the same propagation direction, various phase matching geometries were studied which relied on periodically modulating the linear refractive index and/or the nonlinearity (QPM) in DANS. Although this approach with interdigitated poling electrodes did produce the best results ever reported in polymeric systems, it was not competitive with those in the ferroelectric QPM-LiNbO3. The best results were obtained using modal phase matching in which a low order fundamental waveguide mode was velocity matched to a higher order harmonic mode. by using multiple layer s with successive layers poled in opposite directions, a figure of merit equal to LiNbO3 was achieved in the polymer DR1. However, the large losses at the second harmonic reduced the effective sample length and hence the absolute conversion efficiency. For oppositely propagating fundamental inputs, a geometry appropriate to demultiplexing, alternatively poled layers led to the largest conversion efficiencies for any material system for second harmonic beams radiated normal to the waveguide surfaces.
DTIC
Energy Conversion Efficiency; Nonlinear Optics; Harmonic Generations; Phase Matching; Modulation

19980036644 Georgia Inst. of Tech., School of Mechanical Engineering, Atlanta, GA USA
Deformation Behavior of Thin Lubricant Films at Elevated Pressure ***Final Report, 1 Feb. 1996 - 31 Jan. 1998***
Bair, Scott, Georgia Inst. of Tech., USA; Jan. 1998; 46p; In English
Contract(s)/Grant(s): N00014-96-I-0293
Report No.(s): AD-A336053; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

If care is taken to avoid viscous heating, the results from rheometers may be used to generate empirical rate equations which are useful in modelling EHD traction. However, an analytical treatment of piezo-viscous liquids reveals the Reynolds equation adequately captures the mechanics of the piezo-viscous liquid only when the shear stress is much less than the reciprocal of the pressure viscosity coefficient. Otherwise the cross film pressure gradient cannot be neglected and secondary flows result.
DTIC
Deformation; Thin Films; Pressure Gradients; High Pressure; Lubricants

19980036872 Israel Inst. of Metals, Haifa, Israel
Non-Chromium Conversion Coatings on Aluminium ***Final Report***
Bodnevas, A., Israel Inst. of Metals, Israel; Berkh, O., Israel Inst. of Metals, Israel; Rogalsky, G., Israel Inst. of Metals, Israel; Rotel, M., Israel Inst. of Metals, Israel; Zahavi, J., Israel Inst. of Metals, Israel; Dec. 31, 1997; 36p; In English
Contract(s)/Grant(s): F61708-97-W-0111

Report No.(s): AD-A336091; EOARD-SPC97-4020; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the current period our efforts were concentrated on the without chromate passivation of Al 2024-T3. This material in known to be very prone to both pitting and intergranular corrosion owing to high Cu content (its composition - 4.5% Cu, 1.5% Mg, 0.6% Mn) and heat treatment prehistory (solution heat- treated, then strain-hardened). Corrosion accelerates especially in the presence of halogen ions. The actual mechanism by which the CL- or F- ions affect corrosion of Al and its alloys is not fully understood, but has been attributed to the interaction between the ions and the protective oxide layer 1,2. The following phenomena are responsible for Al 2024 T3 enhanced susceptibility to corrosion: (1) Enhanced cathodic depolarization; (2) Enhanced permeability of Al oxide layer on the material surface; and (3) Galvanic corrosion.

DTIC

Aluminum Alloys; Protective Coatings; Intergranular Corrosion; Metal Oxides

19980036878 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia

Cure Monitoring Techniques Using Embedded Sensors

Vodicka, Roger, Defence Science and Technology Organisation, Australia; Sep. 1997; 18p; In English

Report No.(s): AD-A335342; DSTO-TN-0110; DODA-AR-010-324; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Assessing the exact state of cure of thermosetting polymer composite components using embedded sensors can allow the user to precisely control the cure cycle in order to achieve optimum cure. This is desirable in a field repair situation where a non-optimum cure cycle may have to be adopted. At present a wide variety of options are available. However, to be practical for bonded composite repair, especially field repair, it is important to assess these options against a range of criteria such as size, complexity, cure sensing ability, cost and the ability to measure other information after cure. The techniques reviewed fall into a number of categories defined by the property which is measured. These are electrical, acoustic, optical, thermal and other/indirect properties. of the techniques reviewed three techniques show most promise: viz. dielectrometry (electrical), spectroscopic (optical) and measurement of refractive index during cure (optical). The simplest of these techniques relies on the change in refractive index of the matrix resin during cure. A segment of cured resin is placed as a link between two lengths of a silica optic fibre. This fibre can then be placed in the uncured matrix. Light is transmitted through the fibre prior to cure but as the refractive index of the uncured resin approaches that of the cured resin the transmitted light intensity decreases until the fully cured state is achieved where no light is transmitted. The details of this refractive index technique are highlighted and show that a cure sensing system can be simple, low in cost and effective. Therefore this technique is recommended for further investigation.

DTIC

Matrix Materials; Thermosetting Resins; Refractivity; Curing; Optical Fibers

19980036919 National Space Development Agency, Office of Research and Development, Tokyo, Japan

Research on Thermal Protection Materials for Reentry Vehicle

Morino, Yoshiki, National Space Development Agency, Japan; Yoshinaka, Toshinari, National Space Development Agency, Japan; Oyo Buturi; Dec. 1997; Volume 64, No. 3; 16p; In English; Translated into English by NASDA

Report No.(s): NASDA-ETR-970010; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The most demanding design condition for a reentry vehicle that makes round trips between the ground and the space is the aerodynamic heating environment which the vehicle is exposed to at the time of its reentry into the atmosphere. As a structural material capable of withstanding this environment, the carbon/carbon (C/C) composite material with oxidation resistant coating is promising; however, the resistance to high temperature heating is one of the major technological challenges. The National Space Development Agency is evaluating the durability of this material by performing arc-heated wind tunnel tests simulating the aerodynamic heating environment to which a reentry vehicle is supposed to be exposed. This paper presents the outline of the research activities dealing with this subject with emphasis placed on the test methods and the results obtained by the tests.

Author

Research and Development; Thermal Protection; Reentry Vehicles; Wind Tunnel Tests

28
PROPELLANTS AND FUELS

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

19980025551 Johns Hopkins Univ., Chemical Propulsion information Agency, Columbia, MD USA
Chemical Propulsion Information Agency Bulletin, Volume 24
Hartman, Mary L., Johns Hopkins Univ., USA; Jan. 1998; 12p; In English
Contract(s)/Grant(s): SP0700-97-D-4004
Report No.(s): AD-A333489; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Included in this CPIA Bulletin are the following articles: Domestic Launch Vehicles Finish Strong, The New NIMIS-2 Software is Offered for Beta Release, Test Stand 1A Revitalized after 25 Years, Fire and Explosion Hazards of Liquid Propellants, Meeting PEEKs, and Meeting Preview.
DTIC
Chemical Propulsion; Launch Vehicles; Liquid Rocket Propellants

19980034673 Southwest Research Inst., TARDEC Fuels and Lubricants Research Facility, San Antonio, TX USA
Estimation of Middle Distillate Fuel Properties by FT-IR and Chemometrics, Part 1, Calibrations and Validations ***Interim Report, Jul. 1992 - Apr. 1997***
Fodor, G. E., Southwest Research Inst., USA; Hutzler, S. A., Southwest Research Inst., USA; Dec. 1997; 143p; In English
Contract(s)/Grant(s): DAAK70-92-0059
Report No.(s): AD-A333512; SWRI-TFLRF-321-Pt-1; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

As an alternative to established laboratory protocols, an FT-IR method was developed for the rapid, simultaneous determination of several pertinent fuel properties, using less than 2 mL of sample. The method uses a single wavelength range of baseline uncorrected, raw FT-IR spectra. Neither baseline correction nor use of restricted wavelength regions improved the models. Using training sets comprised of over 500 middle distillate fuel samples, models were built to derive pertinent fuel properties from FT-IR spectra. These models showed that a single calibration training set may properly model several properties of fuels collected during different climatic seasons. Cursory experiments suggest that properties of diesel and turbine fuels may be more accurately derived by FT-IR if separate calibration models are used for each class of fuel.
DTIC
Analytical Chemistry; Diesel Fuels; Fourier Transformation; Fuels; Infrared Spectroscopy; Protocol (Computers); Molecular Spectroscopy

31
ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

19980024020 NASA Lewis Research Center, Cleveland, OH USA
Method and Apparatus for Pressure Pulse Arcjet Starting
Sandkovic, John M., Inventor, NASA Lewis Research Center, USA; Curran, Francis M., Inventor, NASA Lewis Research Center, USA; Nov. 25, 1997; 16p; In English; Division of US-Patent-Appl-SN-236855, filed 2 May 1994
Patent Info.: Filed 26 Mar. 1996; NASA-Case-LEW-15665-2; US-Patent-5,689,951; US-Patent-Appl-SN-626742; US-Patent-Appl-SN-236855; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

The invention disclosed is directed to a model and apparatus for an arcjet starter. The invention discloses a method of moving an arc from the subsonic region of the thruster to the supersonic region by introducing a pressurized propellant into the annular area of the anode.
Official Gazzette of the U.S. Patent and Trademark
Arc Jet Engines; Pressure Pulses; Starting

19980027687 Lund Univ., Dept. of Fire Safety Engineering, Sweden

Ship Fire Safety Engineering

Wikman, J., Lund Univ., Sweden; 1995; 157p; In English

Report No.(s): PB96-142518; LUTVDG-TVBB-1012-SE; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This thesis is concerned with the basic ideas of how the fire safety level can be evaluated. For a specific ship, risk levels are of course independent of the design methodology, but the evaluation of the fire safety level is dependent on the type of regulations that are used. The evaluation of the fire safety can be done in a number of different ways. First, the UK 'Draft Code of Practice for the Application of Fire Safety Engineering Principles to Fire Safety in Buildings' is describes. The Code is intended to facilitate the use of functional building requirements, and it gives guidance on how to evaluate the different parts of the fire safety of buildings. The second approach, the Ship Fire Safety Engineering Method (SFSEM), uses both deterministic calculations and probabilities to determine a numerical value of the fire safety of ship. The third approach is the Australian-Canadian Risk-Cost Assessment Model. This model also produces a numerical value of the fire safety. The model can be used to compare different designs that give the same level of safety, in order to find the most cost effective solution.

NTIS

Fire Prevention; Safety Management; Ships

19980036944 National Space Development Agency, Common Equipment Lab., Tokyo, Japan

Experience of Development and Tests on Power Equipment

Kuwashima, Saburo, National Space Development Agency, Japan; Dec. 1997; 60p; In English; Translated into English by NASDA

Report No.(s): NASA-ETR-970004; NASDA-TMR-960005; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

I would like to discuss the energy equipment testing technology in the tests that we have carried out so far. First of all, broadly speaking, energy equipment means electrical power system equipment and propulsion system equipment, namely equipment providing propulsion and electrical power. Please understand, however, that my experience with propulsion only extends to the study of the electrical power sources of ion engines, and I will limit myself here to talking about electrical power system equipment. When saying electrical power system equipment, I mean solar cell panels, batteries and electrical power control equipment (which have been the electrical power system equipment on satellites up to now), along with the Shuttle's fuel cells, radioisotope thermoelectric generator on probes such as Voyager, and primary chemical batteries which have been used, among other things, on Apollo lunar lander. Primary batteries include ordinary dry cells. Today I would like to talk about the solar cell panels, batteries and power control equipment which are the power source equipment of satellites. In particular, I am currently carrying out research focused on batteries, so in the second half I would like to concentrate oil talking about batteries. I would also like to briefly mention some of the issues facing us in the future of the application of new batteries in space. One is related to fuel cells. These are also being terrestrially used a great deal. The main difficulties with use in space are the gravity and the acceleration upon launch (about 5G) and the non-gravity environment once in orbit. There is the issue of treating produced water. Fuel and an oxidizer are required on earth too, but on earth the oxidizer is taken from air, as automobile engines. Then, after reaction of fuel and oxidizer, waste is emitted as exhaust gas. A fuel cell on earth is therefore an open system. In space, both the fuel and the oxidizer are carried, giving rise to the issue of what to do after the fuel has been reacted. This was actually one of the issues with the fuel cells on the Shuttle; produced water from oxygen or hydrogen(fuel) appears either oxygen line or hydrogen line. Which line depends on the form of fuel cell. Whatever the form, water produced from the reaction of oxygen and hydrogen gets mixed in intake line. So, it cannot be externally released, some mechanism is required that can separate gases and liquids well. Now on to radioisotope thermoelectric generator. Terrestrially there are isotope and nuclear power generation. In space, it is also important to know what kind of design standard is to be applied.

Author

Product Development; Electric Power Supplies; Propulsion; Solar Cells; Fuel Cells; Energy Technology; Acceptability

32
COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications. 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.

19980023098 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop
Golshan, Nassar, Editor, Jet Propulsion Lab., California Inst. of Tech., USA; Sep. 01, 1996; 530p; In English; 20th; NASA Propagation Experimenters Meeting (NAPEX XX), 4-5 Jun. 1996, Fairbanks, AK, Fairbanks, AK, USA, USA; Also announced as 19980023099 through 19980023126
Contract(s)/Grant(s): NAS7-1260
Report No.(s): NASA/CR-96-112600; NAS 1.26:112600; JPL-Publ-96-20; No Copyright; Avail: CASI; A23, Hardcopy; A04, Microfiche

The NASA Propagation Experimenters (NAPEX) Meeting and associated Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop convene yearly to discuss studies supported by the NASA Propagation Program. Representatives from the satellite communications (satcom)industry, academia, and government with an interest in space-ground radio wave propagation have peer discussion of work in progress, disseminate propagation results, and interact with the satcom industry. NAPEX XX, in Fairbanks, Alaska, June 4-5, 1996, had three sessions: (1) ”ACTS Propagation Study: Background, Objectives, and Outcomes,” covered results from thirteen station-years of Ka-band experiments; (2) ”Propagation Studies for Mobile and Personal Satellite Applications,” provided the latest developments in measurement, modeling, and dissemination of propagation phenomena of interest to the mobile, personal, and aeronautical satcom industry; and (3)”Propagation Research Topics,” covered a range of topics including space/ground optical propagation experiments, propagation databases, the NASA Propagation Web Site, and revision plans for the NASA propagation effects handbooks. The ACTS Miniworkshop, June 6, 1996, covered ACTS status, engineering support for ACTS propagation terminals, and the ACTS Propagation Data Center. A plenary session made specific recommendations for the future direction of the program.
Author
Wave Propagation; Satellite Communication; Extremely High Frequencies; Radio Transmission; Radio Waves; Spaceborne Experiments

19980023099 Oklahoma Univ., School of Meteorology, Norman, OK USA
ACTS Propagation Experiment: Preprocessing Software User’s Manual
Crane, Robert K., Oklahoma Univ., USA; Wang, Xu-He, Oklahoma Univ., USA; Westenhaver, David, Westenhaver Wizard Works, Inc., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 9-40; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The preprocessing software (ACTSpp) reads the YYMMDDxx.RVO files (or .rvO files) where YY is year, MM is month, DD is day and xx is site identifier) generated by the ACTS propagation terminals; performs radiometer calibrations, beacon reference level predictions, and beacon tone modulation corrections as needed to provide valid attenuation estimates at both beacon frequencies; tabulates attenuation histograms for further analysis; prepares one-minute averages or second-by-second output for further spreadsheet analysis; and generates YYMMDDxx.PV2 (or .pv2) files for archival and further analysis. The program was originally developed to observe and diagnose ACTS propagation terminal receiver problems but has been quite useful for automating the preprocessing functions needed to convert the terminal output to useful attenuation estimates. As provided, the preprocessing software will generate .pv2 files automatically. Prior to having data acceptable for archival, the individual receiver systems must be calibrated and the power level shifts caused by ranging tone modulation must be removed.
Derived from text
User Manuals (Computer Programs); Preprocessing; Management Methods; Computer Graphics; Tables (Data); Radiometers; Modulation

19980023100 Alaska Univ., Electrical Engineering Dept., Fairbanks, AK USA
Two Years of ACTS Propagation Studies in Alaska
Mayer, Charles E., Alaska Univ., USA; Jaeger, Bradley E., Alaska Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies

Miniworkshop; Sep. 01, 1996, pp. 41-66; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Alaska ACTS Propagation Terminal (APT) is located on top of the engineering building on the University of Alaska Fairbanks campus. The latitude and longitude of the site are 64 deg 51 min 28 sec N and 147 deg 48 min 59 sec W. The geometrical elevation angle to ACTS is 7.97 deg. Including a normal atmospheric refractivity, the elevation angle increases to 8.10 deg. The azimuth angle to ACTS is 129.36 deg. The terminal is located at 580 feet above mean sea level. The site is located in ITU-R rain zone C and Crane global model zone B1. ACTS transmits vertical polarization beacons at 27.505 and 20.185 GHz. At the APT the polarization tilt angle is 19.4 deg rotated CCW with respect to vertical when looking toward the satellite. The beacons are transmitted in a CONUS pattern. The ACTS beacon footprint at the Alaska APT site is 9 dB down from the transmission pattern peak at 27.505 GHz and 11 dB down from the pattern peak at 20.185 GHz. We will henceforth refer to the beacon frequencies as 27.5 (or 27) and 20.2 (or 20) GHz for the sake of brevity.

Derived from text

Attitude (Inclination); Atmospheric Refraction; Superhigh Frequencies; Elevation Angle; Footprints

19980023101 British Columbia Univ., Dept. of Electrical Engineering, Vancouver, British Columbia Canada

Analysis of the ACTS-Vancouver Path Propagation Data: 1 December 1993 - 30 November 1995

Kharadly, M. M. Z., British Columbia Univ., Canada; Ross, Robert, British Columbia Univ., Canada; Dow, B., British Columbia Univ., Canada; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 67-83; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The statistics presented are for the period 1st December, 1993 to 30th November, 1995. These include average and worst-month statistics pertaining to the CDFs, fade duration and fade slopes. Statistics, similar to those in 7.1, are also presented, where the effect of antenna surface wetting during rain events is taken into consideration in an approximate manner. It is shown that moisture clinging to antenna surfaces can significantly affect propagation-data statistics. It must be emphasized, however, that this effect depends on antenna type and conditions at the receiving site. (i) The ITU-R frequency-scaling model appears to apply more closely to the adjusted values rather than the unadjusted. (ii) For fade duration, the number of events for any particular duration is almost an order of magnitude lower using the adjusted results than for the unadjusted. (iii) The fade-slope statistics show a similar trend as for fade duration. There appears to be a need for developing Ka-band antennas which do not suffer from the effect of moisture on their surfaces. This is particularly important for systems with low fade margin. The development of such antennas is not only possible but also feasible.

Derived from text

Extremely High Frequencies; Microwave Antennas; Attenuation; Rain

19980023102 Colorado State Univ., Dept. of Electrical Engineering, Fort Collins, CO USA

Ka-Band Propagation Studies Using the ACTS Propagation Terminal and the CSU-CHILL Multiparameter Radar

Bringi, V. N., Colorado State Univ., USA; Beaver, John, Colorado State Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 85-112; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Due to the high demand for satellite communications, already overused portions of the frequency spectrum (C and Ku-bands) are becoming even more crowded. This necessitates looking at less crowded areas of the spectrum such as the Ka-band frequencies. to study satellite communications at these frequencies, NASA launched the Advanced Communications Technology Satellite (ACTS). The ACTS is an experimental satellite being used to conduct communication and propagation experiments using new Ka-band technology. At Ka-band, weather events can have an adverse affect on the signal being propagated through the atmosphere. Therefore, propagation effects at these frequencies must be studied. This report has outlined the research that has been conducted at CSU during the first two years to meet the ACTS experiment goals and further the understanding of K-band propagation effects. The main goal of constructing an attenuation data base for the B2 climatic zone at K-band frequencies was met by maintaining a well calibrated ground propagation terminal and ensuring the integrity of the data collected and processed. Data were collected and preprocessed for the two year period of December 1, 1993 through November 30, 1995. A statistical analysis for the CSU-APT data was presented in Section 2 and Appendix A. The analysis was done on a monthly and annual basis. An attenuation model was developed to relate S-band radar reflectivity to Ka-band attenuation. Several case studies were presented to illustrate the attenuation model. They included a very strong convective case, with known mixed phase, that occurred on June 20, 1994, a second, weaker convective event that occurred on May 18, 1995 and finally a stratiform event that occurred on June 18, 1995. Radar data, collected by the CSU-CHILL radar, for each of these events were used as inputs to the attenuation model.

Very good results were obtained for each case. Finally to conclude, the ACTS propagation experiment is an on-going experiment with two years of data collection completed, the third year in progress and the possibility of a fourth year. With the increased demand from industry to utilize the Ka-Band spectrum, the attenuation data being collected here, as well as at other sites, and its subsequent analysis will be invaluable for the field of satellite communications.
Derived from text
Satellite Communication; Superhigh Frequencies; Radar Attenuation; Frequency Distribution; Climatology; Radar Data; Statistical Analysis

19980023103 Florida Atlantic Univ., Boca Raton, FL USA
Space Communications Technology Center (SCTC): Propagation Measurements in Florida
Helmken, Henry F., Florida Atlantic Univ., USA; Henning, Rudy, University of South Florida, USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 113-117; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Program goals include: (1) Generate CDF's for sub-tropical regions; (2) Sub-tropical fading statistics; (3) Radiometer development; (4) Diversity gain measurements; (5) Sub-tropical rain models.
Derived from text
Fading; Radiometers; Space Communication; Rain; Tropical Regions

19980023104 Communications Satellite Corp., Clarksburg, MD USA
ACTS Propagation Measurements in Maryland and Virginia
Dissanayake, Asoka, Communications Satellite Corp., USA; Lin, Kuan-Ting, Communications Satellite Corp., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 119-146; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Rapid growth in new satellite services incorporating Very Small Aperture Terminals (VSAT) and Ultra Small Aperture Terminals (USAT) is expected in the coming years. Small size terminals allow for widespread use of satellite services in small business and domestic applications. Due to congestion of lower frequency bands such as C and Ku, most of these services will use Ka-band (20/30 GHz) frequencies. Propagation impairments produced by the troposphere is a limiting factor for the effective use of the 20/30 GHz band and the use of smaller earth terminals makes it difficult to provide sufficient link margins for propagation related outages. In this context, reliable prediction of propagation impairments for low-margin systems becomes important. Due to the complexity of propagation phenomena propagation modeling is mainly attempted on empirical basis. As such, availability of reliable measured data that extend to probability levels well in excess of the traditional limit of 1% is of great importance in the development, validation, and refinement of propagation models. The beacon payload on the ACTS satellite together with the propagation measurement terminals developed under the NASA ACTS propagation program provide an excellent opportunity to collect such data on a long-term basis. This paper presents results of ACTS propagation measurements conducted in the Washington DC metropolitan area by COMSAT Laboratories. The measurement program involves three sites, two in Maryland and one in Virginia. Measurements started soon after the launch of the ACTS satellite in September 1993. However, not all three sites were brought on line at the same time. Results from only two sites are presented in this paper; results from the third site are given in Reference l . Use of multiple sites for the measurement enabled the investigation of site diversity to combat rain fading. Two of the sites use radiometers along with beacon measurement systems, thus allowing a careful estimation of gaseous absorption and other phenomena that produce relatively low attenuation levels. This helps to characterize the attenuation distribution for low availability levels, especially those between 1% and 10%. Several meteorological sensors are also deployed to help evaluate propagation models and to investigate the dependence of propagation impairments on meteorological factors. A description of the measurement sites and the equipment used is given in Section 2. The three measurement systems are not identical and different data analysis procedures are used for the three systems. However, in each case the underlying analysis principles can be considered the same. Data analysis procedure used to convert raw data collected to a form suitable for the generation of attenuation statistics and other useful results are discussed in Section 3. Section 4 provides the salient results of the experiment. One of the sites reports results over a period of 24 months and the second site reports 21 months of data. Most of the results are presented in the form of monthly statistics. Comparison of standard model predictions with the measurement results is presented under summary and conclusions in Section 5.
Derived from text
Extremely High Frequencies; VSAT (Network); Meteorological Parameters; Deployment; Probability Theory; Payloads; Launching

19980023105 Stanford Telecommunications, Inc., Reston, VA USA

ACTS Propagation Measurements Program: Data Analysis Summary

Fell, Julie H., Stanford Telecommunications, Inc., USA; Ippolito, Louis J., Stanford Telecommunications, Inc., USA; Horan, Stephen, New Mexico State Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 147-165; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Topics discussed include: (1) ACTS KA band measurements and analysis; (2) Processing technique differences; (2) Worst month attenuation and weather measurements; (3) 24 month (12/93-11/95) propagation statistics; and (4) Model comparisons.
Derived from text

Attenuation; Extremely High Frequencies; Weather; Statistics

19980023106 Oklahoma Univ., Norman, OK USA

The Need for More Measurements in the ACTS Propagation Experiment

Crane, Robert K., Oklahoma Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 191-197; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The study of attenuation by rain at frequencies above 10 GHz started more than four decades ago. At first we collected data to size the problem. Then we expanded data acquisition to provide a sufficient data base to describe the problem statistically. The ITU-R (former CCIR) attenuation prediction model is a statistical summary of the data in the data banks. Recently we have tried to quantify the uncertainty that should be attributed to a prediction of the attenuation distribution for a specified path, the risk to be associated with an attenuation distribution prediction.
Derived from text

Attenuation; Rain; High Frequencies; Data Acquisition; Data Bases

19980023107 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Eastern US Space-Diversity Experiment: One Year of ACTS 20 GHz Measurements

Goldhirsh, Julius, Johns Hopkins Univ., USA; Musiani, Bert, Johns Hopkins Univ., USA; Dissanayake, Asoka, Communications Satellite Corp., USA; Lin, K. T., Communications Satellite Corp., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 199-219; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Three Site Diversity Required Margins include: (1) At P = 0.05% yields 3.5 dB; (2) At P = 0.01% yields 5.0 dB. Two Site Diversity Required Margins include: (1) 1 to 2 dB more (2 Scenarios); (2) 2 to 4 dB more (APL-COMSAT). ITU-R model agrees to within 1 dB as follows: (1) Up to fade margin of 9 dB for two of three scenarios; (2) Up to fade margin of 15 dB for APL-COMSAT. Seasonal Effects include: (1) Three Site Diversity Fade Margin: At P = 0.01% yields 5 dB (Convective and Stratiform Periods); (2) Significant Increase in Diversity Gain During Convective Season; (3) Greater than 6 dB at P = 0.05%.
Derived from text

COMSAT Program; Superhigh Frequencies; Reception Diversity; Fading; Amplification

19980023108 Communications Satellite Corp., Clarksburg, MD USA

Fade Mitigation Techniques at Ka-Band

Dissanayake, Asoka, Communications Satellite Corp., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 221-240; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Rain fading is the dominant propagation impairment affecting Ka-band satellite links and rain fade mitigation is a key element in the design of Ka-band satellite networks. Some of the common fade mitigation techniques include: power control, diversity, adaptive coding, and resource sharing. ACTS provides an excellent opportunity to develop and test Ka-band rain impairment amelioration techniques. Up-link power control and diversity are discussed.
Derived from text

Fading; Extremely High Frequencies; Satellite Networks; Data Links; Coding

19980023109 Texas Univ., Electrical Engineering Research Lab., Austin, TX USA

Image Analysis as a Tool for Satellite-Earth Propagation Studies ***Progress Report***

Akturan, Riza, Texas Univ., USA; Lin, Hsin-Piao, Texas Univ., USA; Vogel, Wolfhard J., Texas Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 243-255; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

We present a progress report on a useful new method to assess propagation problems for outdoors mobile Earth-satellite paths. The method, Photogrammetric Satellite Service Prediction (PSSP), is based on the determination of Land Mobile Satellite Systems (LMSS) service attributes at the locations of static or mobile LMSS service users by evaluating fisheye images of their environment. This paper gives an overview of the new method and its products.

Author

Satellite Communication; Land Mobile Satellite Service; Photogrammetry; Image Analysis; Satellite Networks

19980023110 Texas Univ., Electrical Engineering Research Lab., Austin, TX USA

GPS Multipath Fade Measurements to Determine L-Band Ground Reflectivity Properties

Kavak, Adnan, Texas Univ., USA; Xu, Guang-Han, Texas Univ., USA; Vogel, Wolfhard J., Texas Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 257-263; In English; Also announced as 19980023098

Contract(s)/Grant(s): JPL-956520; F49620-95-C-0045; N00014-95-I-0638; NSF MIP-95-02695; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

In personal satellite communications, especially when the line-of-sight is clear, ground specular reflected signals along with direct signals are received by low gain, almost omni-directional subscriber antennas. A six-channel, C/A code processing, GPS receiver with an almost omni-directional patch antenna was used to take measurements over three types of ground to characterize 1.575 GHz specular ground reflections and ground dielectric properties. Fade measurements were taken over grass, asphalt, and lake water surfaces by placing the antenna in a vertical position at a fixed height from the ground. Electrical characteristics (conductivity and dielectric constant) of these surfaces (grass, asphalt, lake water) were obtained by matching computer simulations to the experimental results.

Author

Satellite Communication; Ultrahigh Frequencies; Electrical Resistivity; Directional Antennas; Multipath Transmission; Dielectric Properties

19980023111 Hughes Space and Communications Group, Los Angeles, CA USA

A Proposed Change to ITU-R Recommendation 681

Davarian, Faramaz, Hughes Space and Communications Group, USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 265-268; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Rec. 681 of the ITU-R [1] provides five models for the prediction of propagation effects on land mobile satellite links which are listed below: (1) Empirical Roadside Shadowing (ERS); (2) Attenuation Frequency Scaling; (3) Fade Duration Distribution; (4) Non-Fade Duration Distribution; (5) Fading due to Multipath. Because the above prediction models have been empirically derived using a limited amount of data, these schemes work only for restricted ranges of link parameters. With the first two models, for example, the frequency and the elevation angle parameters are restricted to 0.8 to 2.7 GHz and 20 to 60 degrees, respectively. Recently measured data have enabled us to enhance the range of the first two schemes. Moreover, for convenience, they have been combined into a single scheme named the Extended Empirical Roadside Shadowing (EERS) model.

Derived from text

Satellite Networks; Multipath Transmission; Mathematical Models; Data Links; Communication Satellites; Elevation Angle; Fading

19980023112 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Description of Proposed Revision of Handbook on: Propagation Effects for Land Mobile Satellite Systems

Goldhirsh, Julius, Johns Hopkins Univ., USA; Vogel, Wolfhard J., Texas Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 269-287; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Applied Physics Laboratory, The University of Texas at Austin, JPL, and NASA are exploring the need for revising the Handbook on Propagation Effects for Land Mobile Satellite Systems published as NASA Reference Publication 1274 in February 1992. The original publication was an outgrowth of a series of joint mobile propagation experiments performed by the Electrical Engineering Research Laboratory of The University of Texas at Austin and the Applied Physics Laboratory of The Johns Hopkins University between 1983 and 1988. When published, the text served the purpose of providing a state of the art manual describing experiments, results, concepts, and models associated with propagation effects for land mobile satellite scenarios. Investigations were cited from within and outside the USA. Although published in 1992, the text contains only referenced material through 1991. Since this time, a number of other mobile satellite experiments and modeling efforts have been performed throughout the world. In addition, new areas of investigation such as personal access and mobile-aeronautical communications have approached a level of maturity and importance requiring descriptions of propagation effects. The intent of the proposed effort is therefore to revise the manual such that it contains pertinent new information, to broaden its scope by adding new subject material, and to delete outdated material.
Derived from text
Handbooks; Land Mobile Satellite Service; Mobile Communication Systems; Electrical Engineering

19980023113 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Quick Look Analysis of Broadband Aeronautical Data Obtained from the Kuiper Airborne Observatory
Satorius, Edgar, Jet Propulsion Lab., California Inst. of Tech., USA; Abbe, Brian, Jet Propulsion Lab., California Inst. of Tech., USA; Agan, Martin, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 289-301; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The ACTS aeronautical experiments include these purposes: (1) to test the viability of speech/data transmission at: 2.4, 4.8, 9.6, and 64, kbps; (2) To test the viability of high rate transmissions at 512, and 768 kbps; and (3) To test the viability of high data rate transmissions to/from turbojet up to 384 bps.
Derived from text
Viability; Broadband; Data Transmission; Kuiper Airborne Observatory

19980023114 Texas Univ., Electrical Engineering Research Lab., Austin, TX USA
Fade Measurements into Buildings from 500 to 3000 MHz
Vogel, Wolfhard J., Texas Univ., USA; Torrence, Geoffrey W., Texas Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 303-307; In English; Also announced as 19980023098
Contract(s)/Grant(s): JPL-956520; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Slant-path fade measurements from 500 to 3000 MHz were made into six different buildings employing a vector network analyzer, a tower-mounted transmitting antenna and an automatically positioned receiving antenna. The objective of the measurements was to provide information for satellite audio broadcasting and personal communications satellite design on the correlation of fading inside buildings. Fades were measured with 5 cm spatial separation and every 0.2% of the frequency. Median fades ranged from 10 to 20 dB in woodframe houses with metal roofs and walls without and with an aluminum heatshield, respectively. The median decorrelation distance was from 0.5 to 1.1 m and was independent of frequency. The attenuation into the buildings increased only moderately with frequency in most of the buildings with a median slope of about 1 to 3 dB/GHz, but increased fastest in the least attenuating building with a slope of 5 dB/GHz. The median decorrelation bandwidth ranged from 1.2 to 3.8% of frequency in five of the buildings, and was largest in the least attenuating building, with 20.2% of frequency.
Author
Fading; Buildings; Frequencies; Communication Satellites; Broadcasting; Bandwidth; Attenuation

19980023115 New Mexico State Univ., Klipsch School of Electrical and Computer Engineering, Las Cruces, NM USA
TDRS Space-to-Ground Link Weather Events
Horan, Stephen, New Mexico State Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 311-325; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Differences from 1994 WSC data collection to the 1995 data collection include the following: (1) 1995 collection only at the STGT (Danzante); (2) APT and TDRS SGL antennas are within about 1/2 mile (APT to 1994 collection antenna approximately 3 miles); (3) WSC measurements based on the AGC voltage (millivolts) readings from the TDRS SGL antenna system and not

a separate system as in the Raindance data reported for 1994; and (4) Data from TDRS East(TDE) and TDRS West(TDW) provided; no data from spare satellites.
Derived from text
Antenna Design; Data Acquisition; Frequencies; Elevation Angle; TDR Satellites

19980023116 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Atmospheric Visibility Monitoring (AVM) Program
Jeganathan, Muthu, Jet Propulsion Lab., California Inst. of Tech., USA; Tong, Loretta, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 327-342; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The program objective is to obtain atmospheric transmission statistics data to support optical communications through: (1) Atmospheric loss in optical communication channel; (2) Joint PDFs for multiple site reception; (3) Statistical modeling; and (4) extrapolate PDFs for other sites.
Derived from text
Environmental Monitoring; Extrapolation; Optical Communication; Statistical Analysis; Visibility

19980023117 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Atmospheric Turbulence Statistics from GOLD Experiments
Jeganathan, Muthu, Jet Propulsion Lab., California Inst. of Tech., USA; Wilson, Keith, Jet Propulsion Lab., California Inst. of Tech., USA; Lesh, Jim, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 343-361; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Ground-Orbiter Lasercomm Demonstration (GOLD) includes the following: (1) Optical communication experiments between Table Mountain Observatory (TMF) and Japanese Engineering Test Satellite (ETS-VI); (2) International cooperative effort between NASA, NASDA, CRL and JPL; and (3) Phase 1 transmissions from October 1995 to January 1996 and Phase 2 transmissions from March 1996 to May 1996.
Derived from text
Atmospheric Turbulence; Optical Communication; Engineering Test Satellites

19980023118 Colorado Univ., Dept. of Electrical and Computer Engineering, Boulder, CO USA
Earth-Space Propagation Data Bases
Smith, Ernest K., Colorado Univ., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 363-378; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper, designed for the newcomer rather than the expert, will take a rather broad view of what is meant by ”propagation data bases” in that it will take the term to mean both the actual measurements and models of earth-space paths. The text will largely be drawn from CCIR Reports of Study Group 5, now annexed to Recommendations of ITU-R Study Group 3, plus some experience with a course taught at the University of Colorado.
Author
Data Bases; Measurement; Satellite Communication; Radio Waves; NASA Programs

19980023119 Stanford Telecommunications, Inc., ACS, Reston, VA USA
Proposed Revisions to the NASA Propagation Handbooks
Ippolito, Louis J., Stanford Telecommunications, Inc., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 379-411; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Program objectives include: (1) Begin the process of updating the NASA propagation handbooks to include the latest models, data, and analysis tools; (2) Include the results of prior and on-going NASA studies and the ACTS propagation measurements

campaign; (3) Update the systems analysis approach to the evaluation of atmospheric degradations on new applications including KA-Band systems, direct broadcast systems, mobile satellite systems, low margin VSAT systems, and frequency re-use systems.
Derived from text
Direct Broadcast Satellites; Handbooks; Extremely High Frequencies; Satellite Communication; Broadcasting

19980023120 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
A Database for Propagation Models and Conversion to C++ Programming Language
Kantak, Anil V., Jet Propulsion Lab., California Inst. of Tech., USA; Angkasa, Krisjani, Jet Propulsion Lab., California Inst. of Tech., USA; Rucker, James, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 413-421; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The telecommunications system design engineer generally needs the quantification of effects of the propagation medium (definition of the propagation channel) to design an optimal communications system. to obtain the definition of the channel, the systems engineer generally has a few choices. A search of the relevant publications such as the IEEE Transactions, CCIR's, NASA propagation handbook, etc., may be conducted to find the desired channel values. This method may need excessive amounts of time and effort on the systems engineer's part and there is a possibility that the search may not even yield the needed results. to help the researcher and the systems engineers, it was recommended by the conference participants of NASA Propagation Experimenters (NAPEX) XV (London, Ontario, Canada, June 28 and 29, 1991) that a software should be produced that would contain propagation models and the necessary prediction methods of most propagation phenomena. Moreover, the software should be flexible enough for the user to make slight changes to the models without expending a substantial effort in programming. In the past few years, a software was produced to fit these requirements as best as could be done. The software was distributed to all NAPEX participants for evaluation and use, the participant reactions, suggestions etc., were gathered and were used to improve the subsequent releases of the software. The existing database program is in the Microsoft Excel application software and works fine within the guidelines of that environment, however, recently there have been some questions about the robustness and survivability of the Excel software in the ever changing (hopefully improving) world of software packages.
Derived from text
Prediction Analysis Techniques; Robustness (Mathematics); Systems Engineering; Telecommunication; Data Bases; Applications Programs (Computers); C++ (Programming Language)

19980023121 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
NASA Propagation Studies Website
Angkasa, Krisjani S., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 423-427; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The NASA propagation studies objective is to enable the development of new commercial satellite communication systems and services by providing timely data and models about propagation of satellite radio signals through the intervening environment and to support NASA missions. In partnership with industry and academia, the program leverages unique NASA assets (currently Advanced Communications Technology Satellite) to obtain propagation data. The findings of the study are disseminated through referred journals, NASA reference publications, workshops, electronic media, and direct interface with industry.
Derived from text
NASA Programs; Satellite Communication; World Wide Web; Telecommunication; Radio Signals

19980023122 NASA Lewis Research Center, Cleveland, OH USA
ACTS Project and Propagation Program Update
Bauer, Robert, NASA Lewis Research Center, USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 433-441; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Spacecraft operations continue to be nominal and the sixth eclipse season completed. Battery reconditioning to be re-evaluated before the fall eclipse. Other topics covered include: Inclined orbit; Experiments program; Reorganizations; Program timeline; and propagation program status.
Derived from text
NASA Programs; Eclipses; Space Programs; Orbits; Experimentation; Spacecraft Communication

19980023123 NASA Lewis Research Center, Cleveland, OH USA

ACTS Rain Fade Compensation

Coney, Thom A., NASA Lewis Research Center, USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 443-463; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Performance status of the Adaptive Rain Fade Compensation includes: (1) The rain fade protocol is functional detecting fades, providing an additional 10 dB of margin and seamless transitions to and from coded operation; (2) The stabilization of the link margins and the optimization of rain fade decision thresholds has resulted in improved BER performance; (3) Characterization of the fade compensation algorithm is ongoing.

Derived from text

Rain; Fading; Stabilization; Protocol (Computers); Coding; Downlinking

19980023124 Stanford Telecommunications, Inc., ACS, Reston, VA USA

A Sensitivity Analysis of Combined Effects Modeling

Feldhake, Glenn, Stanford Telecommunications, Inc., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 465-481; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Combined effects modeling models distributions of weather characteristics as random variables. It also converts distributions of weather to distributions of attenuation (dB), assumes dependence/independence between events, and creates upper and lower bounds of joint probability.

Derived from text

Probability Theory; Attenuation; Weather; Random Variables

19980023125 Westenhaver Wizard Works, Inc., Stone Mountain, GA USA

ACTS Propagation Terminals: Engineering Support and Systems Upgrades

Westenhaver, David, Westenhaver Wizard Works, Inc., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 483-497; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Software and hardware status, as well as deficiencies and known problems and solutions are discussed. Graphs are provided with the following data: 1K FFT spectrum side lobes, high data rate amplitude histogram at 0.02 dB/bin and 0.05 dB/bin, AK system calibration, BC system calibration, CO system calibration, FL system calibration, NM system calibration, and OK system calibration. A total data accumulation summary is also provided.

Derived from text

Computer Programs; Support Systems; Fast Fourier Transformations; Calibrating; Computers

19980023126 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

NASA Propagation Program Status and Propagation Needs of Satcom Industry

Golshan, Nassar, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Twentieth NASA Propagation Experimenters Meeting (NAPEX XX) and the Advanced Communications Technology Satellite (ACTS) Propagation Studies Miniworkshop; Sep. 01, 1996, pp. 505-514; In English; Also announced as 19980023098; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The program objective is to enable the development of new commercial satellite systems and services and to support NASA's programs by providing timely data and models about propagation of satellite radio signals though the intervening environment. Provisions include new services, higher frequencies, higher data rates, different environments (mobile, indoors, fixed), and different orbits (geostationary, low earth orbit).

Derived from text

NASA Programs; Communication Satellites; Geosynchronous Orbits; Radio Signals; Low Earth Orbits

19980024030 NASA Langley Research Center, Hampton, VA USA

The Radiated Field Generated by a Monopole Source in a Short, Rigid, Rectangular Duct

Lakota, Barbara Anne, NASA Langley Research Center, USA; Mar. 13, 1998; 84p; In English

Report No.(s): NASA/TM-1998-207543; NAS 1.15:207543; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This thesis develops a method to model the acoustic field generated by a monopole source placed in a moving rectangular duct. The walls of the duct are assumed to be infinitesimally thin and the source is placed at the center of the duct. The total acoustic pressure is written in terms of the free-space pressure, or incident pressure, and the scattered pressure. The scattered pressure is the augmentation to the incident pressure due to the presence of the duct. It satisfies a homogeneous wave equation and is discontinuous across the duct walls. Utilizing an integral representation of the scattered pressure, a set of singular boundary integral equations governing the unknown jump in scattered pressure is derived. This equation is solved by the method of collocation after representing the jump in pressure as a double series of shape functions. The solution obtained is then substituted back into the integral representation to determine the scattered pressure, and the total acoustic pressure at any point in the field. A few examples are included to illustrate the influence of various geometric and kinematic parameters on the radiated sound field.
Author
Ducts; Monopoles; Sound Fields; Singular Integral Equations; Shape Functions; Boundary Integral Method

19980024031 Georgia Tech Research Inst., Sensors and Electromagnetic Applications Lab., Atlanta, GA USA
Spread Spectrum Receiver Electromagnetic Interference (EMI) Test Guide ***Final Report, Sep. 1997 - Mar. 1998***
Wheeler, Mark L., Georgia Tech Research Inst., USA; Mar. 09, 1998; 44p; In English
Contract(s)/Grant(s): NASA Order H-28506-D
Report No.(s): NASA/CR-1998-207558; NAS 1.26:207558; A-5541F; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This program consisted of: (1) a study to define appropriate EMI test guidelines and test methods for direct sequence (DS) spread spectrum receivers; and (2) preparation of a written test guide to document the recommended test methods. The scope of this test guide includes: (1) a discussion of generic DS receiver performance characteristics; (2) a summary of S-band TDRSS receiver operation; (3) a discussion of DS receiver EMI susceptibility mechanisms and characteristics; (4) a summary of military standard test guidelines; (5) recommended test approach and methods; and (6) general conclusions and recommendations for future studies in the area of spread spectrum receiver testing.
Author
Spread Spectrum Transmission; Radio Receivers; Electromagnetic Interference

19980024673 Naval Postgraduate School, Monterey, CA USA
Communication Modulation Simulators: An Assessment
Gebhardt, Heidi L., Naval Postgraduate School, USA; Jun. 1997; 77p; In English
Report No.(s): AD-A333341; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The military draw down and budget cut-backs have created a greater emphasis on shorter, faster, and cheaper ways to do the mission. Modulation simulators have become a critical component in the evaluation and testing, and integration of new network, communications, and command and control technologies and applications. This thesis evaluates five current commercial off the shelf products. Each of the products is evaluated using twenty-five primary evaluation criteria. The evaluations include current costs, completeness, user interface and post analysis support methods, and they describe the basic features and distinctive characteristics of each product. The capabilities of the products are compared, providing the reader with the knowledge to make an informed product selection based on the user's needs. A matrix of the products and the evaluation criteria provides a quick overview of the analysis.
DTIC
Command and Control; Communication Networks; Military Technology; Telecommunication

19980025553 Naval Postgraduate School, Monterey, CA USA
Final Design, Integration and Validation of the Pansat Antenna System
Smilowitz, Gary J., Naval Postgraduate School, USA; Jun. 19, 1997; 86p; In English
Report No.(s): AD-A333482; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In this thesis, the final design for the Petite Amateur Navy Satellite (PANSAT) antenna system is constructed, integrated and validated. The antenna elements and matching network are field tested and compared to the Numerical Electromagnetics Code (NEC) model. The final free space radiation pattern and its power gain distribution will be used to help track PANSAT's rotation during its orbit.
DTIC
Antenna Design; Satellite Antennas; Antenna Radiation Patterns

19980026052 Naval Postgraduate School, Monterey, CA USA

Simulation for Smartnet Scheduling of Asynchronous Transfer Mode Virtual Channels

Lemanski, Michael J., Naval Postgraduate School, USA; Benton, Jesse C., Naval Postgraduate School, USA; Jun. 1997; 290p; In English

Report No.(s): AD-A333481; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Critical to the success of all future battlefield commanders is the rapid retrieval of relevant, time sensitive information. Some of this information will be available locally while the remainder is stored in the USA. DARPA's Battlefield Awareness and Data Dissemination (BADD) program attempts to deliver heterogeneous data to the battlefield using Asynchronous Transfer Mode (ATM) protocol. ATM was originally designed to implement dynamic virtual channels over duplex, high-speed, high capacity fiber optic cabling. The problem addressed was to determine which algorithm best schedules calls on BADD's ATM network that uses static virtual channels over simplex, error prone, long delay, satellite links. Because the BADD project uses ATM in such an unusual way, and because of the need to determine a schedule for transmissions over the heterogeneous static channels, we modeled BADD using the state-of-the-art network simulation tool, Optimized Network Engineering Tools (OPNET). We determined several modifications that must be made to existing network simulators to allow them to model next-generation networks. Our simulation shows that a greedy algorithm yields a 53% decrease in the overall completion time and a 46% increase in average bit throughput over FIFO scheduling.

DTIC

Asynchronous Transfer Mode; Communication Networks; Data Transfer (Computers); Local Area Networks

19980029702 NASA Johnson Space Center, Houston, TX USA

High Performance Circularly Polarized Microstrip Antenna

Bondyopadhyay, Probir K., Inventor, NASA Johnson Space Center, USA; Aug. 26, 1997; 19p; In English

Patent Info.: Filed 24 Mar. 1995; NASA-Case-MSC-21982-1; US-Patent-5,661,494; US-Patent-Appl-SN-410625; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A microstrip antenna for radiating circularly polarized electromagnetic waves comprising a cluster array of at least four microstrip radiator elements, each of which is provided with dual orthogonal coplanar feeds in phase quadrature relation achieved by connection to an asymmetric T-junction power divider impedance notched at resonance. The dual fed circularly polarized reference element is positioned with its axis at a 45 deg angle with respect to the unit cell axis. The other three dual fed elements in the unit cell are positioned and fed with a coplanar feed structure with sequential rotation and phasing to enhance the axial ratio and impedance matching performance over a wide bandwidth. The centers of the radiator elements are disposed at the corners of a square with each side of a length d in the range of 0.7 to 0.9 times the free space wavelength of the antenna radiation and the radiator elements reside in a square unit cell area of sides equal to 2d and thereby permit the array to be used as a phased array antenna for electronic scanning and is realizable in a high temperature superconducting thin film material for high efficiency.

Official Gazzette of the U.S. Patent and Trademark

Antenna Arrays; Planar Structures; Electromagnetic Radiation; Microstrip Antennas

19980029705 Federal Communications Commission, Office of Engineering and Technology, Washington, DC USA

Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions, Supplement C, Edition 97-01 to OET Bulletin 65, Edition 97-01

Chan, K., Federal Communications Commission, USA; Cleveland, R. F., Federal Communications Commission, USA; Means, D. L., Federal Communications Commission, USA; Dec. 1997; 58p; In English

Report No.(s): PB98-114598; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In August, 1996, the Commission adopted a Report and Order in ET Docket 93-62 amending its rules for evaluating the environmental effects of radiofrequency (RF) electromagnetic fields. As a part of this proceeding, new limits were adopted for human exposure to RF emissions from certain mobile and portable devices. The purpose of this supplement is to provide parties filing applications for equipment authorization with guidance on complying with these new requirements.

NTIS

Electromagnetic Fields; Environment Effects; Radio Frequencies

19980031732 NASA Langley Research Center, Hampton,VA USA

Application of Finite Element Method to Analyze Inflatable Waveguide Structures

Deshpande, M. D., NASA Langley Research Center, USA; Feb. 1998; 62p; In English

Contract(s)/Grant(s): NAS1-19341; RTOP 522-11-41-02

Report No.(s): NASA/CR-1998-206928; NAS 1.26:206928; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A Finite Element Method (FEM) is presented to determine propagation characteristics of deformed inflatable rectangular waveguide. Various deformations that might be present in an inflatable waveguide are analyzed using the FEM. The FEM procedure and the code developed here are so general that they can be used for any other deformations that are not considered in this report. The code is validated by applying the present code to rectangular waveguide without any deformations and comparing the numerical results with earlier published results.

Author

Rectangular Waveguides; Finite Element Method; Inflatable Structures; Waveguide Antennas

19980034672 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA

Vocal Tract Length Normalization for Large Vocabulary Continuous Speech Recognition

Zhan, Pu-Ming, Carnegie-Mellon Univ., USA; Waibel, Alex, Carnegie-Mellon Univ., USA; May 1997; 20p; In English

Contract(s)/Grant(s): N00014-93-I-0806

Report No.(s): AD-A333514; CMU-CS-97-148; CMU-LTI-97-150; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Generally speaking, the speaker-dependence of a speech recognition system stems from speaker-dependent speech feature. The variation of vocal tract length and/or shape is one of the major source of inter-speaker variations. In this paper, we address several methods of vocal tract length normalization (VTLN) for large vocabulary continuous speech recognition: (1) explore the bilinear warping VTLN in frequency domain; (2) propose a speaker-specific Bark/Mel scale VTLN in Bark/Mel domain; (3) investigate adaptation of the normalization factor. Our experimental results show that the speaker-specific Bark/Mel scale VTLN is better than the piecewise/bilinear warping VTLN in frequency domain. It can reduce up to 12% word error rate for our Spanish and English spontaneous speech scheduling task database. For adaptation of the normalization factor, our experimental results show that promising result can be obtained by using not more than three utterances from a new speaker to estimate his/her normalization factor, and the unsupervised adaptation mode works as well as the supervised one. Therefore, the computational complexity of VTLN can be avoided by learning the normalization factor from very few utterances of a new speaker.

DTIC

Scheduling; Speech Recognition; Words (Language)

19980034682 Naval Postgraduate School, Monterey, CA USA

A Coded Orthogonal Frequency Division Multiplexing Simulation of a High Data Rate, Line-Of-Sight, Digital Radio for Mobile Maritime Communications

Roderick, David V., Naval Postgraduate School, USA; Jun. 1997; 339p; In English

Report No.(s): AD-A333326; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

The Naval Command, Control and Ocean Surveillance Center (NCCOSC), Research Development Test and Evaluation (RDT&E) Division's (NRaD) Communications Department is conducting applied research toward the development of a high-data-rat e (HDR), line-of-sight (LOS), digital modem for ship-to-ship, ship-to-shore, and ship-to-relay communications. Development of bandwidth efficient HDR communications in a maritime radio environment is a challenging research problem due to the time-varying propagation effects within the marine layer. Marine layer propagation typically causes fading of the signal spectrum due to RF interference effects, and intersymbol interference because of multipath induced time spreading. The use of adaptive equalization to overcome distortions is difficult in this environment because of the dynamic nature of the signal propagation caused by transmitter and/or receiver motion and the maritime layer atmospheric effects. An alternative to channel equalization is the application of Coded Orthogonal Frequency Division Multiplexing (COFDM) which overcomes distortion effects without equalization through its orthogonality properties. This thesis explores the application of COFDM toward a HDR LOS maritime communications modem. The modem model is emulated in MAThAB and simulations are performed. Analysis of the simulations are conducted and evaluated Qs to the feasibility of a COFDM implementation in the presence of known noise and signal fading conditions.

DTIC

Bandwidth; Frequency Division Multiplexing; Intersymbolic Interference; Line of Sight; Mobile Communication Systems; Multipath Transmission; Radio Communication; Radio Frequencies; Spread Spectrum Transmission

19980034826 Naval Postgraduate School, Monterey, CA USA

Intranet for the Systems Management Department

Loewen, Edward D., Naval Postgraduate School, USA; Lunn, Robert H., Naval Postgraduate School, USA; Sep. 1997; 189p; In English

Report No.(s): AD-A333500; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The objective of this thesis is to describe in detail the reasoning and development of an Intranet based decision support system. This thesis is intended to show how World Wide Web technologies can be used to develop a prototype Intranet that can provide access to information for faculty, students and staff members via a World Wide Web browser. It provides more open communication in the Department of Systems Management, quicker and more consistent information flows (service) to the faculty and staff, and reduced time spent on the handling of repetitive and often simple information exchanges. The decision support function is supported by a database which is an information clearinghouse, providing a 11 personnel with 24- hour access. Personnel are empowered by information availability and are likely to be more proactive.

DTIC

World Wide Web; Information Flow; Decision Support Systems

19980035469 Georgia Tech Research Inst., Sensors and Electromagnetic Applications Lab., Atlanta, GA USA

Spread Spectrum Receiver Electromagnetic Interference (EMI) Test Guide ***Final Report, Sep. 1997 - Mar. 1998***

Wheeler, Mark L., Georgia Tech Research Inst., USA; Mar. 09, 1998; 44p; In English

Contract(s)/Grant(s): NASA Order H-28506-D

Report No.(s): NASA/CR-1998-207612; NAS 1.26:207612; A-5541F; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This program consisted of: (1) a study to define update EMI test guidelines and test methods for Direct Sequence (DS) spread spectrum receivers; and (2) preparation of a written test guide to document the recommended test methods. The scope of this test guide includes: (1) a discussion of generic DS receiver performance characteristics; (2) a summary of S-band TDRSS receiver operation; (3) a discussion of DS receiver EMI susceptibility mechanisms and characteristics; (4) a summary of military standard test guidelines; (5) recommended test approach and methods; and (6) general conclusions and recommendations for future studies in the area of spread spectrum receiver testing.

Author

Electromagnetic Interference; Spread Spectrum Transmission; Radio Receivers

19980036303 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

Secondary Data Support and Non-Homogeneities in Space-Time Adaptive Processing ***Final Report***

Hale, Todd B., Air Force Inst. of Tech., USA; Dec. 1997; 202p; In English

Report No.(s): AD-A335606; AFIT/GE/ENG/97D-06; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

One of the primary problems with the application of Space-Time Adaptive Processing (STAP) techniques is secondary data support for the interference plus noise covariance matrix estimate. Reed has shown the required secondary data support to achieve performance within 3 dB of optimal SINR is approximately equal to twice the Degrees of Freedom (DOF) used in the algorithm. Reed proved this rule for Sample Matrix Inversion (SMI) techniques. A concern arises when applying this rule to a newer class of reduced dimension STAP algorithms that do not fall under the SMI umbrella. This thesis focuses on the Cross Spectral Metric (CSM) algorithm developed by Goldstein and Reed. Through Monte Carlo simulations, the thesis proves Reed's rule for sample support is not accurate in this case. Optimum SINR performance for the CSM algorithm was obtained by choosing the number of DOF in the algorithm equal to the dimension of the interference subspace. With this choice, the required sample support for the covariance matrix estimate is 2.5 times the DOF used in the algorithm. This relationship is only true when the number of DOF is equal to the interference subspace dimension. A second goal of the thesis determines the impact of non-homogeneities within the secondary data on the CSM algorithm. The Generalized Inner Product (GIP) detection scheme is then used to excise these non-homogeneities from the secondary data. The CSM algorithm was found to be susceptible to non-homogeneities. The use of the GIP successfully negated the impact on this algorithm.

DTIC

Antenna Radiation Patterns; Radar Clutter Maps; Signal Processing; Command Service Modules

19980036326 Army Research Lab., Sensors and Electron Devices Directorate, Adelphi, MD USA

Simulation of Error in Optical Radar Range Measurements ***Final Report***

Der, Sandor, Army Research Lab., USA; Redman, Brian, Army Communications-Electronics Command, USA; Chellappa, Rama, Maryland Univ., USA; Jan. 1998; 30p; In English

Report No.(s): AD-A335609; ARL-TR-1488; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We describe a computer simulation of atmospheric and target effects on the accuracy of range measurements using pulsed laser radars (ladar) with PIN or avalanche photodiodes for direct detection. The computer simulation produces simulated range images as a function of a wide variety of environmental, target, and sensor parameters for ladar with range accuracies smaller than

the pulse width. The simulation allows arbitrary target geometries, and simulates speckle, turbulence, and near-and far-field effects. We compare simulation results to actual range error data collected in field tests.
DTIC
Computerized Simulation; Errors; Optical Radar; Laser Range Finders; Pulsed Lasers

19980036328 Mission Research Corp., Valpariso, FL USA
Focused Application Software for Ferrite Patch Antennas ***Final Report, 1 Aug. 1991 - 31 Jan. 1997***
Kempel, Leo, Mission Research Corp., USA; Guidry, Rene, Mission Research Corp., USA; Tackett, Jeff, Mission Research Corp., USA; McCool, Chris, Mission Research Corp., USA; Brown, Arik, Michigan Univ., USA; Apr. 29, 1997; 47p; In English
Contract(s)/Grant(s): F49620-96- C-0029
Report No.(s): AD-A335613; MRC-C-96095; AFRL-SR-BL-TR-98-0084; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During Phase 1 of this SBIR effort, MRC and UM demonstrated the feasibility of using modem finite element analysis: (1) Finite element formulations for ferrite materials. (2) Implementation of those formulas in a computer program. (3) Convergence issues when ferrite materials are being modeled. (4) Mesh truncation schemes. (5) Element distortion effects. (6) And uses of ferrite antennas as frequency agile antennas, polarization agile antennas and electronic shutter radomes.
DTIC
Applications Programs (Computers); Finite Element Method; Computational Grids

19980036335 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Optimized Design Methodology of Cavity-Backed Microstrip Antennas with Dielectric Overlays
Hermes, Douglas Joseph, Air Force Inst. of Tech., USA; Dec. 1997; 138p; In English
Report No.(s): AD-A335573; AFIT/GE/ENG/97D-04; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The optimized design methodology implemented in this research employs a design methodology, namely Response Surface Methodology (RSM), that is relatively new to the electromagnetics field. The design methodology used a full factorial designed experiment, a Hybrid Finite Element Method (HFEM) analysis code, a cubic spline empirical model, an ANalysis of VAriance (ANOVA) test, and a simplex optimization code to successfully measure, predict, analyze, and optimize average antenna gain and antenna input impedance for a cavity backed microstrip antenna with dielectric overlays. Based on HFEM results from the full factorial designed experiment, a cubic spline empirical model successfully predicted average antenna gain and input impedance values for variable combinations within the experiment variable limits. The ANOVA test determined the impact each design variable introduced on the average antenna gain and indicated the areas of greatest concern during manufacturing and testing phases. Using simplex optimization, an optimized, realizable antenna design with minimum average antenna gain above the antenna bore sight and a target input impedance of 50 ohms was located within two minutes that agreed within approximately 4.0 percent to HFEM values determined from design validation te sts, while measured results from the constructed optimized antenna design closely replicated the predicted antenna patterns and the predicted input impedance value. The design methodology eliminated numerous antenna builds by applying straight forward RSM techniques and saved countless man hours. The significant time savings found using this optimized design methodology demonstrates the power of RSM and motivates its application to other electromagnetic design problems.
DTIC
Optimization; Design Analysis; Microstrip Antennas; Apertures; Antenna Radiation Patterns; Antenna Design

19980036342 Defence Research Establishment Ottawa, MilSat Communications Group, Ottawa, Ontario Canada
Ground Terminal Processor Interface Board for Skynet Uplink Synchronization Trials
Tom, Caroline, Defence Research Establishment Ottawa, Canada; Nov. 1997; 56p; In English
Report No.(s): AD-A335548; DREO-1321; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A ground terminal (GT) simulator subsystem is being developed at Defence Research Establishment Ottawa (DREO) as part of the in-house work examining the aspects of uplink synchronization for extremely-high-frequency (EHF) spread spectrum satellite communications (SATCOM). Requirements of the GT subsystem include the generation of hop clock and data clock signals, and the interface between the GT processor and a hopping synthesizer controller (HSC) for commanding the HSC and transmitting data. A GT processor interface (i/f) board was designed and fabricated at DREO to satisfy these requirements. This report describes the functions of the i/f board and specific requirements related to the uplink synchronization experiments and the interface to the HSC. The i/f board is a printed circuit board which is contained in a backplane chassis and is driven by the GT processor. The GT processor is realized by a Spectrum Signal Processing Inc. TMS320C30 digital signal processor board and communicates with the GT processor i/f board via the DSPLINK interface through the backplane. This report includes implementation details

of the clock generation and interface circuitry and a user's guide for the proper configuration, installation and operation of the GT processor i/f board.
DTIC
Satellite Communication; Uplinking; Printed Circuits; Circuit Boards

19980036881 Naval Postgraduate School, Monterey, CA USA
Implementing Closed-Loop Control Algorithms for DC-to-DC Converters and ARCP Inverters Using the Universal Controller
Hanson, Ronald J., Naval Postgraduate School, USA; Jun. 1997; 142p; In English
Report No.(s): AD-A335368; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The objective of this thesis is to investigate the use of the Universal Controller to control the DC-to-DC power converter and the Auxiliary Resonant Commutated Pole (ARCP) power inverter. These power electronic devices are central to the development of a DC Zonal Electric Distribution System (DC ZEDS) that is scheduled for application in the twenty-first century surface combatant (SC-21). The development of appropriate closed-loop controls is a key element to this design process. The Universal Controller is a digital controller that was developed by personnel at the Naval Surface Warfare Center (NSWC), Annapolis, Maryland. The basic operation and control of the DC-to-DC buck converter and the ARCP inverter are described, with emphasis placed on the advantages of DSP control. A complete investigation of the hardware that comprises the controller and how to program the controller to implement closed-loop control is undertaken. Previous studies have developed control algorithms that have been tested through simulation and analog hardware. In this research endeavor these control algorithms, particularly the one relevant to the DC-to-DC converter, are implemented using the Universal Controller to validate operations. Finally, a flow path for implementing the closed-loop control of the ARCP unit is discussed and recommendations for improvements in future designs are outlined.
DTIC
Feedback Control; Voltage Converters (DC to DC); Electric Power Transmission

19980036924 National Space Development Agency, Tokyo, Japan
On Satellite-based Navigation/Mobile Communications System as Post-NAVSTAR/GPS
Yamawaki, Koji, National Space Development Agency, Japan; Journal of the Japan Society for Aeronautical and Space Sciences; Dec. 1997; Volume 43, No. 503; 28p; In English; Translated into English by NASDA
Report No.(s): NASDA-ETR-970006; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

This paper discusses the next generation global satellite system which follows NAVSTAR/GPS and supplies the services of mobile communications as well as position determination for all kinds of mobile vehicles. The service area of the system proposed here is not global in the first stage of the operation because several geosynchronous satellites are used as the means of navigation and radio communication in the limited area. A constellation of five geosynchronous satellites is dealt with to evaluate the performance in terms of the coverage and the navigation accuracy.
Author
Radio Communication; Mobile Communication Systems; Global Positioning System; Navigation

19980036927 National Space Development Agency, Tracking and Data Acquisition Dept., Tokyo, Japan
Communication Experiments with Engineering Test Satellite 6
Kashimoto, Masami, National Space Development Agency, Japan; Sugawara, Masayuki, National Space Development Agency, Japan; Ikegami, Tetsuhi, Ministry of Posts and Telecommunications, Japan; Araki, Kenichi, Ministry of Posts and Telecommunications, Japan; Sakamoto, Hiroshi, Nippon Telegraph and Telephone Public Corp., Japan; Ueno, Kenji, Nippon Telegraph and Telephone Public Corp., Japan; Journal of the Japan Society of Aeronautical and Space Sciences; Dec. 1997; Volume 44, No. 513; 28p; In English; Translated into English by NASDA
Report No.(s): NASDA-ETR-970008; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The National Space Development Agency of Japan(NASDA), the Ministry of Posts and Telecommunications Communications Research Laboratory(CRL), and Nippon Telegraph and Telephone Corporation(NTT) separately conducted communications experiments utilizing the Engineering Test Satellite VI(ETS-VI). The experiments conducted by the individual organizations are as follows, and the objectives, technologies required, and execution of experiments are described later for each of the three organizations: (1) Experiments conducted by NASDA: ETS-VI data relay and tracking experiments; (2) Experiments conducted by CRL: Experiments concerning S band, millimeter waves, and optical communications; and (3) Experiments conducted by

NTT: Experiments concerning fixed station and mobile communications. The ETS-VI was launched on August 28, 1994, but the later nonconformance at its apogee motor prevented it from entering geo-stationary orbit. As the result of reviewing the operations of the ETS-VI and planned experiments to deal with this situation; the triaxial attitude control was established by utilizing the reprogramming function of the attitude control system, and the orbit was modified to a three day five revolution ground trace repeat orbit after conducting a series of orbit control actions; these measures allowed the time to be secured during which communications experiments were enabled. Furthermore, establishing the procedure by which the satellite antenna is pointed to the ground experimental station enabled the communications experiments to be started in the middle of December. NASDA sponsored regular operations coordination meetings to adjust overall schedules related with the satellite. The window enabling communications experiments on the repeat orbit opens for 2-3 hours every 3 days; however, due to conflict between NASDA and CRL in using payload communications equipment, experiments by both organization were conducted alternately on the basis of 6-day experiment period each.
Author
Communication Equipment; Experimentation; Engineering Test Satellites; Attitude Control

19980036983 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Modifications to a Constant-Temperature Hot-Wire Anemometer System to Measure Higher-Order Turbulence Terms Using Digital Signal Processing
Erm, Lincoln P., Defence Science and Technology Organisation, Australia; Sep. 1997; 40p; In English
Report No.(s): AD-A335307; DSTO-TR-0506; DODA-AR-010-162; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An existing constant-temperature hot-wire anemometer system that enabled broadband-turbulence quantities to be determined using a hybrid analog/digital measurement technique has been modified so that turbulence quantities can now be determined using a purely digital technique. With the new system, higher-degree turbulence terms, such as u3, V3, w3, u2v, uv2, u4, v4 and w4, can now be obtained. These terms are used to calculate turbulent-kinetic-energy and Reynolds-shear-stress balances, and skewness and flatness factors, that could not be calculated previously. In this report the new equipment is described and the procedures and computer programs used to take measurements and process the data are detailed.
DTIC
Turbulence; Hot-Wire Anemometers; Digital Techniques; Computer Programs; Signal Processing

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

19980027035 Maryland Univ., Inst. for Plasma Research, College Park, MD USA
Graduate Student Support for Studies of Plasma Loaded Backward Wave Oscillators ***Final Report, 1 Aug. 1993 - 31 Jul. 1997***
Carmel, Y., Maryland Univ., USA; Dec. 10, 1997; 55p; In English
Contract(s)/Grant(s): F49620-93-I-0456
Report No.(s): AD-A334846; AFRL-SR-BL-TR-98-0051; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This grant partially supported the work of three graduate students at the Institute for Plasma Research, University of Maryland. These students actively participated in and greatly contributed to the research program on studies of plasma loaded backward wave oscillators, funded by AFOSR.
DTIC
Backward Waves; Plasmas (Physics)

19980027593 National Inst. of Standards and Technology, Electricity Div., Gaithersburg, MD USA
Gases for Electrical Insulation and Arc Interruption: Possible Present and Future Alternatives to Pure SF6
Christophorou, L. G., National Inst. of Standards and Technology, USA; Olthoff, J. K., National Inst. of Standards and Technology, USA; Green, D. S., National Inst. of Standards and Technology, USA; Nov. 1997; 62p; In English
Report No.(s): PB98-117476; NIST/TN-1425; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The electric power industry's preferred gaseous dielectric (besides air), sulfur hexafluoride (SF6), has been shown to be a greenhouse gas. In this report we provide information that is useful in identifying possible replacement gases, in the event that

replacement gases are deemed a reasonable approach to reducing the use of SF6 in high voltage electrical equipment. The report focuses on the properties of SF6 as a dielectric gas and on the data available for possible alternatives to pure SF6.
NTIS
Electrical Insulation; Sulfur Hexafluoride; Alternatives

19980027601 National Space Development Agency, Tokyo, Japan
Reliability Estimation of Large Capacitance Film Capacitors for Space Station Use
Nagaoka, Miyuki, Matsushita Electric Industrial Co. Ltd., Japan; Terada, Teruhisa, Matsushita Electric Industrial Co. Ltd., Japan; Nakai, Muneaki, National Space Development Agency, Japan; Shimizu, Akira, National Space Development Agency, Japan; Institute of Electronics, Information and Communication Engineers; Dec. 1997; Volume J79-B-I, No. 10; 22p; In English; Translated into English by NASDA
Report No.(s): NASDA-ETR-970013; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The experiment module to be coupled to the space station, the Japanese Experiment Module (JEM), which is scheduled to be launched in the late 1990's, is designed to be equipped with a power supply with a higher power capacity (25 kW) and a higher voltage (the JEM uses a 120 V system instead of the mainstream 28 V system on the conventional satellites) compared with those with which conventional large scale satellites were equipped. to match this new power supply requirements, a high voltage, large capacitance capacitor has become necessary. With emphasis placed on the reliability required of a space use component, we have developed large capacitance capacitors to be used in the filter and the resonance circuit. This paper describes the outline of the capacitors developed and the results of evaluating the reliability of the capacitors.
NASDA
Capacitors; Spacecraft Modules; Capacitance; Product Development; Vibration Tests; Shock Tests; High Temperature Tests

19980027607 Department of the Navy, Washington, DC USA
Fringe Field Superconducting Switch
Johnson, Mark B., Inventor, Department of the Navy, USA; Clinton, Thomas W., Inventor, Department of the Navy, USA; Oct. 31, 1997; 39p; In English
Patent Info.: US-Patent-Appl-SN-962454
Report No.(s): AD-D018666; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The instant invention is a switch, comprising: (1) a pathway of a superconductive material; and (2) a ferromagnet, where the ferromagnet is adapted for having at least a first magnetization state and a second magnetization state, where fringe fields from the ferromagnet in the first magnetization state do not exceed a predetermined magnetic field in the superconductive pathway to convert at least a portion of the superconductive pathway to the normal state; where fringe fields from the ferromagnet in the second magnetization state exceed the predetermined magnetic field in the superconductive pathway to convert at least a portion of the superconductive pathway to the normal state.
DTIC
Switches; Superconductors (Materials)

19980029701 NASA Marshall Space Flight Center, Huntsville, AL USA
Dynamically Timed Electric Motor
Casper, Ann M., Inventor, NASA Marshall Space Flight Center, USA; Aug. 05, 1997; 6p; In English
Patent Info.: Filed 5 Aug. 1997; NASA-Case-MFS-28958-1; US-Patent-5,654,599; US-Patent-Appl-SN-365880; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A brushless DC motor including a housing having an end cap secured thereto. The housing encloses a rotor. a stator and a rotationally displaceable commutation board having sensors secured thereon and spaced around the periphery of the rotor. An external rotational force is applied to the commutation board for displacement of the sensors to various positions whereby varying feedback signals are generated by the positioning of the sensors relative to the rotating rotor. The commutation board is secured in a fixed position in response to feedback signals indicative of optimum sensor position being determined. The rotation of the commutation board and the securing of the sensors in the desired fixed position is accomplished without requiring the removal of the end cap and with the DC motor operating.
Official Gazzette of the U.S. Patent and Trademark
Electric Motors; Time Lag; Brasses; Direct Current; Feedback

19980031483 NERAC, Inc., Tolland, CT USA
Built in Self Tests. (Latest citations from the Ei Compendex*Plus database)
Dec. 1997; In English; Page count unavailable.
Report No.(s): PB98-851454; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning built in self test techniques used in the fault diagnosis and testing of electronics, circuits, systems, and networks. Topics include test pattern generation and sequences, test synthesis, design for testability, testability enhancement, cellular automation, electric and electronic network analyses, and very large scale integration systems. References also examine the testing of integrated circuits, random access storages, multichip modules, switching circuits, logic circuits, datapath faults, and power supply systems. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Self Tests; Bibliographies; Fault Detection

19980033936 NERAC, Inc., Tolland, CT USA
Compact Fluorescent Lamps. (Latest citations from the US Patent Bibliographic File with Exemplary Claims)
Jan. 1998; In English; Page count unavailable.
Report No.(s): PB98-851892; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning compact fluorescent lamps and systems. Citations describe low pressure discharge, low power, helical, self-ballasted, and high luminescent lamps. Topics include ballast devices, power supplies and switches, voltage conversion and feedback, reflectors and phosphor coatings, convection cooling, and protection circuits. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Fluorescence; Luminaires; Bibliographies

19980035467 Bowling Green State Univ., OH USA
Optoelectronic Devices Based on Novel Semiconductor Structures ***Final Report, 4 Feb. 1984 - 14 Jul. 1997***
Ding, Yujie J., Bowling Green State Univ., USA; Jul. 14, 1997; 17p; In English
Contract(s)/Grant(s): F49620-94-10154; AF Proj. 2305
Report No.(s): AD-A335822; AFRL-SR-BL-TR-98-0090; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have proposed a class of nonlinear optical devices based on (cascaded second-order nonlinearities, in particular, optical parametric oscillators and amplifiers, optical frequency shifters, and frequency doublers, in novel configurations. We have developed a microscopic theory for cascading optical nonlinearities and studied influence of the ionized impurities on the tunneling rates in quantum wells. We have set up a state-of-the-art nonlinear optics lab. We have systematically investigated spatially-localized band-gap renormalization and band-filling effects, photoluminescence saturation due to interface traps, and tunneling of heavy holes. We have designed and grown two optimized multilayer structures for implementing optical parametric oscillators and amplifiers, and efficient frequency doublers.
DTIC
Nonlinear Optics; Optoelectronic Devices

19980036338 Prairie View Agricultural and Mechanical Coll., Dept. of Electrical Engineering, TX USA
Study of Radiation Effects Electronics at Atmospheric Altitudes ***Final Report***
Wilkins, Richard, Prairie View Agricultural and Mechanical Coll., USA; Mar. 30, 1998; 7p; In English
Contract(s)/Grant(s): NAG4-129
Report No.(s): NASA/CR-1998-207660; NAS 1.26:207660; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A test bed for the in situ evaluation of electronic devices for high altitude aircraft was developed. A prototype of the test bed, suitable for operation on a research aircraft, was built and readied for ground tests. The principle investigator established a working relationship with the Project APEX team at Dryden with the intent of flying the test bed ”piggyback” on an Project APEX balloon in 1998. Contact was also established with NASA contractors charged with operating the ER-2 aircraft now at Dryden.
Author
Experimentation; Evaluation; Electronic Equipment; Research Aircraft; Radiation Effects; Ground Tests

19980036371 Communications Research Centre, Ottawa, Ontario Canada
44.5 GHz PHEMT Power Amplifier
McLelland, Scott, Carleton Univ., Canada; Stubbs, Malcom G., Communications Research Centre, Canada; Morin, Gilbert A., Defence Research Analysis Establishment, Canada; Dec. 1997; 43p; In English
Contract(s)/Grant(s): DND Proj. 5CA12
Report No.(s): AD-A335369; CRC-97-007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The work described in this report represents the design phase of a gallium arsenide monolithic microwave integrated circuit (GaAs MMIC) power amplifier using pseudomorphic high electron mobility transistors (PHEMTs). The main purpose was to investigate the possible performance of a power amplifier at 44 GHz for future application in a phased array antenna system. The design of a two stage amplifier, providing over 12 dB of gain over the frequency range 43.5-45.5 GHz, is described along with the expected large signal performance. It is expected that the amplifier will provide over 20 dBm of output power. The final layout of the complete chip is also presented.
DTIC
Power Amplifiers; Microwave Circuits; Integrated Circuits; Phased Arrays; Antenna Arrays; High Electron Mobility Transistors

19980036870 Academy of Sciences (USSR), Ioffe Physical-Technical Inst., Saint Petersburg, USSR
Study Into the Design of the Semiconductor Power Pulsers With Less Than 1 Nanosecond Front and Up to 100 kV Output *Final Report*
Kardo-Sysoev, Alexei, Academy of Sciences (USSR), USSR; Jan. 1997; 179p; In English
Contract(s)/Grant(s): F61708-96-W-0280
Report No.(s): AD-A336086; EOARD-SPC96-4074; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The technology of short (less than 10(exp -8) s) pulse generation is limited, as a rule, by availability of switching devices (closing or opening switches). The most promising devices are semiconductor devices, but until last years the power of semiconductor devices have been far lower, than the power of gas-discharge gaps or magnetic compressing cells. In the last decade, a promising trend connected with the appearance of high-power, super fast semiconductor devices has arisen. The devices operation is based on recently discovered physical effects: superfast recovery of high voltage diodes, and delayed ”overvoltaged” breakdown.
DTIC
Design Analysis; Semiconductor Devices; Experimentation

19980036942 Institute of Electrical and Electronics Engineers, Piscataway, NJ USA
International Conference on Indium Phosphide and Related Materials *Final Report*
Jan. 14, 1998; 694p; In English, 11-15 May 1997, Cape Cod, MA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): N00014-97-I-0876
Report No.(s): AD-A335326; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

Topics considered include: InP-Based Components for Telecom Systems in Europe; Advances in InP-Based Optoelectronic Devices and Circuits for Optical Communication, Interconnection and Signal Processing; Unipolar Mid-Infrared Semiconductor Lasers; Power Devices - Bandgap Engineered InP-Based Power Double Heterojunction Bipolar Transistor; 0.9 W/mm, 76% PAE (7 GHz) GaInAs/InP Composite Channel HEMTS; High Power InAlAs/InGaAs/InP-HFET Grown by MOVPE; InP/InGaAs Double HBTs with High CW Power Density at 10 GHz.
DTIC
Indium Phosphides; Conferences

34
FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

19980024021 Colorado Univ., Cooperative Inst. for Research in Environmental Science, Boulder, CO USA
Models and Laboratory Experiments of Buoyant Puff Dispersion in a Convective Boundary Layer
Weil, J. C., Colorado Univ., USA; Snyder, W. H., Surrey Univ., UK; Lawson, R. E., National Oceanic and Atmospheric Administration, USA; Thompson, R. S., Environmental Protection Agency, USA; Shipman, M. S., Geophex Ltd., USA; 1997; 12p; In English; 10th; Joint Conference on the Applications of Air Pollution Meteorology, 11-16 Jan. 1998, Phoenix, AZ, USA;

Sponsored by American Meteorological Society, USA
Report No.(s): PB98-116379; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper, the authors present: (1) a simple model of buoyant puff dispersion in the CBL, (2) results from experiments on puff dispersion in a laboratory convection tank, and (3) a brief comparison of the two.

NTIS

Plumes; Atmospheric Boundary Layer; Convection; Buoyancy

19980024304 Colorado Univ., Cooperative Inst. for Research in Environmental Science, Boulder, CO USA

Recent Experiments on Buoyant Plume Dispersion in a Laboratory Convection Tank

Weil, J. C., Colorado Univ., USA; Snyder, W. H., Surrey Univ., UK; Lawson, R. E., National Oceanic and Atmospheric Administration, USA; Shipman, M. S., Geophex Ltd., USA; 1997; 12p; In English; 10th; Joint Conference on the Applications of Air Pollution Meteorology, 11-16 Jan. 1998, Phoenix, AZ, USA; Sponsored by American Meteorological Society, USA
Report No.(s): PB98-116361; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The main experimental objective was to obtain statistically-reliable dispersion characteristics, for highly-buoyant plume. Since the concentration fluctuations were known to be large, a key design feature was a means for obtaining a sufficiently large number of measurements to ensure such reliability.

NTIS

Convection; Plumes; Ecology; Reliability

19980024305 Environmental Protection Agency, National Exposure Research Lab., Research Triangle Park, NC USA

Laboratory Model of Diffusion in the Convective Boundary Layer

Lawson, R. E., Environmental Protection Agency, USA; Snyder, W. H., Surrey Univ., UK; Shipman, M. S., Geophex Ltd., USA; 1997; 12p; In English
Report No.(s): PB98-116486; EPA/600/A-97/080; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In order to meet the need for additional experimental data, the EPA Fluid Modeling Facility (FMF) has established a laboratory for investigating convective boundary layer processes. The laboratory consists of several components which are linked mechanically or electrically to fully automate the process of acquiring experimental CBL data. The central component of the laboratory is a convection tank patterned after that used by Willis and Deardoff.

NTIS

Atmospheric Diffusion; Plumes; Convection; Turbulent Flow; Dispersion

19980024672 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Numerical Study of Interaction of a Vortical Density Inhomogeneity with Shock and Expansion Waves ***Final Report***

Povitsky, A., Institute for Computer Applications in Science and Engineering, USA; Ofengeim, D., Manchester Coll. of Science and Technology, UK; Feb. 1998; 22p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-1998-206918; NAS 1.26:206918; ICASE-98-10; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We studied the interaction of a vortical density inhomogeneity (VDI) with shock and expansion waves. We call the VDI the region of concentrated vorticity (vortex) with a density different from that of ambiance. Non-parallel directions of the density gradient normal to the VDI surface and the pressure gradient across a shock wave results in an additional vorticity. The roll-up of the initial round VDI towards a non-symmetrical shape is studied numerically. Numerical modeling of this interaction is performed by a 2-D Euler code. The use of an adaptive unstructured numerical grid makes it possible to obtain high accuracy and capture regions of induced vorticity with a moderate overall number of mesh points. For the validation of the code, the computational results are compared with available experimental results and good agreement is obtained. The interaction of the VDI with a propagating shock wave is studied for a range of initial and induced circulations and obtained flow patterns are presented. The splitting of the VDI develops into the formation of a non-symmetrical vortex pair and not in a set of vortices. A method for the analytical computation of an overall induced circulation Gamma(sub 1) as a result of the interaction of a moving VDI with a number of waves is proposed. Simplified, approximated, expressions for Gamma(sub 1) are derived and their accuracy is discussed. The splitting of the VDI passing through the Prandtl-Meyer expansion wave is studied numerically. The obtained VDI patterns

are compared to those for the interaction of the VDI with a propagating shock wave for the same values of initial and induced circulations. These patterns have similar shapes for corresponding time moments.
Author
Vortices; Unstructured Grids (Mathematics); Euler Equations of Motion; Vorticity; Inhomogeneity; Shock Waves; Elastic Waves; Computational Grids

19980025557 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Prospects for CFD on Petaflops Systems
Keyes, David E., Old Dominion Univ., USA; Kaushik, Dinesh K., Old Dominion Univ., USA; Smith, Barry F., Argonne National Lab., USA; Dec. 1997; 26p; In English
Contract(s)/Grant(s): NAS1-19480; NAS1-97046; W-31-109-eng-38; NSF ECS-95-27169
Report No.(s): AD-A333354; NASA/CR-97-206279; NAS 1.26:206279; ICASE-97-73; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With tetraflops-scale computational modeling expected to be routine by 2003-04, under the terms of the Accelerated Strategic Computing Initiative (ASCT) of the U.S. Department of Energy, and with teraflops-capable platforms already available to a small group of users, attention naturally focuses on the next symbolically important milestone, computing at rates of 10 to the 15th power floating point operations per second, or ”petaflop/s”. For architectural designs that are in any sense extrapolations of today’s, petaflops-scale computing will require approximately one-million-fold instruction-level concurrency. Given that cost-effective one thousand-fold concurrency is challenging in practical computational fluid dynamics simulations today, algorithms are among the many possible bottlenecks to CFD on petaflops systems. After a general outline of the prob lems and prospects of petaflops computing, we examine the issue of algorithms for PDE computations in particular, a back-of-the-envelope parallel complexity analysis focuses on the latency of global synchronization steps in the implicit algorithm. We argue that the latency of synchronization steps is a fundamental, but addressable, challenge for PDE computations with static data structures, which are primarily determined by grids. We provide recent results with encouraging scalability for parallel implicit Euler simulations using the Newton-Krylov-Schwarz solver in the PETSc software library. The prospects for PDE simulations with dynamically evolving data structures are far less clear.
DTIC
Computational Fluid Dynamics; Computer Programs; Data Structures; Floating Point Arithmetic

19980025566 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA
3-D Parachute Descent Analysis Using Coupled Computational Fluid Dynamic and Structural Codes ***Final Report***
Sahu, Jabaraj, Army Research Lab., USA; Cooper, Gene R., Army Research Lab., USA; Benney, Richard J., Natick Research, Development and Engineering Center, USA; Sep. 1997; 28p; In English
Contract(s)/Grant(s): DA Proj. 1L1-61102-AH-43
Report No.(s): ARL-TR-1435; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A computational tool that models the terminal descent characteristics of a single or a cluster of parachutes is a technology that is needed by parachute designers and engineers. As part of a technology program annex (TPA), a joint effort between the U.S. Army Natick Research, Development, and Engineering Center (NRDEC) and the U.S. Army Research Laboratory (ARL) to develop this computational tool is now under way. As a first effort, attempts are being made to analyze both two-dimensional (2-D) and three-dimensional (3-D) flow fields around a parachute using a coupling procedure in which the fluid dynamics are coupled to 2-D and 3-D structural dynamic (SD) codes. This effort uses computational fluid dynamic (CFD) codes to calculate a pressure field, which is then used as an input load for the SD code. Specifically, this report presents the methods and results of the flow field plus the structural characteristics of a single axisymmetric parachute and a 3-D gore configuration for the terminal descent velocity. Computed results have been obtained using the payload weight and unstretched constructed geometry of the canopies as input. Significant progress has been made in determining the terminal descent flow field along with the terminal shape of the parachute. A discussion of the fluid and structural dynamics codes, coupling procedure, and the associated technical difficulties is presented. Examples of the codes’ current capabilities are shown.
Author
Computational Fluid Dynamics; Parachute Descent; Three Dimensional Flow; Structural Design; Dynamic Structural Analysis; Dynamic Response; Parachutes

19980025567 Rutherford Appleton Lab., Central Laser Facility, Chilton, UK
Density Profile Measurements of Non-Cylindrical Pulsed Gas Jets: TMR Large-Scale Facilities Access Programme
Resendes, D., Instituto Superior Tecnico, Portugal; Neely, D., Rutherford Appleton Lab., UK; Danson, C. N., Rutherford Apple-

ton Lab., UK; Booth, G., Rutherford Appleton Lab., UK; Azambuja, R., Instituto Superior Tecnico, Portugal; Eloy, M., Instituto Superior Tecnico, Portugal; Figueira, G., Instituto Superior Tecnico, Portugal; Jan. 1998; ISSN 1358-6254; 9p; In English; Original contains color illustrations
Contract(s)/Grant(s): CEC-ERBFMGE-CT95-0053
Report No.(s): RAL-TR-98-009; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0QX, UK), Hardcopy, Microfiche

This report describes the experiment entitled 'Density Profile Measurements of Non-Cylindrical Pulsed Gas Jets'; carried out at the Central Laser Facility (CLF) from the 10th to the 23rd February 1997. The experiment, funded by the Framework IV Large-Scale Facilities Access Scheme, was proposed by Prof D Resendes, GoLP/Centro de Fisica de Plasmas, Instituto Superior Tecnico, Lisbon, Portugal, and carried out by visiting researchers from the Institute. They were given technical support by researchers from the Central Laser Facility, Rutherford Appleton Laboratory.
Derived from text
Gas Jets; Cylindrical Bodies; Density Measurement; Plasmas (Physics)

19980027603 NASA Langley Research Center, Hampton, VA USA
Mixing Enhancement by Tabs in Round Supersonic Jets
Seiner, John M., NASA Langley Research Center, USA; Grosch, C. E., Old Dominion Univ., USA; 1998; 18p; In English; 4th; Aeroacoustics Conference, 2-4 Jun. 1998, Toulouse, France; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS1-97046
Report No.(s): NASA/CR-1998-207690; NAS 1.26:207690; AIAA Paper 98-2326; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this study was to analyze jet plume mass flow entrainment rates associated with the introduction of counter-rotating streamwise vorticity by prism shaped devices (tabs) located at the lip of the nozzle. We have examined the resulting mixing process through coordinated experimental tests and numerical simulations of the supersonic flow from a model axisymmetric nozzle. In the numerical simulations, the total induced vorticity was held constant while varying the distribution of counter-rotating vorticity around the nozzle lip training edge. In the experiment, the number of tabs applied was varied while holding the total projected area constant. Evaluations were also conducted on initial vortex strength. The results of this work show that the initial growth rate of the jet shear layer is increasingly enhanced as more tabs are added, but that the lowest tab count results in the largest entrained mass flow. The numerical simulations confirm these results.
Author
Shear Layers; Mixing Layers (Fluids); Computational Fluid Dynamics; Navier-Stokes Equation; Mass Flow; Supersonic Jet Flow; Vorticity

19980027606 Brown Univ., Div. of Applied Mathematics, Providence, RI USA
Parallel Multi-Scale Algorithms and Applications to Turbulence ***Final Report, 1 Jun. 1994 - 31 May 1997***
Karniadakis, George E., Brown Univ., USA; Oct. 09, 1997; 7p; In English
Contract(s)/Grant(s): F49620-94-I-0313
Report No.(s): AD-A334848; AFRL-SR-BL-TR-98-0059; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report describes development of a new hierarchical spectral basis appropriate for hp-finite element formulations on unstructured grids consisting of triangular and tetrahedral subdomains. The new multi-resolution basis has the following properties: (1) Jacobi polynomials of mixed weights, (2) Semi-orthogonality, leading to great sparsity, (3) Hierarchical structure, (4) Generalized tensor products, (5) Mixed order expansions, which provides great flexibility in adaptive discretizations, and (6) Gauss-Jacobi quadratures that minimize errors in complicated geometries. The accuracy of this method has been tested in two and three dimensions. Importantly, numerical results verified that the new hierarchical basis exhibits convergence even for highly distorted meshes.
DTIC
Unstructured Grids (Mathematics); Finite Element Method; Computational Fluid Dynamics; Turbulence

19980031001 Iowa Univ., Iowa Inst. of Hydraulic Research, Iowa City, IA USA
Leonardian Fluid Mechanics in the Codex Atlanticus 8-9
Macagno, E., Iowa Univ., USA; Aug. 1997; 202p; In English
Report No.(s): PB98-117534; IIHR-MONO-115; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Beginning at Iowa in the early sixties, the laboratory methodology for the objective study of Leonardo's reported observations and experiments was gradually developed along more than three decades and is still in use. Long periods were spend in fluid

mechanics and hydrualic laboratories in the USA and Europe (Iowa' Institute of Hydraulic Research, College of Engineering Iowa City, Institut fur Hydromechanik Karlsruhe, Laboratoire de Mecanique des Fluides Orsay, and others). Some illustrations of such a methodology are interspersed in this monograph.
NTIS
Fluid Mechanics; Hydraulic Equipment; Mechanical Engineering

19980036921 National Space Development Agency, System Engineering Dept., Tokyo, Japan
Simulation of Fluid Behavior of Thermally Driven Flow Unit (TDFU)
Futamata, Ryosuke, National Space Development Agency, Japan; Tsukiyama, Hiroshi, Tsukiyama Research, Inc., Japan; Furukawa, Masao, National Space Development Agency, Japan; Journal of the Japan Society of Microgravity Application; Dec. 1997; Volume 13, No. 3; 20p; In English; Translated into English by NASDA
Report No.(s): NASDA-ETR-970016; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Abstract Thermally Driven Flow Unit (TDFU) experiment was performed as a mission of IML-2 Project. TDFU is a thermal accumulator model for Two-Phase Fluid Loop. One of TDFU experiment's purposes was to verify Liquid/Vapor phase-separation and liquid positioning at core section in TDFU vessels, and was satisfactorily achieved in IML-2 Project. Besides, in NASDA, another vessel experiments abroad airplane was performed as preflight estimation. This paper presents numerical simulation analysis on above experimental results basis, and the method of modeling the surface tension and the wall adhesion force in the absence of gravity.
Author
Simulation; Fluid Flow; Liquid-Vapor Interfaces; Liquid-Vapor Equilibrium

19980036978 NASA Langley Research Center, Hampton, VA USA
Computational Aeroheating Predictions for X-34
Kleb,William H., NASA Langley Research Center, USA; Wood, William A., NASA Langley Research Center, USA; Gnoffo, Peter A., NASA Langley Research Center, USA; Jan. 1998; 46p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 242-80-01-01
Report No.(s): NASA/TM-1998-206289; NAS 1.15:206289; L-17687; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Radiative equilibrium surface temperatures, heating rates, streamlines, surface pressures, and flow-field features as predicted by the Langley Aerothermodynamic Upwind Relaxation Algorithm (LAURA) are presented for the X-34 Technology Demonstrator. Results for two trajectory points corresponding to entry peak heating and two control surface deflections are discussed. This data is also discussed in the context of Thermal Protection System (TPS) design issues. The work presented in this report is part of a larger effort to define the X-34 aerothermal environment, including the application of engineering codes and wind-tunnel studies.
Author
Aerothermodynamics; Aerodynamic Heating; Surface Temperature; Heat Transfer; Flow Distribution; Computational Fluid Dynamics; Reynolds Averaging; Hypersonic Flow; Navier-Stokes Equation

19980037001 NASA Ames Research Center, Moffett Field, CA USA
Comparison of Implicit Schemes for the Incompressible Navier-Stokes Equations
Rogers, Stuart E., NASA Ames Research Center, USA; AIAA Journal; Nov. 1995; Volume 33, No. 11, pp. 2066-2072; In English; Aerospace Science Meetings, 9-12 Jan. 1995, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-95-207284; NAS 1.15:207284; AIAA Paper 95-0567; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

For a computational flow simulation tool to be useful in a design environment, it must be very robust and efficient. to develop such a tool for incompressible flow applications, a number of different implicit schemes are compared for several two-dimensional flow problems in the current study. The schemes include Point-Jacobi relaxation, Gauss-Seidel line relaxation, incomplete lower-upper decomposition, and the generalized minimum residual method preconditioned with each of the three other schemes. The efficiency of the schemes is measured in terms of the computing time required to obtain a steady-state solution for the laminar flow over a backward-facing step, the flow over a NACA 4412 airfoil, and the flow over a three-element airfoil using overset grids. The flow solver used in the study is the INS2D code that solves the incompressible Navier-Stokes equations using the method of artificial compressibility and upwind differencing of the convective terms. The results show that the generalized minimum

residual method preconditioned with the incomplete lower-upper factorization outperforms all other methods by at least a factor of 2.
Author
Navier-Stokes Equation; Incompressible Flow; Computational Fluid Dynamics; Reynolds Averaging

35
INSTRUMENTATION AND PHOTOGRAPHY

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

19980031002 NASA Lewis Research Center, Cleveland, OH USA
Scanning Mode Sensor for Detection of Flow Inhomogeneities
Adamovsky, Grigory, Inventor, NASA Lewis Research Center, USA; Feb. 03, 1998; 6p; In English
Patent Info.: Filed 8 Jul. 1998; NASA-Case-LEW-16041-1; US-Patent-5,715,047; US-Patent-Appl-SN-687062; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A scanning mode sensor and method is provided for detection of flow inhomogeneities such as shock. The field of use of this invention is ground test control and engine control during supersonic flight. Prior art measuring techniques include interferometry. Schlieren, and shadowgraph techniques. These techniques. however, have problems with light dissipation. The present method and sensor utilizes a pencil beam of energy which is passed through a transparent aperture in a flow inlet in a time-sequential manner so as to alter the energy beam. The altered beam or its effects are processed and can be studied to reveal information about flow through the inlet which can in turn be used for engine control.
Official Gazzette of the U.S. Patent and Trademark
Engine Control; Scanners; Sensors; Shadowgraph Photography; Ground Tests

19980032582 NASA Langley Research Center, Hampton, VA USA
Fuel Line Based Acoustic Flame-Out Detection System
Puster, Richard L., Inventor, NASA Langley Research Center, USA; Franke, John M., Inventor, NASA Langley Research Center, USA; Sep. 09, 1997; 7p; In English
Patent Info.: Filed 28 Jun. 1996; NASA-Case-LAR-15296-1; US-Patent-5,665,916; US-Patent-Appl-SN-672294; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

An acoustic flame-out detection system that renders a large high pressure combustor safe in the event of a flame-out and possible explosive reignition. A dynamic pressure transducer is placed in the fuel and detects the stabilizing fuel pressure oscillations, caused by the combustion process. An electric circuit converts the signal from the combustion vortices, and transmitted to the fuel flow to a series of pulses. A missing pulse detector counts the pulses and continuously resets itself. If three consecutive pulses are missing, the circuit closes the fuel valve. With fuel denied the combustor is shut down or restarted under controlled conditions.
Official Gazzette of the U.S. Patent and Trademark
Fuel Flow; Acoustic Imaging; Flames; Combustion Chambers; High Pressure; Sound Detecting and Ranging

36
LASERS AND MASERS

Includes parametric amplifiers. For related information see also 76 Solid-State Physics.

19980023496 Rutherford Appleton Lab., Central Laser Facility, Chilton, UK
Petawatt Enhancement of the Vulcan High Power Nd:Glass Laser, Phase 1 ***Final Report***
Edwards, C. B., Rutherford Appleton Lab., UK; Toner, W. T., Rutherford Appleton Lab., UK; Danson, C. N., Rutherford Appleton Lab., UK; Allott, R., Rutherford Appleton Lab., UK; Angood, S., Rutherford Appleton Lab., UK; Barzanti, L., Rutherford Appleton Lab., UK; Bates, D., Rutherford Appleton Lab., UK; Beckwith, C., Rutherford Appleton Lab., UK; Birks, M., Rutherford Appleton Lab., UK; Booth, G., Rutherford Appleton Lab., UK; Bradwell, N., Rutherford Appleton Lab., UK; Brummitt, P., Rutherford Appleton Lab., UK; Coates, D., Rutherford Appleton Lab., UK; Collier, J., Rutherford Appleton Lab., UK; Damerell, A. R., Rutherford Appleton Lab., UK; Edwards, D., Rutherford Appleton Lab., UK; Ellwood, J., Rutherford Appleton Lab., UK; Exley, P., Rutherford Appleton Lab., UK; Flintoff, P. S., Rutherford Appleton Lab., UK; Frackiewicz, A., Rutherford Appleton

Lab., UK; Jan. 1998; ISSN 1358-6254; 43p; In English; Original contains color illustrations
Contract(s)/Grant(s): GPSRC-GR/K-74180
Report No.(s): RAL-TR-98-004-Phase-1; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0Qx, UK), Hardcopy, Microfiche

There has been considerable interest in the last 10 years in the physics of ultra-high power laser interactions. With all high power lasers such as VULCAN there is a limit to the energy that can be extracted from laser amplifiers at short pulse-lengths due to the intensity dependent non-linear refractive index. This effect, the Kerr effect, places an upper limit on the maximum mean laser pulse intensity by generating a spatial modulation of refractive index due to any spatial modulation of the laser beam intensity. These small scale variations of refractive index behave as local positive lenses and cause a slight local self-focusing. This in turn increases the local intensity and thus the strength of the local lens thereby exponentially enhancing the self-focusing effect. This leads both to the onset of material damage and the inability to focus the laser beam to target. The technique of Chirped Pulse Amplification (CPA)[1] has overcome the classic limit imposed by the Kerr effect and has resulted in massive increases in focused intensity. Arguably, the most successful implementation of CPA on a large laser system world-wide is that on the VULCAN system. The large increase to on target intensity is achieved by a substantial, usually orders of magnitude, reduction in pulse duration whilst at the same time maintaining comparable pulse energy and focusability. In the implementation of CPA an ultra-short pulse, typically a hundred femtoseconds, is stretched in time to become a 'long' pulse of about a nanosecond in duration. An ultra-short pulse necessarily has a large spectral content and the stretching is accomplished by dispersing these spectral components and arranging that each component travels a different distance prior to amplification. The generated long pulse thus possesses an internal frequency sweep with time and is therefore chirped This chirped pulse is amplified as per normal and because the pulse is now long the intensity in the laser chain remains below the critical value imposed by the Kerr effect. After amplification, the chirped pulse is compressed under vacuum in a similar way to its stretching to yield an ultra short pulse once more. The compression occurs just prior to target focusing and can result in an ultra-high on target intensity far in excess of that possible by the direct amplification of the short pulse length. This report of the Phase I PetaWatt Upgrade describes the enhancement of the CPA facility on the VULCAN laser system.
Derived from text
Electromagnetic Interactions; Glass Lasers; High Power Lasers; Pulse Duration; Light Amplifiers; Amplification

19980029704 NASA Johnson Space Center, Houston, TX USA
Ranging Apparatus and Method Implementing Stereo Vision System
Li, Larry C., Inventor, NASA Johnson Space Center, USA; Cox, Brian J., Inventor, NASA Johnson Space Center, USA; Nov. 04, 1997; 13p; In English
Patent Info.: Filed 10 Apr. 1995; NASA-Case-MSC-22431-1; US-Patent-5,684,531; US-Patent-Appl-SN-425002; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A laser-directed ranging system for use in telerobotics applications and other applications involving physically handicapped individuals. The ranging system includes a left and right video camera mounted on a camera platform, and a remotely positioned operator. The position of the camera platform is controlled by three servo motors to orient the roll axis, pitch axis and yaw axis of the video cameras, based upon an operator input such as head motion. A laser is provided between the left and right video camera and is directed by the user to point to a target device. The images produced by the left and right video cameras are processed to eliminate all background images except for the spot created by the laser. This processing is performed by creating a digital image of the target prior to illumination by the laser, and then eliminating common pixels from the subsequent digital image which includes the laser spot. The horizontal disparity between the two processed images is calculated for use in a stereometric ranging analysis from which range is determined.
Official Gazzette of the U.S. Patent and Trademark
Technologies; Stereoscopic Vision; Cameras; Pixels; Patents

19980034675 Lebedev Physical Inst., Chemical and Electric-Discharge Laser Lab., Moscow, Russia
Parametric Characterization of a Jet Singlet Oxygen Generator Driven COIL ***Final Report***
Nikolaev, Valeri, Lebedev Physical Inst., Russia; Jan. 1997; 41p; In English
Contract(s)/Grant(s): F61708-97-W-0193
Report No.(s): AD-A333510; SPC-97-4059-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking P. N. Lebedev Physical Institute, Samara branch as follows: The contractor will investigate the cost and present a detailed design to increase the flow rate in the laser system to 0.10 mole/sec of chlorine with

He diluent. He will also perform experiments with 8 M, 6 M, and 4 M BHP at -20, -10, and 0 C to determine optimum mirror reflectivities and iodine and diluent flow rates.
DTIC
Oxygen Production; Oxygen Supply Equipment; Lasers

19980036330 Arizona Univ., Tucson, AZ USA
Semiconductor Laser Dynamics ***Final Report, 15 Feb. 1994 - 14 Feb. 1997***
Moloney, J., Arizona Univ., USA; Apr. 15, 1997; 100p; In English
Contract(s)/Grant(s): F49620-94-I-0144
Report No.(s): AD-A335789; AFRL-SR-BL-TR-98-0123; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
Significant progress has been made in constructing a mathematical model of wide aperture semi-conductor lasers which simultaneously resolves multi-longitudinal mode and transverse filamentation instabilities in high brightness lasers. The original working model discussed under project 'Simulations of Broad Area Flared Amplifiers and Lasers' utilized a nonlinear gain/index model but ignored gain and index dispersion. Gain and index spectra computed microscopically for specific laser structures and including the contributions of barrier states, are fed as rational functions approximations into the laser simulation code. Using this model, we have been able, for the first time, to simulate the full space-time evolution of all the relevant optical fields and carrier density in the state-of-the-art commercial MOPA high brightness source. Our simulations, suggesting a redesign of this device for improved stability, has attracted the attention of Opto Power Corporation laser design engineers.
DTIC
Semiconductor Lasers; Mathematical Models

19980036875 Cardiff Univ., Dept. of Physics and Astronomy, UK
The Thirteenth UK National Quantum Electronics Conference
Sep. 11, 1997; 183p, 8-11 Sep. 1997, Cardiff, UK
Report No.(s): AD-A335553; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche; Abstracts Only; Abstracts Only
The Thirteenth UK National Quantum Electronics Conference (QE 13), organized by the Quantum Electronics Group of the Institute of Physics and hosted by the Department of Physics and Astronomy, University of Wales, Cardiff, will be held in the Trevithick Building from Monday 8 to Thursday 11 September, 1997. The scope of the topics to be covered includes: (1) The physics of coherent light sources; (2) New laser systems; (3) Non-linear and quantum optics; (4) Laser spectroscopy; and (5) Application of lasers. The conference will also feature a Technical Exhibition, a Workshop on Microcavities and Photonic Band-gaps and a special Industrial Session, as well as laboratory tours.
DTIC
Quantum Electronics; Conferences

37
MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

19980026076 Department of the Navy, Washington, DC USA
Cable Connector Assembly
Moody, Paul E., Inventor, Department of the Navy, USA; McCarthy, James M., Inventor, Department of the Navy, USA; Langmack, Dennis J., Inventor, Department of the Navy, USA; Chester, Mark V., Inventor, Department of the Navy, USA; Sep. 23, 1997; 5p; In English; Supersedes US-Patent-Appl-SN-712526, AD-D018207.
Patent Info.: Filed 11 Sep. 1996; US-Patent-Appl-SN-712526; US-Patent-5,669,776
Report No.(s): AD-D018678; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A cable connector assembly is provided to eliminate or minimize dynamic disturbance on the body shell surface of a vehicle in motion. The vehicle includes a body shell having a recessed portion which includes a cable connector receptacle and a connector housing. The connector housing does not protrude from the vehicle and is smooth with the body shell contour. The connector housing includes a female electrical connection portion. Adjacent the connector housing in the recessed portion of the body shell is a hinged closure plate which is controlled by a compression spring. When the vehicle is at rest, an electrical cable is connected to the connector housing and the closure plate is pushed into the recessed portion of the body shell. When the vehicle is put in

motion, the closure plate spring decompresses to force the closure plate to close and seal the recessed portion of the body shell. The closure plate and the connector housing form a uniform and smooth surface whIch blends with the contour of the body shell. DTIC

Assemblies; Connectors; Cables (Ropes); Vibration Isolators; Electric Connectors

19980027602 NASA Marshall Space Flight Center, Huntsville, AL USA

ISWE: A Case Study of Technology Utilization

Benfield, M. P., NASA Marshall Space Flight Center, USA; Mitchell, D. P., NASA Marshall Space Flight Center, USA; Vanhooser, M. T., NASA Marshall Space Flight Center, USA; Landrum, D. B., NASA Marshall Space Flight Center, USA; Mar. 1998; 32p; In English

Report No.(s): NASA/TM-1998-206528; M-845; NAS 1.26:206528; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The International Space Welding Experiment is a joint project between the E.O. Paton Welding Institute of Kiev, Ukraine and the George C. Marshall Space Flight Center in Huntsville, Alabama. When an international partner is involved in a project, differences in design and testing philosophy can become a factor in the development of the hardware. This report addresses selected issues that arose during the ISWE hardware development as well as the solutions the ISWE team made.

Author

Technology Utilization; Standards; Spaceborne Experiments; Welding

19980031004 NASA Johnson Space Center, Houston, TX USA

Bevel Gear Driver and Method Having Torque Limit Selection

Cook, Joseph S., Jr., Inventor, NASA Johnson Space Center, USA; Jul. 15, 1997; 8p; In English

Patent Info.: Filed 10 Aug. 1994; NASA-Case-MSC-22384-1; US-Patent-5,647,254; US-Patent-Appl-SN-288102; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

Methods and apparatus are provided for a torque driver including an axially displaceable gear with a biasing assembly to bias the displaceable gear into an engagement position. A rotatable cap is provided with a micrometer dial to select a desired output torque. An intermediate bevel gear assembly is disposed between an input gear and an output gear. A gear tooth profile provides a separation force that overcomes the bias to limit torque at a desired torque limit. The torque limit is adjustable and may be adjusted manually or automatically depending on the type of biasing assembly provided. A clutch assembly automatically limits axial force applied to a fastener by the operator to avoid alteration of the desired torque limit.

Official Gazzette of the U.S. Patent and Trademark

Gears; Torque; Fasteners

19980032330 NASA Lewis Research Center, Cleveland, OH USA

Development of Gear Technology and Theory of Gearing

Litvin, Faydor L., Illinois Univ., USA; Handschub, Robert F., Army Research Lab., USA; Dec. 1997; 122p; In English

Contract(s)/Grant(s): DA Proj. 1L1-62211-A-47A; RTOP 581-30-13

Report No.(s): NASA-RP-1406; NAS 1.61:1406; E-10679; ARL-TR-1500; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This book presents recent developments in the theory of gearing and the modifications in gear geometry necessary to improve the conditions of meshing. Highlighted are low-noise gear drives that have a stable contact during meshing and a predesigned parabolic transmission error function that can handle misalignment during operation without sacrificing the low-noise aspects of operation. This book also provides a comprehensive history of the development of the theory of gearing through biographies of major contributors to this field. The author's unique historical perspective was achieved by assiduous research into the lives of courageous, talented, and creative men who made significant contributions to the field of gearing.

Author

Gears; Transmissions (Machine Elements); Gear Teeth; Mechanical Drives

19980034829 Moscow State Univ., Russia

Experimental Investigation of a Possibility of Application of a Microwave Streamer Gas Discharge for Ignition of Fuel in a Jet Engine *Final Report*

Ershov, Elksei, Moscow State Univ., Russia; Jan. 1997; 78p; In English

Contract(s)/Grant(s): F61708-97-W-0009

Report No.(s): AD-A333334; EOARD-SPC-97-4003; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report contains results from a contract tasking Moscow State University as follows: The contractor will investigate possible application of a microwave streamer gas discharge for ignition of fuel in a jet engine.
DTIC
Ignition; Jet Engines; Microwaves; Plasma Generators

19980036258 Southwest Research Inst., San Antonio, TX USA
Development of a Natural Gas-Powered APU for a Hybrid Electric S-10 Pickup Truck ***Interim Report, May 1994 - Apr. 1995***
Podner, Daniel J., Southwest Research Inst., USA; Capshaw, William K., Southwest Research Inst., USA; Dec. 1997; 82p; In English
Contract(s)/Grant(s): DAAK70-92-C-0059
Report No.(s): AD-A333298; TFLRF-315; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
A natural gas-fueled Auxiliary Power Unit (APU) was developed for use in a hybrid electric vehicle. The project involved conversion and development of the powerplant from gasoline to natural gas operation, application of an engine control system, application of a three-way catalyst system, development of an APU controller, and integration and testing of the APU in the laboratory and vehicle environment The project was divided into three phases: (1) engine development, (2) APU control system development, and (3) APU integration/testing. The resultant APU was integrated into a hybrid electric utility truck for use as a range extender in a series hybrid configuration. The project resulted in an APU configuration producing ultra-low emissions levels while achieving high efficiency due to implementation of a unique APU operating strategy.
DTIC
Auxiliary Power Sources; Electric Motor Vehicles; Engine Control; Engine Design; Systems Engineering; Emission

38
QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

19980027036 Hampton Univ., Dept. of Electrical Engineering, VA USA
Development of Ultrasonic and Fabry-Perot Interferometer for Non-Destruction Inspection of Aging Aircraft ***Final Report***
Smith, Alphonso C., Hampton Univ., USA; Mar. 03, 1998; 14p; In English
Contract(s)/Grant(s): NAG4-12; NAG4-1
Report No.(s): NASA/CR-95-207462; NAS 1.26:207462; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Fabry-Perot Interferometer (FPI) sensor detection system was continued and refined modifications were made in the data acquisition and evaluation process during the last year. The ultrasonic and FPI detection system was improved from one to multiple sensor detectors. Physical models were developed to understand the physical phenomenon of this work. Multilayered flawed samples were fabricated for inspection by a prototype ultrasonic and FPI detection. Experimental data was verified with simulated results. Undergraduate students that were associated with this research gained valuable knowledge from this experience. This was a learning process helping students to understand the importance of research and its application to solve important technological problems. As a result of our students exposure to this research two and planning to continue this type of research work in graduate school. A prototype instrument package was laboratory tested an actual airframe structure for documentation purposes.
Author
Fabry-Perot Interferometers; Fabrication; Data Acquisition

19980029720 Washington Univ., Dept. of Physics, Saint Louis, MO USA
Ultrasonic Nondestructive Evaluation Techniques Applied to the Quantitative Characterization of Textile Composite Materials ***Semiannual Report, 13 Jun. - 12 Dec. 1997***
Miller, James G., Washington Univ., USA; 1997; 49p; In English; CD-ROM conforms to the ISO9660 standard
Contract(s)/Grant(s): NAG1-1848
Report No.(s): NASA/CR-97-206781; NAS 1.26:206781; NONP-NASA-CD-1998056117; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; CD-ROM or HC/CD-ROM Set A99; CD-ROM or HC/CD-ROM Set A99
In this Progress Report, we describe our recent developments of advanced ultrasonic nondestructive evaluation methods applied to the characterization of anisotropic materials. We present images obtained from experimental measurements of ultrasonic diffraction patterns for a thin woven composite in an immersion setup. In addition, we compare apparent signal loss measure-

ments of the thin woven composite for phase-sensitive and phase-insensitive detection methods. All images of diffraction patterns have been included on the accompanying CD-ROM in the Adobe(Trademark) Portable Document Format (PDF). Due to the extensive amount of data, however, hardcopies of only a small representative selection of the images are included within the printed report. This Progress Report presents experimental results that support successful implementation of single element as well as one and two-dimensional ultrasonic array technologies for the inspection of textile composite structures. In our previous reports, we have addressed issues regarding beam profiles of ultrasonic pressure fields transmitted through a water reference path and transmitted through a thin woven composite sample path. Furthermore, we presented experimental results of the effect of a thin woven composite on the magnitude of an insonifying ultrasonic pressure field. In addition to the study of ultrasonic beam profiles, we consider issues relevant to the application of single-element, one-dimensional, and two-dimensional array technologies towards probing the mechanical properties of advanced engineering composites and structures. We provide comparisons between phase-sensitive and phase-insensitive detection methods for determination of textile composite structure parameters. We also compare phase-sensitive and phase-insensitive - - ---- ----- apparent signal loss measurements in an effort to study the phenomenon of phase cancellation at the face of a finite-aperture single-element receiver. Furthermore, in this Progress Report we extend our work on ultrasonic beam profile issues through investigation of the phase fronts of the pressure field. In Section H of this Progress Report we briefly describe the experimental arrangement and methods for data acquisition of the ultrasonic diffraction patterns upon transmission through a thin woven composite. Section III details the analysis of the experimental data followed by the experimental results in Section IV. Finally, a discussion of the observations and conclusions is found in Section V.
Derived from text
Textiles; Composite Materials; Ultrasonics; Nondestructive Tests; Anisotropy; Diffraction Patterns; Composite Structures; Inspection; Data Acquisition; Woven Composites

39
STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

19980031731 NASA Dryden Flight Research Center, Edwards,CA USA
Mechanical- and Thermal-Buckling Behavior of Rectangular Plates With Different Central Cutouts
Ko, William L., NASA Dryden Flight Research Center, USA; Mar. 1998; 48p; In English
Contract(s)/Grant(s): RTOP 522-32-34
Report No.(s): NASA/TM-1998-206542; H-2206; NAS 1.15:206542; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mechanical- and thermal-buckling analyses were performed on rectangular plates with central cutouts. The cutouts were either circular holes or square holes. The finite-element structural analysis method was used to study the effects of plate-support conditions, plate aspect ratio, hole geometry, and hole size on the mechanical-and thermal-buckling strengths of the perforated plates. By increasing the hole size, thermal-buckling strengths of the plates could be enhanced. The compressive-buckling strengths of the plates could also be increased considerably only under certain boundary conditions and aspect ratios. The plate-buckling mode can be symmetrical or antisymmetrical, depending on the plate boundary conditions, aspect ratio, and the hole size. For the same cutout areas (i.e., same plate weight density), the buckling strengths of the same-sized plates with square holes generally surpass those of the plates with circular holes over the range of hole sizes. The results and illustrations provide vital information for the efficient design of aerospace structural panels.
Author
Perforated Plates; Rectangular Plates; Structural Analysis; Thermal Buckling; Finite Element Method; Buckling; Holes (Mechanics); Structural Failure

19980035470 Massachusetts Inst. of Tech., MIT Space Engineering Research Center, Cambridge, MA USA
Evolutionary Design of Controlled Structures
Masters, Brett P., Massachusetts Inst. of Tech., USA; Crawley, Edward F., Massachusetts Inst. of Tech., USA; Apr. 1997; 238p; In English
Contract(s)/Grant(s): NAGw-2014; NAG1-1717
Report No.(s): NASA/CR-97-207554; NAS 1.26:207554; SERC-1-97; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Basic physical concepts of structural delay and transmissibility are provided for simple rod and beam structures. Investigations show the sensitivity of these concepts to differing controlled-structures variables, and to rational system modeling effects. An evolutionary controls/structures design method is developed. The basis of the method is an accurate model formulation for dynamic compensator optimization and Genetic Algorithm based updating of sensor/actuator placement and structural attributes. One and three dimensional examples from the literature are used to validate the method. Frequency domain interpretation of these controlled structure systems provide physical insight as to how the objective is optimized and consequently what is important in the objective. Several disturbance rejection type controls-structures systems are optimized for a stellar interferometer spacecraft application. The interferometric designs include closed loop tracking optics. Designs are generated for differing structural aspect ratios, differing disturbance attributes, and differing sensor selections. Physical limitations in achieving performance are given in terms of average system transfer function gains and system phase loss. A spacecraft-like optical interferometry system is investigated experimentally over several different optimized controlled structures configurations. Configurations represent common and not-so-common approaches to mitigating pathlength errors induced by disturbances of two different spectra. Results show that an optimized controlled structure for low frequency broadband disturbances achieves modest performance gains over a mass equivalent regular structure, while an optimized structure for high frequency narrow band disturbances is four times better in terms of root-mean-square pathlength. These results are predictable given the nature of the physical system and the optimization design variables. Fundamental limits on controlled performance are discussed based on the measured and fit average system transfer function gains and system phase loss.
Author
Interferometry; Structural Design; Genetic Algorithms; Control Systems Design; Transfer Functions

19980036370 Army Construction Engineering Research Lab., Champaign, IL USA
Design and Performance Testing of Prestressed Precast Reinforced Concrete Double-Tee Beams With Web Openings ***Final Report***
Saleh, Moshen A., Army Construction Engineering Research Lab., USA; Brady, Pamalee A., Army Construction Engineering Research Lab., USA; Einea, Amin, Army Construction Engineering Research Lab., USA; Tadros, Maher K., Army Construction Engineering Research Lab., USA; Dec. 1997; 145p; In English
Report No.(s): AD-A336029; CERL-TR-98/03; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Conventional precast reinforced concrete double-tee joists may be made more structurally efficient by incorporating large openings in the web to accommodate environmental pipes and ducts. Double-tee joists with web openings may also reduce the total required building height, which would significantly lower costs for labor and materials during new construction. This report presents a method for designing prestressed precast reinforced concrete double-tee joists with web openings. Alternative designs were investigated by varying parameters such as prestressing strand layout, opening pier width, and pier reinforcement. Test results from six prestressed concrete joists are presented to substantiate finite element analysis results. The effect of web openings on beam behavior is discussed, and a simple method for designing the beams is presented. It is concluded that double-tee joists can be designed and manufactured with many web openings without jeopardizing beam strength. However, due to the effect of concentrated loading on shear failure modes in the tests, double-tee designs with web openings are recommended only floor and roof applications where only uniform loading will occur. Material costs associated with this design are slightly higher than for conventional double-tee members, but the design promotes an overall reduction in new construction costs.
DTIC
Performance Tests; Design Analysis; Concretes; Prestressing; T Shape

19980036383 Army Construction Engineering Research Lab., Champaign, IL USA
Design and Performance Testing of Prestressed Precast Reinforced Concrete Hybrid Joists ***Final Report***
Saleh, Moshen A., Army Construction Engineering Research Lab., USA; Brady, Pamalee A., Army Construction Engineering Research Lab., USA; Einea, Amin, Army Construction Engineering Research Lab., USA; Tadros, Maher K., Army Construction Engineering Research Lab., USA; Decker, Curtis L., Army Construction Engineering Research Lab., USA; Dec. 1997; 121p; In English
Report No.(s): AD-A336038; CERL-TR-98/04; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report describes an innovative design for prestressed precast reinforced concrete joists. The joist is a hybrid design that uses large web openings for passage of environmental pipes and ducts, replicating an advantage of steel truss construction. The design also exploits the stiffness and strength of precast concrete double-tee beams. Alternative designs were investigated by varying parameters such as concrete strength, prestressing strand layout, and reinforcement. Test results from eight hybrid joists are presented to substantiate finite element analysis results, and a simple method for designing the beams is presented. It is concluded that hybrid joist demonstrates remarkable performance and the capability to behave like a conventional double-tee beam. The

behavior of the hybrid joist meets the requirements of ACI 318-95. Experimental failure loads were very high compared with design service and ultimate loads. The analytical and experimental results indicate that the hybrid joist has a predictable ductile response, and the experimental results verify that the analytical model provides a reliable and simple method for determining the load-deflection response. Vibration analysis showed that the hybrid joist has acceptable response to established criteria and compares well with the response of both concrete and steel bar joists.
DTIC
Design Analysis; Performance Tests; Concretes; Prestressing; Reinforcement (Structures)

19980036980 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA
Modeling Threshold Velocity of Hemispherical and Ogival-Nose Tungsten-Alloy Penetrators Perforating Finite Aluminum Targets ***Final Report, Jul. 1995 - May 1997***
Scheffler, Daniel R., Army Research Lab., USA; Jan. 1998; 106p; In English
Contract(s)/Grant(s): DA Proj. 1L1-62618-AH-80
Report No.(s): AD-A336131; ARL-TR-1583; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study examines the ability of the CTH hydrocode to predict the effect of rod nose shape on the transition from rigid body to eroding rod penetration for tungsten alloy long rod penetrators perforating finite aluminum targets. Two rod nose shapes and two target alloys were considered. The rod nose shapes were hemispherical and ogival, and the target alloys were 7.62 cm thick 5083 and 7039 aluminum. Results are compared to an experimental study that delineated the effect of nose shape on the threshold velocity at which tungsten alloy penetrators transition from rigid body to eroding rod when perforating finite aluminum targets.
DTIC
Models; Velocity; Tungsten Alloys; Aluminum Alloys; Thresholds (Perception)

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.

19980022678 NASA Langley Research Center, Hampton, VA USA
Remote Sensing of Global Fire Patterns, Aerosol Optical Thickness, and Carbon Monoxide During April 1994
Christopher, Sundar A., South Dakota School of Mines and Technology, USA; Wang, Min, South Dakota School of Mines and Technology, USA; Klich, Donna V., South Dakota School of Mines and Technology, USA; Welch, Ronald M., South Dakota School of Mines and Technology, USA; Nolf, Scott, NASA Langley Research Center, USA; Connors, Vickie S., NASA Langley Research Center, USA; 1997; 4p; In English
Contract(s)/Grant(s): NAS1-19077; NAGw-3740; NAGw-5195
Report No.(s): NASA/CR-97-207279; NAS 1.26:207279; ISBN 0-7803-3836; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

Fires play a crucial role in several ecosystems. They are routinely used to burn forests in order to accommodate the needs of the expanding population, clear land for agricultural purposes, eliminate weeds and pests, regenerate nutrients in grazing and crop lands and produce energy for cooking and heating purposes. Most of the fires on earth are related to biomass burning in the tropics, although they are not confined to these latitudes. The boreal and tundra regions also experience fires on a yearly basis. The current study examines global fire patterns, Aerosol Optical Thickness (AOT) and carbon monoxide concentrations during April 9-19, 1994. Recently, global Advanced Very High Resolution Radiometer (AVHRR) data at nadir ground spatial resolution of 1 km are made available through the NASA/NOAA Pathfinder project. These data from April 9-19, 1994 are used to map fires over the earth. In summary, our analysis shows that fires from biomass burning appear to be the dominant factor for increased tropospheric CO concentrations as measured by the MAPS. The vertical transport of CO by convective activities, along with horizontal transport due to the prevailing winds, are responsible for the observed spatial distribution of CO.
Derived from text
Remote Sensing; Aerosols; Optical Thickness; Carbon Monoxide; Fires; Ecosystems

19980025564 Naval Postgraduate School, Dept. of Oceanography, Monterey, CA USA
The Assimilation of Satellite Altimeter Data into a Global Eddy Resolving Ocean Model
Tokmakian, Robin T., Naval Postgraduate School, USA; Jun. 1997; 186p; In English
Contract(s)/Grant(s): NSF OCE-94-01910

Report No.(s): AD-A333483; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Two assimilation experiments have been conducted using the Semtner/Chervin Parallel Ocean Climate Model at 1/40 resolution to investigate the dynamical changes which occur with the application of the nudging method to incorporate sea surface height observations (with associated vertical corrections to temperature and salinity) into a global eddy resolving ocean model. The first experiment used a previous model run as the observational field to determine if the assimilation technique, nudging, produced significant changes in the simulated fields to adjust the model to the observed fields when staring at a statistically different initial condition. The twin experiment has shown that the model does respond to the inclusion of the observed fields. Both the surface fields and subsurface fields have been adjusted towards these synthetic observations. The second experiment involved t he use of a combined altimetric sea surface height anomaly field from the ERS-1 and the T/P satellites. The surface height fields are extended vertically by using the Levitus 94 monthly climatological fields. This dissertation has shown that assimilation of surface height data and an associated vertical adjustment to temperature and salinity, modifies both the surface and subsurface fields. Changes can be seen in both prognostic and diagnostic quantities (such as heat content and meridional overturning) while remaining dynamically consistent with the numerics of the model itself. Comparison of the simulated fields with in situ observations of temperature and salinity show that the model has adjusted towards observations not included in the assimilation process.
DTIC
Ocean Models; Vortices; Climate Models; Climatology

19980032334 Wisconsin Univ., Dept. of Geography and Earth Science, La Crosse, WI USA
Satellite AVHRR Temperature Measurements of Pools 4, 7, and 8 of the Upper Mississippi River System
Weinkauf, R. A., Wisconsin Univ., USA; Nov. 1997; 32p; In English
Report No.(s): PB98-116973; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The polar-orbiting Advanced Very High Resolution Radiometer (AVHRR) was evaluated as a means of detecting and measuring surface water temperatures of selected Pools of the Upper Mississippi River System. In summer 1994, Pools 4, 7, and 8 were monitored and, despite heavy cloud cover and fog, useful results were obtained. Satellite mean temperatures were within about 1 Celsius degree of in situ temperature means for nine observation dates for three pools. A split window procedure, combining the radiance of thermal infrared bands 4 and 5, greatly improved the accuracy of temperature estimates.
NTIS
Satellite Sounding; Advanced Very High Resolution Radiometer; Atmospheric Temperature; Mississippi River (US); Infrared Radiation

19980032957 Geological Survey, Water Resources Div., Reston, VA USA
Water Budget for the Island of Molokai, Hawaii
Shade, P. J., Geological Survey, USA; 1997; 32p; In English
Report No.(s): PB98-118276; USGS/WRI-97-4155; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this report is to describe the calculation of a mean monthly water budget for natural conditions on the island of Molokai. The availability of monthly mean rainfall distribution maps for the island was the determining factor for the time period used in the water-budget calculation. Three water budgets are described that together present a range of actual evapotranspiration and ground-water recharge values useful for water-resource management. The spatial distribution of the water-management areas is tabulated, and the ground-water recharge distribution is displayed.
NTIS
Ground Water; Resources Management; Water Management; Water Resources

19980034678 Wisconsin Univ., Dept. of Geography and Earth Science, La Crosse, WI USA
Satellite AVHRR Temperature Measurements of Pools 4, 7, and 8 of the Upper Mississippi River System
Weinkauf, Ronald A., Wisconsin Univ., USA; Nov. 1997; 23p; In English
Report No.(s): AD-A333469; Rept-97-S007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The polar orbiting Advanced Very High Resolution Radiometer (AVHRR) was evaluated as a means of detecting and measuring surface water temperatures of selected Pools of the Upper Mississippi River System in summer 1994 Pools 4, 7, and 8 were monitored and, despite heavy cloud cover and fog, metal results were obtained. Satellite mean temperatures were within about 1 Celsius degree of in situ temperature means for nine observation dates for the three pools. A split window procedure, combining the radiance of thermal infrared bands 4 and 5, greatly improved the accuracy of temperature estimates. Routine temperature monitoring could become a reality when some of the logistical problems encountered in this study are addressed. in particular there is a need to establish improved locational control to the AVHRR pixels more accurately to their surface locations, to provide for

systematic surface water data collection on dates of imaging passes, and to link other variables such as water depth and turbidity to the remote temperature measurements.
DTIC
Satellite Sounding; Remote Sensing; Temperature Measurement; Surface Water; Infrared Radiation; Mississippi River (US); Advanced Very High Resolution Radiometer

19980035141 Geological Survey, Reston, VA USA
Estimates of Water Use in the Western USA
Solley, W. B., Geological Survey, USA; Aug. 1997; 32p; In English
Report No.(s): PB98-113053; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The purpose of this paper is to present consistent estimates of water use by category, State, and water-resources region for the western USA, including Alaska and Hawaii. Estimates of freshwater withdrawn from ground- and surface-water sources, consumptive use, and instream use during 1990 are presented along with trends from 1960 to 1990.
NTIS
Fresh Water; Surface Water; Water Resources

19980036926 Geological Survey, Water Resources Div., Tucson, AZ USA
Geochemical Analyses of Ground-Water Ages, Recharge Rates and Hydraulic Conductivity of the N Aquifer, Black Mesa Area, Arizona
Lopes, T. J., Geological Survey, USA; Hoffmann, J. P., Geological Survey, USA; 1997; 54p; In English
Report No.(s): PB98-111586; USGS/WRI-96-4190; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report describes how geochemical techniques were used to improve the conceptual model of the N-aquifer flow system of the Black Mesa area. The conceptual model of ground-water flow is the basis for a numerical model that represents the N-aquifer flow system and the response of the aquifer to pumping. Data from analyses of major ion, radioactive carbon-14, tritium, oxygen-18, hydrogen-2, carbon-13, and chlorine-36, were used to estimate ground-water ages, delineate flow directions, and estimate recharge rates and aquifer properties. Estimated ground-water flow directions, recharges rates, average linear velocities, and hydraulic conductivities were compared with values estimated in previous studies.
NTIS
Ground Water; Water Flow; Aquifers; Conductivity; Geochemistry

19980036963 Satellite Research Lab., Washington, DC USA
Remote Sensing of Coccolithophore Blooms in the Western South Atlantic Ocean
Brown, C. W., Satellite Research Lab., USA; Podesta, G. P., Miami Univ., USA; Remote Sensing of the Environment; 1997; ISSN 0034-4257; Volume 60, pp. 83-91; In English; Original contains color illustrations; Copyright; Avail: Issuing Activity (Elsevier Science, Inc., 655 Ave. of the Americas, New York, NY 10010, United State), Hardcopy, Microfiche
High-reflectance patches are regularly observed off the southeastern coast of South America during the late austral spring and summer in visible satellite imagery of the Coastal Zone Color Scanner (CZCS). Unfortunately coincident in situ samples for identifying their cause are lacking. to ascertain the likelihood that these patches represent surface blooms of the coccolithophore Emiliania huxleyi, their distribution pattern was mapped and their spectral signature evaluated by classifying CZCS imagery with a supervised multispectral classification scheme that had been developed to detect this phytoplankton species. On the basis of the similarity of these characteristics to those of documented cases we conclude that the high-reflectance patches observed in surface waters of the shelf and beyond are E. huxleyi blooms. The blooms seasonally occupied an area as large as 550000 sq km. Standing stock estimates indicate that the detected blooms produced an average of 1.5 x 4.9x10(exp 5) metric tons of calcite carbon and 4.0 x 10(exp 3) t of dimethyl sulfide sulfur. The bloom's production of these climatically relevant compounds and their alteration of optical properties in the surface layer suggest that the blooms significantly affect the biogeochemistry and ecology of this region.
Author
Algae; Biogeochemistry; Coastal Zone Color Scanner; Carbon Isotopes; Surface Water; Remote Sensing; Phytoplankton

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

19980023506 TRW Space and Electronics Group, Redondo Beach, CA USA
TRMM Solar Array *Final Report*
1996; 216p; In English
Contract(s)/Grant(s): NAS5-32464
Report No.(s): NASA/CR-96-207106; NAS 1.26:207106; TRW-Sales-61058.000; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Basic requirement of 978.59 watts per Panel output @ 58.9 volts B.O.L. was met on an average basis per agreement with NASA. Lower grade Cells were used on the shadowed Panel (Boom shadow) to maximize available power to the Spacecraft. The average output @ 58.9 volts was 991 watts. The outputs of the four t4) Panels ranged from 960 to 1,022 watts. The Panels successfully passed environmental testing at TRW to the contract specification and subsequent testing at NASA which involved output measurements at elevated temperatures. As this type of Array had never previously been built by TRW (aluminum Substrate with 4 cm x 4.4 cm GaAs Cells), the TRMM Program was a development effort combined with a Qual and Flight production effort. The most significant technical problem was Cell cracking during Qual thermal cycling. The cracking problem was determined to be generic within our Solar Array factory in the application of GaAs Cells to our designs. As a result, a TRW funded manufacturing process verification panel (known as the Manufacturing Verification Panel) was built to demonstrate our ability to properly apply GaAs Cells. The original Qual Panel comprised three (3) design variations with respect to Coverglass-to-Cell and Cell-to-Substrate adhesives. The intent was to qualify multiple designs in case one or more failed. When two of the three combinations failed due to excessive Cell breakage during thermal cycling, NASA was reluctant to allow Flight production based on the one remaining good Qual Panel Quadrant. This issue was pivotal for continuing the contract. Facts and recommendations are as follows: (1) The cause of the excessive cracking was never determined. and (2) The areas where the excessive cracking occurred utilized DC93-500 glassing adhesive which was NASA approved, and had been widely used by TRW on a multitude of projects. Derived from text
Solar Arrays; Structural Design; Thermal Cycling Tests; Panels

19980031484 NERAC, Inc., Tolland, CT USA
Flywheel Energy Storage. (Latest citations from the Energy Science and Technology Database)
Jan. 1998; In English; Page count unavailable.
Report No.(s): PB98-851801; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the use of flywheels in energy storage systems and other applications. Discussion topics include flywheels as an energy storage device in wind power generation systems and as an alternative or back-up energy storage system for spacecraft power supplies and electric-powered vehicles. Other applications consider new materials for increased flywheel energy storage density, the role of magnetic bearings in energy storage systems and the use of flywheels in machinery.(Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Flywheels; Energy Storage

45
ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

19980024022 Alabama Univ., Huntsville, AL USA
Plume-in-Grid Treatment of Major Elevated Point-Source Emissions in Models-3
Gillani, N. V., Alabama Univ., USA; Biazar, A., Alabama Univ., USA; Wu, Y. L., Alabama Univ., USA; Godowitch, J., National Oceanic and Atmospheric Administration, USA; Ching, J., National Oceanic and Atmospheric Administration, USA; 1997; 12p; In English
Report No.(s): PB98-116452; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The plume-in-grid modeling approach for treating the subgrid scale dispersion, transport, and chemistry of pollutants contained in plumes released from major point source stacks is described. A plume dynamics model provides the plume rise height, plume position, and the horizontal and vertical plume dispersions in the subgrid scale phase when the pollutants are to be simulated by the Lagrangian reactive plume module. A coupling exists between the models as the grid concentrations provide boundary conditions for entrainment to the subgrid plume sections, and a feedback occurs when the plume size and chemical criteria indicate a plume's pollutants are to be transferred to the grid system for further simulation. The methods for simulating the plume processes are also presented and the input/output data involved with these two components of the Models 3 plume-in-grid approach are discussed.
NTIS
Point Sources; Plumes; Air Pollution; Entrainment; Boundary Conditions

19980024023 National Oceanic and Atmospheric Administration, Atmospheric Sciences Modeling Div., Research Triangle Park, NC USA
Models-3: A Unifying Framework for Environmental Modeling and Assessment
Novak, J., National Oceanic and Atmospheric Administration, USA; Young, J., National Oceanic and Atmospheric Administration, USA; Byun, D., National Oceanic and Atmospheric Administration, USA; Coats, C., Microelectronics Center of North Carolina, USA; Walter, G., National Oceanic and Atmospheric Administration, USA; 1997; 12p; In English
Report No.(s): PB98-116460; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Models-3 is a flexible software system designed to simplify the development and use of environmental assessment and decision support tools for a wide range of applications from regulatory and policy analysis to understanding the interactions of atmospheric chemistry and physics. The Models-3 framework provides an interface between the user and operational models, between the scientist and developing models, and between ever changing hardware and software platforms. The authors discuss key capabilities and design features of the Models-3 framework that provide more flexibility in data handling, modeling, visualization, and analysis.
NTIS
Environment Models; Air Pollution; Mathematical Models; Atmospheric Chemistry; Atmospheric Physics

19980024024 National Oceanic and Atmospheric Administration, Atmospheric Sciences Modeling Div., Research Triangle Park, NC USA
Aggregation Using Cluster Analyses for Models-3 CMAQ Applications
LeDuc, S., National Oceanic and Atmospheric Administration, USA; Eder, B., National Oceanic and Atmospheric Administration, USA; Dennis, R., National Oceanic and Atmospheric Administration, USA; Cohn, R., Analytical Sciences Corp., USA; 1997; 10p; In English
Report No.(s): PB98-116478; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Models-3, a framework for air quality modeling, is scheduled for public release in June 1998. The framework will support statistical analysis and presently uses four SAS(R) modules (base, graph, AF and FSP) in the emissions processing. Statistics such as mean median, and percentiles can be plotted from Models-3 with IBM's Visualization Data Explorer. The statistical tool described in this paper is for policy planning for air quality issues related to annual or multi-year measures, rather than the most extreme events.
NTIS
Air Pollution; Cluster Analysis; Statistical Analysis; Air Quality; Environment Models

19980024027 Versar, Inc., Columbia, MD USA
Atmospheric Deposition in Maryland: Assessment of Status, Trends, and Environmental Effects
Southerland, M., Versar, Inc., USA; Rzemien, E., Versar, Inc., USA; Roth, N., Versar, Inc., USA; Corio, L., Versar, Inc., USA; Lynch, J., Lynch (James), USA; Oct. 1997; 128p; In English
Report No.(s): PB98-119274; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
This report is the first in a series that will document and reevaluate the trends in the atmospheric deposition problem, especially in regard to implementation of the Clean Air Act Amendments of 1990. This report is organized in four chapters. Each chapter addresses the three issues of acidic, nutrient, and toxic atmospheric deposition in a parallel manner. Chapter 1 provides a brief description of the atmospheric deposition process and its effects on Maryland's aquatic and terrestrial resources. Chapter 2 identifies the sources of atmospheric pollutants affecting Maryland and describes the relative contributions of different industries and geographic regions. Chapter 3 presents the status and trends in atmospheric deposition in Maryland based on a range of studies including analysis of original, long-term data sets from the Chesapeake Bay region. Chapter 4 discusses the regulatory controls

and strategies for monitoring, modeling, and mitigating adverse effects on resources that will likely determine the extent of the atmospheric deposition problem in the future.
NTIS
Environmental Monitoring; Surface Water; Air Pollution; Environment Effects; Toxicity; Air Quality

19980024228 NASA Langley Research Center, Hampton, VA USA
Origin of Ozone NO(x) in the Tropical Troposphere: A Photochemical Analysis of Aircraft Observations Over the South Atlantic Basin
Jacob, D. J., Harvard Univ., USA; Heikes, B. G., Rhode Island Univ., USA; Fan, S.-M., Harvard Univ., USA; Logan, J. A., Harvard Univ., USA; Mauzerall, D. L., Harvard Univ., USA; Bradshaw, J. D., Georgia Inst. of Tech., USA; Singh, H. B., NASA Ames Research Center, USA; Gregory, G. L., NASA Langley Research Center, USA; Talbot, R. W., New Hampshire Univ., USA; Blake, D. R., California Univ., USA; Sachse, G. W., NASA Langley Research Center, USA; Journal of Geophysical Research; Oct. 30, 1996; ISSN 0148-0227; Volume 101, No. D19, pp. 24,235-24,250; In English
Contract(s)/Grant(s): NAG1-1421; NSF ATM-93-20778
Report No.(s): NASA/CR-96-207268; NAS 1.26:207268; Paper-96JD00336; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The photochemistry of the troposphere over the South Atlantic basin is examined by modeling of aircraft observations up to 12-km altitude taken during the TRACE A expedition in September-October 1992. A close balance is found in the 0 to 12-km column between photochemical production and loss of O3, with net production at high altitudes compensating for weak net loss at low altitudes. This balance implies that O3 concentrations in the 0-12 km column can be explained solely by in situ photochemistry; influx from the stratosphere is negligible. Simulation of H2O2, CH3OOH, and CH2O concentrations measured aboard the aircraft lends confidence in the computations of O3 production and loss rates, although there appears to be a major gap in current understanding of CH2O chemistry in the marine boundary layer. The primary sources of NO(x) over the South Atlantic Basin appear to be continental (biomass burning, lightning, soils). There is evidence that NO(x) throughout the 0 to 12-km column is recycled from its oxidation products rather than directly transported from its primary sources. There is also evidence for rapid conversion of HNO3 to NO(x) in the upper troposphere by a mechanism not included in current models. A general representation of the O3 budget in the tropical troposphere is proposed that couples the large scale Walker circulation and in situ photochemistry. Deep convection in the rising branches of the Walker circulation injects NO(x) from combustion, soils, and lightning to the upper troposphere, leading to O3 production; eventually, the air subsides and net O3 loss takes place in the lower troposphere, closing the O3 cycle. This scheme implies a great sensitivity of the oxidizing power of the atmosphere to NO(x) emissions in the tropics.
Author
Nitrogen Oxides; Ozone; Tropical Regions; Troposphere; Photochemical Reactions; Marine Meteorology; Oxidation; Air Water Interactions

19980024307 Environmental Protection Agency, Air Pollution Prevention and Control Div., Research Triangle Park, NC USA
Metal Partitioning in Combustion Processes
Linak, W. P., Environmental Protection Agency, USA; 1997; 16p; In English; 4th; International Conference on Technologies and Combustion for a Clean Environment, 7-10 Jul. 1997, Lisbon, Portugal
Report No.(s): PB98-116437; EPA/600/A-97/085; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper summarizes ongoing research efforts at the National Risk Management Research Laboratory of the U.S. Environmental Protection Agency examining (high temperature) metal behavior within combustion environments. The partitioning of non-volatile (Cr and Ni), semi-volatile (Cd and Pb), and volatile (Hg) metals in combustion systems was investigated theoretically and experimentally. Theoretical predictions were based on chemical equilibrium and suggested that such calculations can be useful in predicting relative volatility and speciation trends, and to direct experimental efforts. Equilibrium studies employing a 59 kW laboratory scale combustor examined the behavior (volatility, particle size, and speciation) of metal vapors and particles produced by aqueous metal solutions sprayed through a swirling natural gas diffusion flame. These experiments were designed to study metal transformation mechanisms in a relatively simple combustion environment without the complex effects of additional species. Further experiments examined the potential use of common inorganic sorbents (kaolinite, bauxite, and hydrated lime) to adsorb metal vapor, offering a potential means of metal emissions control.
NTIS
Combustion Physics; Metals; Environment Protection; Metal Combustion; Volatility; Gaseous Diffusion; Chemical Equilibrium

19980025482 NASA Langley Research Center, Hampton, VA USA

Chemical Characteristics of Continental Outflow from Asia to the Troposphere over the Western Pacific Ocean during September - October 1991: Results from PEM-West A

Talbot, R. W., New Hampshire Univ., USA; Dibb, J. E., New Hampshire Univ., USA; Klemm, K. I., New Hampshire Univ., USA; Bradshaw, J. D., Georgia Inst. of Tech., USA; Sandholm, S. T., Georgia Inst. of Tech., USA; Blake, D. R., California Univ., USA; Sachse, G. W., NASA Langley Research Center, USA; Collins, J., NASA Langley Research Center, USA; Heikes, B. G., Rhode Island Univ., USA; Gregory, G. L., NASA Langley Research Center, USA; Anderson, B. E., NASA Langley Research Center, USA; Singh, H. B., NASA Ames Research Center, USA; Thornton, D. C., Drexel Univ., USA; Merrill J. T., Rhode Island Univ., USA; Journal of Geophysical Research; Jan. 20, 1996; ISSN 0148-0227; Volume 101, No. D1, pp. 1713-1725; In English

Contract(s)/Grant(s): NAG1-1233

Report No.(s): NASA/CR-96-207466; NAS 1.26:207466; Paper-95JD01044; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

An important objective of the Pacific Exploratory Mission-West A (PEM-West A) was the chemical characterization of the outflow of tropospheric trace gases and aerosol particles from the Asian continent over the western Pacific Ocean. This paper summarizes the chemistry of this outflow during the period September - October 1991. The vertical distributions of CO, C2H6, and NO(x), showed regions of outflow at altitudes below 2 km and from 8 to 12 km. Mixing ratios of CO were approx. equals 130 parts per billion by volume (ppbv), approx. equals 1OOO parts per trillion by volume (pptv) for C2H6, and approx. equals 100 pptv for NO(x) in both of these regions. Direct outflow of Asian industrial materials was clearly evident at altitudes below 2 km, where halocarbon tracer compounds such as CH3CCl3 and C2Cl4 were enhanced about threefold compared to aged Pacific air. The source attribution of species outflowing from Asia to the Pacific at 8-12 km altitude was not straightforward. Above 10 km altitude there were substantial enhancements of NO(y), O3, CO, CH4, SO2, C2H6, C3H8, C2H2, and aerosol Pb-210 but not halocarbon industrial tracers. These air masses were rich in nitrogen relative to sulfur and contained ratios of C2H2/CO and C3H8/C2H6 (approx. equals l.5 and 0.1 respectively) indicative of several- day-old combustion emissions. It is unclear if these emissions were of Asian origin, or if they were rapidly transported to this region from Europe by the high wind speeds in this tropospheric region (60 - 70 m/s). The significant cyclonic activity over Asia at this time could have transported to the upper troposphere emissions from biomass burning in Southeast Asia or emissions from the extensive use of various biomass materials for cooking and space heating. Apparently, the emissions in the upper troposphere were brought there by wet convective systems since water-soluble gases and aerosols were depleted in these air masses. Near 9 km altitude there was a distinct regional outflow that appeared to be heavily influenced by biogenic processes on the Asian continent, especially from the southeastern area. These air masses contained CH4 in excess of 1800 ppbv, while CO2 and OCS were significantly depleted (349 - 352 ppmv and 450 - 500 pptv, respectively). This signature seemingly reflected CH4 emissions from wetlands and rice paddies with coincident biospheric uptake of tropospheric CO2 and OCS.

Author

Atmospheric Composition; Combustion Products; Chemical Composition; Troposphere; Radioactive Isotopes

19980032955 Environmental Protection Agency, Chesapeake Bay Program, Annapolis, MD USA

Chesapeake Bay Nutrient Reduction Progress and Future Directions: Nutrient Reduction Reevaluation Summary Report

Oct. 1997; 50p; In English

Report No.(s): PB98-117013; CBP/TRS-189/97; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As part of the effort to set and meet challenging goals, the Bay Program periodically measures--or reevaluates--the progress that has been made to date, and measures how close we are to attaining our goals. The following report is a summary of the 1997 Nutrient Reduction Reevaluation findings. The numbers and findings are preliminary. A more detailed final report will be available in early 1998.

NTIS

Nutrients; Water Management; Agriculture; Fisheries

19980032956 Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC USA

Locating and Estimating Air Emissions from Sources of Mercury and Mercury Compounds

Dec. 1997; 220p; In English

Report No.(s): PB98-117054; EPA/454/R-97/012; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This document deals specifically with mercury and mercury compounds. Its intended audience includes Federal, State and local air pollution personnel and others interested in locating potential emitters of mercury and mercury compounds and in making gross estimates of air emissions therefrom. This document presents information on (1) the types of sources that may emit mercury

and mercury compounds, (2) process variations and release points for these sources, and (3) available emissions information indicating the potential for mercury and mercury compound releases into the air from each operation.
NTIS
Air Pollution; Mercury Compounds; Position (Location)

19980032958 Department of Energy, Office of Integrated Analysis and Forecasting, Washington, DC USA
Mitigating Greenhouse Gas Emissions: Voluntary Reporting
Oct. 1997; 134p; In English
Report No.(s): PB98-118292; DOE/EIA-0608(96); No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
This second annual report of the Voluntary Reporting Program, describes information provided by the participating organizations on their aggregate emissions and emissions reductions, as well as their emissions reductions, reductions, or avoidance projects, through 1995. This information has been compiled into a database that includes reports from 142 organizations and descriptions of 967 projects that either reduced greenhouse gas emissions or sequestered carbon. Fifty-one reporters also provided estimates of emissions, and emissions reductions achieved, for their entire organizations.
NTIS
Exhaust Emission; Exhaust Gases; Greenhouse Effect; Air Quality; Air Pollution

19980035140 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
A Floristic Inventory and Spatial Database for Fort Wainwright, Interior Alaska
Racine, Charles, Army Cold Regions Research and Engineering Lab., USA; Lichvar, Robert, Army Cold Regions Research and Engineering Lab., USA; Murray, Barbara, Army Cold Regions Research and Engineering Lab., USA; Tande, Gerald, Army Cold Regions Research and Engineering Lab., USA; Lipkin, Robert, Army Cold Regions Research and Engineering Lab., USA; Oct. 1997; 75p; In English
Report No.(s): AD-A333255; CRREL-SR-97-23; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
An inventory of the vascular and ground-inhabiting cryptogam flora of Fort Wainwright, in interior Alaska, was conducted during the summer of 1995 to support land management needs related to the impact of training. Primary plant collecting, identification and verification were conducted by the Alaska Natural Heritage Program and the University of Alaska Museum. The work was supervised and the data compiled into a geographic information system by the USA Cold Regions Research and Engineering Laboratory and the USA Waterways Experiment Station. Fort Wainwright covers 370,450 hectares (915,000 acres); it was divided into five areas: 1) the valleys of a cantonment area of base facilities, 2) the slopes and alp ine areas of the Yukon-Tanana Uplands, 3) Tanana Flats and associated wetlands, 4) the upland buttes and Blair Lakes area in Tanana Flats, and 5) the floodplains of the Tanana and Chena Rivers. Over 100 sites were visited, with habitats ranging from very dry south-facing slopes to forest, floodplains, wetlands, and alpine tundra. Vascular collections represented 491 species (including subspecies and varieties), included about 26% of Alaska's vascular flora, and are considered to be relatively complete. The cryptogam collections included 219 species, representing 92 mosses, 117 lichens, and lO liverworts. The flora is characteristic of the circumpolarboreal forest and wetlands of both North America and Eurasia, but it also contains alpine and dry-grassland and steppe species.
DTIC
Bryophytes; Buttes; Cardiovascular System; Collection; Data Bases; Geographic Information Systems; Grasslands; Inventories; Low Temperature Environments; Plants (Botany)

19980035146 North Carolina State Univ., Dept. of Civil Engineering, Raleigh, NC USA
Enhanced Bioremediation of BTEX Using Immobilized Nutrients: Field Demonstration and Monitoring
Borden, R. C., North Carolina State Univ., USA; Goin, R. T., North Carolina State Univ., USA; Kao, C. M., North Carolina State Univ., USA; Rosal, C. G., North Carolina State Univ., USA; Dec. 1996; 68p; In English
Report No.(s): PB97-186290; EPA/600/R-96/145; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A permeable barrier system was developed for controlling the migration of dissolved contaminant plumes in ground water. The barrier system consisted of a line of closely spaced wells installed perpendicular to the contaminant plume. Each well contained concrete briquets that released oxygen and nitrate at a controlled rate, enhancing the aerobic biodegradation of dissolved hydrocarbons in the downgradient aquifer. A full scale permeable barrier system was constructed at a gasoline-spill site near Leland, NC. Initially, increased dissolved oxygen and decreased benzene, toluene, ethylbenzene, and xylene isomer (BTEX) concentrations in the downgradient aquifer indicated that oxygen released from the remediation wells was enhancing biodegradation.

Field tracer tests and soil analyses performed at the conclusion of the project indicated that the aquifer in the vicinity of the remediation wells was being clogged by precipitation from iron minerals.
NTIS
Aerobes; Aquifers; Benzene; Biodegradation; Concretes; Gasoline

19980036259 National Center for Atmospheric Research, Environmental and Societal Impacts Group, Boulder, CO USA
Climate Variability, Climate Change, and Western Water ***Final Report***
Miller, K. A., National Center for Atmospheric Research, USA; Sep. 1997; 84p; In English
Report No.(s): PB98-113137; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The first section of this report describes the present distribution of water resource availability across the West and the variability of streamflows on multiple time scales. This description of contemporary climate examines some of the evidence for links between the ENSO (El Nino) phenomenon and anomalously wet or dry periods in some parts of the West. The next section describes the current state of scientific understanding regarding the effects of fossil fuel burning and other human activities on the global climate system and on broad-scale regional patterns of climate change. The report then focuses on efforts to develop scenarios of the possible impacts of climate change on western streamflows and lays out the results for a sample of such studies. The relevance of climate variability and climate change for western water policy is then addressed.
NTIS
El Nino; Climate Change; Climatology; Southern Oscillation; Greenhouse Effect

19980036334 Army Construction Engineering Research Lab., Champaign, IL USA
Characterization of Nitrocellulose Fines in Wastewater and Development of Pollution Prevention Strategy
Kim, Byung J., Army Construction Engineering Research Lab., USA; Park, James K., Army Construction Engineering Research Lab., USA; Clapp, Lee W., Army Construction Engineering Research Lab., USA; Sep. 1997; 78p; In English
Contract(s)/Grant(s): DA Proj. 4A1-62720-D-048
Report No.(s): AD-A335562; USACERL-TR-97/138; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Various NitroCellulose (NC) manufacturing processes at Radford Army Ammunition Plant (PAAP), VA produce wastewater containing NC particles in millimeter, micron, and sub-micron range, known as 'fines.' Available NC fines characterization data vary widely and often conflict with each other because they are based on 'grab samples,' in which the wastewater quality can fluctuate widely. A critical need exists to collect and analyze NC fines characteristics at each sequence for each unit operation over an extended period of time. The U.S. Army Construction Engineering Research Laboratories (USACERL) has been evaluating technical alternatives and developing technologies to separate, recycle, and treat NC fines from RAAP manufacturing wastewater. This study characterized the physical properties of NC fines and developed a strategy to prevent pollution with NC fines. Characterized parameters included Particle Size Distribution (PSD), Total Suspended Solids (TSS), turbidity, zeta potential (particle surface charge), conductivity, and pH. Recommended pollution prevention methods included separation and recycle of NC fines at each process, more effective settling, and in-process modifications.
DTIC
Waste Water; Cellulose Nitrate; Pollution Control; Water Quality; Revisions

19980036945 Environmental Protection Agency, Chemical Industry Branch, Washington, DC USA
Chemical Industry National Environmental Baseline Report, 1990-1994 ***Final Report***
DeRieux, W., Environmental Protection Agency, USA; Sasnett, S., Environmental Protection Agency, USA; Mason, J., Environmental Protection Agency, USA; Oct. 1997; 158p; In English
Contract(s)/Grant(s): EPA-305-R-96-002
Report No.(s): PB98-110406; EPA/305/R-96/002; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The U.S. Environmental Protection Agency has developed this report to present an environmental compliance overview for the U.S. chemical industry sector (Standard Industrial Classification (SIC) Codes in the 2800 series). Through an analysis of data related to economics, demographics, the Toxics Release Inventory (TRI), compliance trends for the industry, and focus compliance efforts. Information provided in the baseline report may also provide catalyst for the development of similar profiles on a state or regional basis and for development of innovative national, state, or regional compliance initiatives. by presenting a national overview for this sector for the first half of the decade, the report provides information that begins to establish relative trends among the various four-digit SIC codes within the sector. Through a comparison of environmental performance, risk-based criteria, and other factors, the data in this report may be useful to select certain industrial sub-sectors for special assistance and

outreach efforts, or for increased compliance monitoring or enforcement, or to improve compliance through development of custom compliance programs that meet the needs of specific sub-sectors.
NTIS
Catalysts; Chemical Engineering; Environment Protection; Trends

19980036952 Research Triangle Inst., Research Triangle Park, NC USA
Developing and Using Production-Adjusted Measurements of Pollution Prevention
Malkin, M., Research Triangle Inst., USA; Baskir, J., Research Triangle Inst., USA; Greiner, T. J., Greiner Environmental, USA; Sep. 1997; 90p; In English
Report No.(s): PB97-199707; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report describes research examining production-adjusted measures of pollution prevention (P2). Under this research, a methodology was developed for applying statistical and graphical tools to assess the accuracy of the factors (called units-of-product) used to adjust P2 measures. Graphical analysis is used to qualitatively assess a unit-of-product, while regression analysis is used to quantitatively evaluate a unit-of-product. These statistical and graphical tools were applied to data from five case study facilities in different industrial sectors. The units-of-product currently being used by the facilities were tested for correlation with key waste of chemical use streams. It was found that the methodology for applying statistical and graphical tools was usable with data routinely collected at the five case study facilities. It was further found that the factors being used by four of the facilities correlate with chemical usage for key input streams.
NTIS
Pollution Control; Production Management; Industrial Management; Waste Management; Industrial Wastes

19980036965 Brown Univ., Providence, RI USA
Common Questions About Climate Change
Hamburg, S. P., Brown Univ., USA; Harris, N., World Meteorological Organization, Switzerland; Jaeger, J., International Inst. for Applied Systems Analysis, Austria; Karl, T. R., National Oceanic and Atmospheric Administration, USA; McFarland, M., United Nations Environment Programme, USA; 1997; 32p; In English
Report No.(s): PB98-112147; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document answers some of the most commonly asked questions about climate change, including whether the Earth has warmed, which human activities are contributing to climate change, what further climatic changes are expected to occur, and what effects these changes may have on humans and the environment.
NTIS
Climate Change; Global Warming; Greenhouse Effect

19980036991 Concurrent Technologies Corp., Johnstown, PA USA
Powder Coat Applications ***Final Report, Dec. 1995 - Dec. 1996***
Docherty, M. J., Concurrent Technologies Corp., USA; Mulkey, F. J., Concurrent Technologies Corp., USA; Sep. 1997; 84p; In English
Contract(s)/Grant(s): DAAA21-93-C-0046
Report No.(s): PB98-108624; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The report discusses an investigation of critical factors that affect the use of powder coatings on the environment, cost, quality, and production. The investigation involved a small business representative working with the National Defense Center for Environmental Excellence (NDCEE), operated by Concurrent Technologies Corporation (CTC), through the EPA's Environmental Technology Initiative. The investigation demonstrated that powder has the potential to provide unique and valuable benefits when considering each of these areas.
NTIS
Powder (Particles); Environmental Quality

46
GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see 93 Space Radiation.

19980024670 Finnish Geodetic Inst., Kirkkonummi, Finland
The 1979-1996 Gravity Survey and Results of the Gravity Survey of Finland 1945-1996, No. 125
Kaariainen, Jussi, Finnish Geodetic Inst., Finland; Makinen, Jaakko, Finnish Geodetic Inst., Finland; 1997; ISSN 0085-6932; 30p; In English; ISBN 951-711-213-0; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The gravimetric survey of Finland up to 1978 has been documented by HONKASALO (1962) and KIVINIEMI (1980). Here we report on the 1979-1996 survey and publish a Bouguer anomaly map compiled on the basis of all measurements performed 1945-1996. Since 1978 a total of 10779 new points were measured, of which the majority, 8903 points, densify the national 5x5 sq km network in mainland Finland. The rest, 1876 points, were measured in cooperation with Swedish institutes on sea-ice in the Gulf of Bothnia and Aland Sea in 5x5 sq km and 5x10 sq km grids. In 1996 the remaining unsurveyed areas in the Bothnian Sea were measured by shipboard gravimetry in a joint Nordic venture. Results of sea-ice and shipboard measurements in international waters and Swedish territorial waters are included in the anomaly map. We use throughout the cgs-units milligal (1 mgal = 10(exp -5)/sq ms) and microgal (1 microgal = 10(exp -8)/sq ms).
Derived from text
Surveys; Gravimetry; Gulfs; Sea Ice; Gravitation

19980025545 Orion International Technologies, Albuquerque, NM USA
Characterization of UV Emissions Resulting from Electronic Energy Transfer in Atmospheric Molecules *Final Report, Nov. 1992 - Mar. 1997*
Dentamaro, Anthony V., Orion International Technologies, USA; Thomas, Joseph M., Orion International Technologies, USA; Nov. 1997; 61p; In English
Contract(s)/Grant(s): F19628-92-C-0161; AF Proj. 2303
Report No.(s): AD-A333985; TR-97-003; PL-TR-97-2108; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

State-specific experiments were performed which studied collision induced electronic transitions (CIET) in a diatomic molecule. These optical-optical double resonance (OODR) experiments employed a resonance enhanced multiphoton ionization (REMPI) technique for purposes of detection. A strong dependence on Franck-Condon factor (FCF) and small energy gap, as well as a propensity for conservation of rotational angular momentum have become trademarks of our CIET experiments. Present theoretical models of these processes are not able to fully reproduce the observed results, thus making it important to perform experiments which consider a wide range of energy gaps and FCF. The volume of our data has led to the development of an empirical branching ratio model which appears to be quite accurate and useful in predicting deactivation rate constants for CIET in various diatomic molecules. These results have been incorporated into a model of atmospheric Lyman-Birge-Hopfield (LBH) emissions.
DTIC
Atmospheric Chemistry; Atmospheric Models; Diatomic Molecules; Energy Transfer; Franck-Condon Principle; Photoionization; Reaction Kinetics

19980028458 NASA Ames Research Center, Moffett Field, CA USA
Extraterrestrial Helium Trapped in Fullerenes in the Sudbury Impact Structure
Becker, Luann, NASA Ames Research Center, USA; Poreda, Robert J., Rochester Univ., USA; Bada, Jeffrey L., Scripps Institution of Oceanography, USA; Science; Apr. 12, 1996; Volume 272, pp. 249-252; In English
Contract(s)/Grant(s): NAGw-2881
Report No.(s): NASA/CR-96-207585; NAS 1.26:207585; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

Fullerenes (C60 and C70) in the Sudbury impact structure contain trapped helium with a He-3/He-4 ratio of 5.5 x 10(exp -4) to 5.9 x 10(exp -4). The He-3/He-4 ratio exceeds the accepted solar wind value by 20 to 30 percent and is higher by an order of magnitude than the maximum reported mantle value. Terrestrial nuclear reactions or cosmic-ray bombardment are not sufficient to generate such a high ratio. The He-3/He-4 ratios in the Sudbury fullerenes are similar to those found in meteorites and in some interplanetary dust particles. The implication is that the helium within the C60 molecules at Sudbury is of extraterrestrial origin.
Author
Helium; Fullerenes; Nuclear Reactions; Helium Isotopes; Cosmic Rays; Interplanetary Dust

19980029715 University of Central Washington, Dept. of Geology, Ellensburg, WA USA

Systematic Underestimation of Earthquake Magnitudes from Large Intracontinental Reverse Faults: Historical Ruptures Break Across Segment Boundaries

Rubin, C. M., University of Central Washington, USA; Geology; Nov. 01, 1996; Volume 24, No. 11, pp. 989-992; In English

Contract(s)/Grant(s): NAGw-3691; NSF EAR-89-20136

Report No.(s): NASA/CR-96-207708; NAS 1.26:207708; SCEC-Contrib-338; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Because most large-magnitude earthquakes along reverse faults have such irregular and complicated rupture patterns, reverse-fault segments defined on the basis of geometry alone may not be very useful for estimating sizes of future seismic sources. Most modern large ruptures of historical earthquakes generated by intracontinental reverse faults have involved geometrically complex rupture patterns. Ruptures across surficial discontinuities and complexities such as stepovers and cross-faults are common. Specifically, segment boundaries defined on the basis of discontinuities in surficial fault traces, pronounced changes in the geomorphology along strike, or the intersection of active faults commonly have not proven to be major impediments to rupture. Assuming that the seismic rupture will initiate and terminate at adjacent major geometric irregularities will commonly lead to underestimation of magnitudes of future large earthquakes.

Author

Earthquakes; Geological Faults; Geomorphology; Estimating; Discontinuity

19980034827 Phillips Lab., Directorate of Geophysics, Hanscom AFB, MA USA

Models of the Near-Space Geophysical Environment ***Topical Report***

Robinson, Edward C., Phillips Lab., USA; Bass, James N., Radex, Inc., USA; Bhavnani, Krishin H., Radex, Inc., USA; Hein, Carl A., Radex, Inc., USA; McNeil, William J., Radex, Inc., USA; Jun. 30, 1997; 55p; In English

Contract(s)/Grant(s): F19628-93-0023; AF Proj. 1010

Report No.(s): AD-A333333; PL-TR-97-2089; ERP-1207; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report provides descriptions of environmental models used in the near-earth environment for the analysis of earth-based and satellite data. Included are models of the ionosphere, atmosphere, radiation belt, Earth's magnetic field, and orbital prediction. These models are used at PL for a variety of purposes, in particular, for the analysis of experimental data obtained from ground based instruments and, where applicable, instruments carried on balloons, rockets, and satellites. Some of the models described here were developed at PL based upon such measurements. For many of the models described here, computer output is provided together with estimates of computer (CPU) times required to generate such output. The computer codes (subroutines) for these models are frequently incorporated into programs used for data analysis and reduction, as well as mission planning. It is hoped that this report will serve as a useful reference for planning such future missions.

DTIC

Aerospace Environments; Artificial Satellites; Environment Models; Geomagnetism; Geophysics; Mission Planning; Radiation Belts

19980035144 Dartmouth Coll., Dept. of Physics and Astronomy, Hanover, NH USA

Self-Consistent Effects of Magnetospheric Hydromagnetic Waves on Ring Current Ions ***Final Report, 1 Jan. 1993 - 31 Dec. 1996***

Hudson, Mary K., Dartmouth Coll., USA; May 08, 1997; 10p; In English

Contract(s)/Grant(s): F49620-93-I-0101

Report No.(s): AD-A335827; AFRL-SR-BL-TR-98-0109; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of this research in magnetospheric physics was to advance understanding of the interaction of ring current ions with magnetospheric hydromagnetic waves. The goal was to examine the excitation of westward propagating hydromagnetic waves by drift-bounce resonance with 100 to 200 MeV ring current protons using a 3D MHD code in dipole geometry which incorporates the ring current ions via a gyrokinetic treatment. This was the first self-consistent study of this phenomenon. An extension of the ring current particle trajectory tracing code, developed with Air Force support, was used to study the rapid formation of new electron and proton radiation belts. The model has been highly successful at explaining the observed acceleration of electrons and protons by tens of MeV in less than a drift period.

DTIC

Magnetohydrodynamic Waves; Ring Currents; Ions

19980036336 Air Force Inst. of Tech., Graduate School of Engineering Physics, Wright-Patterson AFB, OH USA

Displacement of the Earth's Bow Shock and Magnetopause Due to an Impinging Interplanetary Shock Wave

Olson, William A., Air Force Inst. of Tech., USA; Dec. 1997; 93p; In English

Report No.(s): AD-A335576; AFIT/GAP/ENP/97D-08; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Interplanetary Shock Waves (ISWs) propagating through the solar wind can collide with the earth's bow shock, resulting in a series of new shocks, contact discontinuities, and rarefaction waves which interact to effectively move the bow shock and magnetopause toward the earth. A one dimensional MacCormack predictor corrector algorithm with Flux Corrected Transport (FCT) was developed to model the ISW bow shock and magnetopause interactions, and to numerically predict their propagation speeds after collision. Analytic relationships for the Mach numbers and propagation speeds of the generated shock waves and contact discontinuities were used to validate the model and to compare numerical results. In both the gas dynamic and MagnetoHydroDynamic (MHD) fluid approximations the model predicted propagation speeds of the moving bow shock to within five percent of analytical solutions. Propagation speeds of the moving magnetopause were also determined to within five percent.

DTIC

Shock Waves; Displacement; Shock Wave Interaction; Bow Waves

19980036640 Woods Hole Oceanographic Inst., MA USA

Laboratory Measurements of the Water/Air Flux of Dimethylsulfide Using a Wind/Wave Tank ***Final Report, 1 May 1995 - 31 Dec. 1996***

Dacey, John W., Woods Hole Oceanographic Inst., USA; Frew, Nelson M., Woods Hole Oceanographic Inst., USA; Jan. 1998; 8p; In English

Contract(s)/Grant(s): N00014-95-I-0817

Report No.(s): AD-A335352; WHOI-PROPOSAL-9577; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The flux of dimethylsulfide (DMS) from the surface water of the ocean to the atmosphere is an important biogeochemical problem, since DMS contributes to optical haze and potentially impacts global climate by influencing earth's albedo. DMS is also an interesting gas in terms of gas exchange. The rate of flux of a gas across the air-water interface is regulated by its diffusivity and by the hydrodynamics of the two sublayers on either side of the interface. The fluxes of permanent gases are typically controlled by the rate of transport to the surface of the water film, and hence are called "water-side" controlled. The hydrodynamics of the aqueous sublayer are not as important in controlling fluxes of highly soluble gases, which are controlled by transport through the atmospheric sublayer above the interface. Our project indicates that the flux of DMS is transitional; at low wind speeds and in warm water, its flux is water-side controlled; at higher wind speeds in cold water, DMS flux has a significant component of air-side control. Under these latter conditions, flux models as they are usually applied may overestimate flux by 60%. We developed a coefficient, gamma(sub a) to characterize the contribution of air-side control to flux.

DTIC

Wind Velocity; Air Water Interactions; Gas Exchange; Flux (Rate)

19980036986 Huntington Consulting, Eagle River, AR USA

Report of the Sixth Working Group Meeting of the Program for the Conservation of Arctic Flora and Fauna (CAFF)

Huntington, H. P., Huntington Consulting, USA; Oct. 1997; 260p; In English

Report No.(s): PB98-114168; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This report describes the program for the Conservation of Arctic Flora and Fauna (CAFF) under the Arctic Environmental Protection Strategy; outlines the significant discussions held during the sixth meeting of the CAFF Working Group (CAFF VI); discusses organization and operation of the U.S. CAFF Delegation; and concludes with observations and suggestions to the Marine Mammal Commission for strengthening the role of the USA and of the Commission with regard to CAFF and the Arctic Council. Documents from the meeting or otherwise related to CAFF and its work are appended to the report.

NTIS

Environment Protection; Plants (Botany); Arctic Regions

47
METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

19980023505 Naval Postgraduate School, Dept. of Oceanography, Monterey, CA USA
Wind-Forced Modeling Studies of Currents, Meanders, Eddies, and Filaments of the Canary Current System
Buch, Eric J., Naval Postgraduate School, USA; Jun. 1997; 123p; In English
Contract(s)/Grant(s): NSF NPS-96-00004
Report No.(s): AD-A333992; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A high-resolution, multi-level, primitive equation ocean model is used to examine the response of an eastern boundary oceanic regime to both wind forcing and irregular coastline geometry. The focus of this study is the coastal region from 300 N to 42.50 N, a portion of the Canary Current System (CCS). to study the generation, evolution, and sustainment of the currents, meanders, eddies and filaments of the CCS, the model is forced from rest using seasonal climatological winds. to investigate - the role of irregular coastline geometry, the first experiment uses climatological wind forcing along an idealized 'straightened' coastline, while the second experiment uses the same wind forcing along an irregular coastline. In both cases a surface current, undercurrent, meanders, eddies, and filaments are generated. The results obtained while using the irregular, rather than the idealized coastline, however, show preferred eddy generation locations as well as enhanced growth of meanders, eddies, and filaments. The features produced by the model are consistent with available observations of the CCS. The model results support the hypothesis that both wind forcing and irregular coastline geometry are important mechanisms in the generation of many of the observed features of the CCS.
DTIC
Climatology; Meanders; Ocean Models; Vortices; Eddy Currents; Annual Variations

19980024227 Colorado State Univ., Cooperative Inst. for Research, Fort Collins, CO USA
Using WSR-88D Radar Data and 30-second Interval GOES Satellite Imagery to Examine Apparent Thunderstorm-top Rotation Observed on May 31,1996
Motta, Brian, Colorado State Univ., USA; Weaver, John, National Environmental Satellite Service, USA; 28th Conference on Radar Meteorology; 1997, pp. 544-546; In English; 28th; Conference on Radar Meterology, 7-12 Sep. 1997, Austin, TX, USA; Sponsored by American Meteorological Society, USA
Contract(s)/Grant(s): NOAA-NA37RJ0202; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Previous studies utilizing Doppler radar velocity data (Lemon, et al., 1982 and Rotzoll, et al.,1983) have shown that supercell thunderstorms can have significant rotation very near storm top. Satellite studies based on single images have also found indications of this rotation in visible imagery (Adler, et al., 1981), and a study by Anderson (1982) shows apparent cyclonic rotation at storm top in wind vectors derived from sequential satellite imagery. As part of the National Weather Service FIRSTT(1) initiative, a supercell outbreak over Kansas and Colorado is being examined using a combination of WSR-88D radar data, and special 30-second interval GOES-8 satellite imagery. The storm of interest to this paper produced apparent storm top rotation coincident with a series of F1 tornadoes. The storm occurred near Ness City, Kansas which is located within 75 km of the Dodge City, Kansas WSR-88D radar. The data were synthesized to determine whether or not the rotation observed at anvil level was connected to the storm's mesocyclone.
Author
Radar Data; Satellite Imagery; Thunderstorms

19980027708 National Environmental Satellite Service, Office of Research and Applications, Camp Springs, MD USA
Interactions between Upper-Level Moisture and Precipitation as Measured by Satellite Microwave Radiometers
Grody, Norman C., National Environmental Satellite Service, USA; Weng, Fuzhong, Caelum Research Corp., USA; Ferraro, Ralph, National Environmental Satellite Service, USA; Eighth Conference on Satellite Meteorology and Oceanography; 1996, pp. 569-573; In English; 8th; Conference on Satellite Meteorology and Oceanography, 28 Jan. - 2 Feb. 1996, Atlanta, GA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Water vapor plays a vital role in the weather and climate. High level water vapor plumes strongly promote convection over the continental United States (Scofield and Turk, 1986). Deep convective motion also leads to the formation of significant amounts of upper level clouds. These upper level clouds moisten the upper atmosphere through the melting of ice particles and evaporation (Sun and Lindzen, 1993). With the recent launch of the Special Temperature Microwave Temperature-2 (SSMT/2) sensors aboard the DMSP satellites? we can now for the first time measure the spatial and temporal variation of the upper level moisture in the presence of clouds. This new information complements the measurements of total precipitable water and rainfall derived from

the Special Sensor Microwave Imager (SSM/I). The paper by Ferraro et al., (1996) at this conference discusses the use of SSM/I for deriving the total precipitable water (V) and rainfall (R). Comparisons between the SSM/I and SSMT/2 observations of precipitation were discussed by Lee (1995) and in this conference by Grody et. al., (1996). This paper examines the relationship between the upper level water vapor inferred from the SSMT/2 and the rainfall and total precipitable water derived from the SSM/I over the tropics.
Author
Moisture; Precipitation (Meteorology); Temperature Profiles; Water Vapor; Upper Atmosphere

19980027709 National Environmental Satellite Service, Systems Design and Applications Branch, Madison, WI USA
Initializing Cloud Predictions Using the GOES-8 Sounder
Aune, Robert M., National Environmental Satellite Service, USA; Eighth Conference on Satellite Meterology and Oceanography; 1996, pp. 408-412; In English; 8th; Conference on Satellite Meterology and Oceanography, 28 Jan. - 2 Feb. 1996, Atlanta, GA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The impact of initializing the cloud water field is determined by comparing forecasts with INitialized CLouDs (INCLD) to a parallel forecast with zero initial cloud water (NOCLD). Verification of 12 hour forecasted temperatures at 925 hPa. 850 hPa. and 700 hPa against rawinsonde temperatures consistently show a slight reduction in RMS and bias. Although the improvement here is small it is consistently positive from day to day. Larger improvements have been observed. An objective verification of forecasted cloud fields is more difficult. A subjective comparison is possible using IR images derived from forecast datasets. Observed cloud-top pressure (hPa) retrieved from the GOES-8.
Derived from text
Forecasting; Cloud Cover; Water

19980027710 National Environmental Satellite Service, Office of Research and Applications, Washington, DC USA
An Absolute Moisture Index
McMillin, Larry, National Environmental Satellite Service, USA; Eighth Conference on Satellite Meterology and Oceanography; 1996, pp. 60-63; In English; 8th; Conference on Satellite Meterology and Oceanography, 28 Jan. - 2 Feb. 1996, Atlanta, GA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Satellites carry channels which measure atmospheric radiation at wavelengths where moisture is the primary absorber. In particular, the National Oceanic and Atmospheric Administration (NOAA) series of satellites carry the TIROS-N Operational Vertical Sounder (TOVS). a combination of three instruments which consists of three moisture channels, four surface channels, one visible channel, and 19 temperature channels (see Smith et al. 1979). Measurements at wavelengths absorbed by atmospheric moisture can be used to determine the atmospheric moisture, but the determination is complicated by the response of these channels to atmospheric temperature. In the past, this separation has been accomplished by a parameter called the Relative Moisture Index (RMI). which successfully separates the moisture and temperature effects (McMillin et al. 1995). It extends the moisture information from the upper levels in the tropics, where moisture variations dominate, into the higher latitudes and lower levels, where variations in temperature and moisture occur together. The RMI is obtained by using channels that respond to temperature changes to predict the value of a moisture channel. Then the RMI is the brightness temperature difference between the measured and the predicted value, and represents the departure from the expected value for the given temperature profile. An unfortunate feature of the RMI is the fact that the value of absolute moisture is not completely determined by the RMI value. The absolute moisture is determined by the combination of the temperature profile and the RMI value. The RMI has been modified to provide an Absolute Moisture Index (AMI). The motivation for the AMI is to find the moisture parameter that is most directly related to the satellite measurements.
Derived from text
Atmospheric Moisture; Temperature Effects; Atmospheric Temperature; Atmospheric Sounding

19980028488 National Environmental Satellite Service, Office of Research and Applications, Washington, DC USA
Assessment of GOES-8 Imager Data Quality
Ellrod, Gary P., National Environmental Satellite Service, USA; Nelson, James P., III, Wisconsin Univ., USA; Eighth Conference on Satellite Meteorology and Oceanography; 1996, pp. 105-109; In English; 8th; Conference on Satellite Meteorology and Oceanography, 28 Jan. - 2 Feb. 1996, Atlanta, GA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

GOES-8, operated by the National Environmental Satellite Data, and Information Service (NESDIS) is now the operational eastern geostationary satellite, and is located at 75 deg W. GOES-8 is the first in the GOES I-M series that will provide high quality, digital or analog facsimile imagery to a wide range of users worldwide. The primary improvements advertised prior to the launch

of GOES-8 were: (1) better resolution in the InfraRed (IR) and Water Vapor (WV) channels by at least a factor of two, (2) reduced instrument noise, (3) 10-bit Visible (Vis) and IR digitization, (4) greater image frequency (15 minutes or less for digital data users) for mesoscale applications, (5) improved multispectral capabilities, and (6) an independent sounder. The capabilities of the imager and sounder have been described in detail in the literature (Menzel and Purdom, 1994; Komajda and McKenzie, 1994; Hayden and Schmit, 1991). This paper will concentrate on data provided by the GOES-8 imager. Characteristics of the spectral channels available on the GOES-8 imager. Data from all five channels was received at the NOAA Science Center in Camp Springs, Maryland beginning early summer, 1994, and was evaluated in the NESDIS Office of Research and Applications through the Fall, 1994. The imagery was found to meet or exceed most of the expectations mentioned above. This paper will summarize some of these findings.
Author
GOES 8; Imagery; Digital Data; Data Acquisition; Digital Techniques

19980029721 National Environmental Satellite Service, Regional and Mesoscale Meteorology Branch, Fort Collins, CO USA
Near Term Opportunities and Past Impacts of Space-Based Data in Operational Weather Forecasting
Purdom, James F. W., National Environmental Satellite Service, USA; Menzel, W. Paul, Wisconsin Univ., USA; 14th Conference on Weather Analysis and Forecasting; 1995, pp. 295-306; In English; 14th; Weather Analysis and Forecasting, 15-20 Jan. 1995, Dallas, TX, USA; Sponsored by American Meteorological Society, USA
Contract(s)/Grant(s): NOAA-NA85RAH05045; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Since the early 1960's, meteorological and oceanographic data from satellites have had a major impact on environmental analysis, forecasting and research in the USA and in other nations throughout the world. While the early generations of polar orbiting satellites provided once or twice daily snapshots of various phenomena, by 1967 the ability to see weather systems in animation was realized after the launch of the first geostationary cloud imaging satellite. In 1975, operational geostationary satellites provided a major advancement in our ability to observe weather systems by providing frequent interval visible and thermal infrared imagery of the earth and its cloud cover. Weather systems within the satellites view could be monitored day and night, and GOES data became a critical part of National Weather Service operations by providing unique information about emerging storms and storm systems. Today, geostationary satellites have evolved to include the capability of producing atmospheric thermodynamic soundings. The evolution in polar orbiting satellite technology has been impressive. Polar orbiting satellites are operated by a number of countries and provide routine multispectral imagery ranging from tenths of microns to microwave wavelengths of the earth, its oceans and overlying cloud cover. While significant accomplishments have occurred with the US Defense Meteorological Satellite Program, what follows will focus on the civilian polar and geostationary.
Author
Weather Forecasting; Data Bases; Space Surveillance (Spaceborne); Meteorological Parameters; Meteorological Services

19980035145 State Univ. of New York, Atmospheric Sciences Research Center, Albany, NY USA
Improved Representations of Cloud-Scale Processes in Meteorological Forecast Models ***Final Report, 1 Jul. 1993 - 30 Jun. 1997***
Walcek, Chris J., State Univ. of New York, USA; Iacovazzi, Robert, State Univ. of New York, USA; Jul. 31, 1997; 12p; In English
Contract(s)/Grant(s): F49620-93-I-0392
Report No.(s): AD-A332318; AFOSR-TR-97-0610; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The functional relationship between cloud cover and relative humidity (Rh) averaged over areas comparable to grid dimensions of numerical weather models was quantified using RTNEPH and 3DNEFH observations. Cloud cover in any atmospheric level decreases exponentially as layer averaged Rh tails below 100%, and no observations support critical Rhs below which cloud cover is zero. Small cloud amounts occur at all Rhs. Therefore, current weather models probably underestimate cloud coverage, especially at Rhs below the critical humidities used by most models. At the same Rh, convection enhances cloud coverage in the upper troposphere. and decreases cloud coverage in the lower troposphere. Developed a simplified and innovative mass flux convective parameterization that was evaluated using atmospheric radon profiles, and was also used to simulate the redistribution of heat and moisture by combining the approach of stochastic mixing with detraining plumes. A public domain cloud resolving model (ARPS) was used to further refine the 1-D parameterization. Both the cloud resolving models and the convective parameterization were evaluated using GATE observations. However the ARPS model employs an advection algorithm that does not conserve water mass, making it unreliable to use for refining cloud parameterizations.
DTIC
Atmospheric Models; Cloud Cover; Cloud Physics; Clouds (Meteorology); Convection; Parameterization; Plumes; Refining; Troposphere

19980036977 NASA Langley Research Center, Hampton, VA USA

Parameterizing Grid-Averaged Longwave Fluxes for Inhomogeneous Marine Boundary Layer Clouds

Barker, Howard W., Atmospheric Environment Service, Canada; Wielicki, Bruce A., NASA Langley Research Center, USA; Journal of the Atmospheric Sciences; Dec. 15, 1997; Volume 54, No. 24, pp. 2785-2798; In English

Report No.(s): NASA/TM-97-207571; NAS 1.15:207571; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper examines the relative impacts on grid-averaged longwave flux transmittance (emittance) for Marine Boundary Layer (MBL) cloud fields arising from horizontal variability of optical depth tau and cloud sides, First, using fields of LANDSAT-inferred tau and a Monte Carlo photon transport algorithm, it is demonstrated that mean all-sky transmittances for 3D variable MBL clouds can be computed accurately by the conventional method of linearly weighting clear and cloudy transmittances by their respective sky fractions. Then, the approximations of decoupling cloud and radiative properties and assuming independent columns are shown to be adequate for computation of mean flux transmittance. Since real clouds have nonzero geometric thicknesses, cloud fractions A'(sub c) presented to isotropic beams usually exceed the more familiar vertically projected cloud fractions A(sub c). It is shown, however, that when A(sub c)less than or equal to 0.9, biases for all-sky transmittance stemming from use of A(sub c) as opposed to A'(sub c) are roughly 2-5 times smaller than, and opposite in sign to, biases due to neglect of horizontal variability of tau. by neglecting variable tau, all-sky transmittances are underestimated often by more than 0.1 for A(sub c) near 0.75 and this translates into relative errors that can exceed 40% (corresponding errors for all-sky emittance are about 20% for most values of A(sub c). Thus, priority should be given to development of General Circulation Model (GCM) parameterizations that account for the effects of horizontal variations in unresolved tau, effects of cloud sides are of secondary importance. On this note, an efficient stochastic model for computing grid-averaged cloudy-sky flux transmittances is furnished that assumes that distributions of tau, for regions comparable in size to GCM grid cells, can be described adequately by gamma distribution functions. While the plane-parallel, homogeneous model underestimates cloud transmittance by about an order of magnitude when 3D variable cloud transmittances are less than or equal to 0.2 and by approx. 20% to 100% otherwise, the stochastic model reduces these biases often by more than 80%.

Author

Parameterization; Average; Marine Meteorology; Cloud Physics; Cloud Cover; Atmospheric Boundary Layer; Computational Grids; Planetary Waves

48
OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

19980025466 NASA Goddard Space Flight Center, Greenbelt, MD USA

SeaWiFS Science Algorithm Flow Chart

Darzi, Michael, NASA Goddard Space Flight Center, USA; Jan. 1998; 42p; In English

Contract(s)/Grant(s): NAS5-32377

Report No.(s): NASA/CR-1998-206848; NAS 1.26:206848; Rept-98B00018; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This flow chart describes the baseline science algorithms for the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) Data Processing System (SDPS). As such, it includes only processing steps used in the generation of the operational products that are archived by NASA's Goddard Space Flight Center (GSFC) Distributed Active Archive Center (DAAC). It is meant to provide the reader with a basic understanding of the scientific algorithm steps applied to SeaWiFS data. It does not include non-science steps, such as format conversions, and places the greatest emphasis on the geophysical calculations of the level-2 processing. Finally, the flow chart reflects the logic sequences and the conditional tests of the software so that it may be used to evaluate the fidelity of the implementation of the scientific algorithm. In many cases however, the chart may deviate from the details of the software implementation so as to simplify the presentation.

Author

Ocean Data Acquisitions Systems; Remote Sensing; Remote Sensors; Flow Charts; Oceanography

19980025547 Naval Postgraduate School, Monterey, CA USA

Propagation of Vertically Polarized Waves Over Rough Ocean Surfaces

Conrad, Jeffrey G., Naval Postgraduate School, USA; Jun. 1997; 57p; In English

Report No.(s): AD-A333902; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The problem of propagation of vertically polarized radiowaves in an inhomogeneous atmosphere and over rough ocean surfaces is solved using the parabolic equation method. The solution of the parabolic equation is accomplished through the use of the Fourier split-step algorithm. Formulation of the equations is based upon (1) recognizing that the Fourier kernels of the transform equations in the split step algorithm represent planes waves and (2) compensating for the effects of rough ocean surfaces by using a rough surface reduction factor directly in the spectral domain. to accomplish this a redefinition of the Fourier transform pair is done to ensure mathematical consistency. The formulation also incorporates the first and second derivatives of the refractivity index to accommodate steep gradients in the refractivity profile. Hanning windows are used in both the spatial and wavenumber domains to contain computational requirements. The effects on propagation by varying parameters such as wave heights, computational domain ceilings, frequency and step size are investigated.

DTIC

Air Water Interactions; Ocean Surface; Wave Propagation; Radio Transmission; Radio Waves

19980025556 Naval Postgraduate School, Monterey, CA USA

Towed Array Performance in the Littoral Waters of Northern Australia

Crouch, James A. M., Naval Postgraduate School, USA; Jun. 1997; 121p; In English

Report No.(s): AD-A333355; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The goal of this research was to investigate the performance of low frequency passive sonars in the Arafura Sea. Sound speed profiles representative of the wet and dry monsoon seasons and geoacoustic data were inputted into a finite element primitive equation transmission loss model to model the expected propagation at three frequencies, 10, 50 and 300 Hz. Initial detection ranges for several source/receiver depth combinations and geoacoustic areas (deep/shallow water) were compared and evaluated. Results demonstrate that low frequency (-10 Hz) detection ranges suffer due to cutoff frequency problems and to surface-decoupling loss. Propagation in deep water has the added disadvantage of excessive loss of signal power due to spherical spreading considerations. Conversely, higher frequencies (300 Hz) provided extended detection ranges in shallow water due to trapping of energy within the entire 50 m to 100 m water column. Additionally, investigation into advantages to be gained through advanced signal processing techniques shows that improvements of the order of 10 to 15 dB of detection gain are possible through the utilization of inverse beamforming.

DTIC

Acoustic Velocity; Finite Element Method; Frequency Measurement; Signal Processing

19980029706 Asia Foundation, San Francisco, CA USA

International Workshop: Planning for Climate Change through Integrated Coastal Management, Volume 1, Summary Report

1997; 100p; In English; International Workshop: Planning for Climate Change through Integrated Coastal Management, 24-28 Feb. 1997, Taipei, China

Report No.(s): PB98-116254; Copyright Waived; Avail: CASI; A05, Hardcopy; A02, Microfiche

This document summarizes the workshop's major findings. It begins by recapping, discussions from eight expert panels, which focused largely on various aspects of ICM and their elucidation in the guidelines under consideration by the workshop. It then summarizes a series of country reports on climate change and ICM presented by deltaic nations, island nations, and nations with continental shorelines.

NTIS

Climate Change; Shorelines

19980034679 Naval Postgraduate School, Monterey, CA USA

Modeling Studies of Wind and Thermohaline Forcing on the California Current System

Vance, Phillip W., Naval Postgraduate School, USA; Jun. 1997; 89p; In English

Report No.(s): AD-A333389; NPS-OC-97-005; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A high-resolution, multi-level, primitive equation model is initialized with climatological data to study the combined effects of wind and thermohaline forcing on the ocean circulation of the California Current System (CCS). The ocean circulation is generated by the model using a combination of climatological wind stress and thermohaline forcing. In the first experiment, the effects of thermohaline forcing alone are evaluated, in the second experiment, previously conducted, the effects of wind forcing are iso-

lated, while in the third experiment, the combined effects of wind and thermohaline forcing are looked at. The results from the combined experiment show that even though the effects of wind forcing dominate the CCS, the additional effects of the thermohaline forcing results in the following: the seasonal development of a poleward surface current and an equatorward undercurrent in the poleward end of the model region; an onshore geostrophic component, which results in a temperature front and stronger surface and subsurface currents between Cape Mendocino and Point Arena; and a region of maximum eddy kinetic energy inshore of tilde 125 deg W between Cape Mendocino and Point Arena, associated with the temperature front. These model simulations are qualitatively similar to recent hydrographic, altimetric, drifter, and moored observations of the CCS.
DTIC
Ocean Currents; Wind Effects; Wind Shear; Climatology; Kinetic Energy; Hydrography

19980035471 Naval Research Lab., Oceanography Div., Stennis Space Center, MS USA
Software Design Document for the Polar Ice Prediction System, 2.0 ***Final Report***
Preller, Ruth H., Naval Research Lab., USA; Posey, Pamela G., Naval Research Lab., USA; Dec. 15, 1997; 152p; In English
Report No.(s): AD-A335554; NRL/FR/7322--95-9637; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Since 1987, the Fleet Numerical Meteorology and Oceanography Center (FNMOC) has been running sea ice forecasting systems in various regions of Navy interest (the Central Arctic, the Barents Sea, and the Greenland Sea). The Polar Ice Prediction System (PIPS1.1) predicts sea ice conditions in the Arctic basin, the Barents Sea, and the Greenland Sea at a resolution of 127 km. Two regional sea ice forecasting systems, the Polar Ice Prediction System - Barents Sea (RPIPS-B) and the Polar Ice Prediction System - Greenland Sea (RPIPS-G), also predict sea ice conditions in the Barents and Greenland Seas, respectively, at a higher resolution of 20-25 km. In 1995, the Naval Research Laboratory delivered to FNMOC a coupled ice-ocean system, the Polar Ice Prediction System 2.0 (PIPS2.0), which predicts sea ice conditions of most of the ice-covered regions in the Northern Hemisphere. PIPS2.0 will replace the three existing operational forecast systems when it completes the final operational testing phase at FNMOC. PIPS2.0 uses as its basis the Hibler ice model and the Cox ocean model. PIPS2.0 has a resolution of approximately a quarter of a degree, which is similar to the resolution of the operational regional systems (RPIPS-B and RPIPS-G). This report briefly describes the main program and each of its subroutines.
DTIC
Ice Formation; Sea Ice; Polar Regions; Computer Programs

19980036332 Woods Hole Oceanographic Inst., MA USA
WHOI Cable: Time Domain Numerical Simulation of Moored and Towed Oceanographic Systems
Gobat, Jason I., Woods Hole Oceanographic Inst., USA; Grosenbaugh, Mark A., Woods Hole Oceanographic Inst., USA; Triantafyllou, Michael S., Woods Hole Oceanographic Inst., USA; Nov. 1997; 104p; In English
Contract(s)/Grant(s): N00014-92-J-1269; N00014-95-I-0106
Report No.(s): AD-A335552; WHOI-97-15; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report presents a numerical framework for analyzing the statics and dynamics of cable structures commonly encountered in oceanographic engineering practice. The numerical program, WHOI Cable, features a nonlinear solver that includes the effects of geometric and material nonlinearities, bending stiffness for seamless modeling of slack cables, and a model for the interaction of cable segments with the seafloor. The program solves both surface and subsurface single-point mooring problems, systems with both ends anchored on the bottom, and towing and drifter problems. Forcing includes waves, current, ship speed, and pay-out of cable. The programs that make-up WHOI Cable run under UNIX, DOS, and Windows. There is a familiar Windows style interface available for Windows 95 and Windows NT platforms. In the report, the mathematical and numerical framework for WHOI Cable is described, followed by detailed instructions for formulating problem input files and running the codes. Examples are included in an appendix to highlight the range of problems that WHOI Cable can solve.
DTIC
Mooring; Towed Bodies; Numerical Analysis; Towing

19980036376 Naval Research Lab., Oceanography Div., Stennis Space Center, MS USA
Joint Distributed Surf Zone Environmental Model: FY 1996 Modeling Procedure ***Final Report***
Allard, Richard A., Naval Research Lab., USA; Collins, Mona J., Naval Research Lab., USA; DelBalzo, Donald R., Naval Research Lab., USA; Smith, Jane McKee, Naval Research Lab., USA; Dec. 22, 1997; 46p; In English
Report No.(s): AD-A335440; NRL/FR/7322--97-9675; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents the modeling procedure used during the FY96 Joint Distributed Surf Zone Environmental Model Program. The approach of this program is to develop techniques that incorporate current state of the art, physics based numerical models to determine surf zone characteristic that are important to the modeling and simulation community. to test this proof of

concept, a suite of models were identified and tested for Camp Pendelton, CA, during two 7 day periods in January and August 1995, in which data from the Coupled Ocean Atmosphere Mesoscale Prediction System (COAMPS) and the deep water wave model WAM, were available. Spectra describing the wave energy distribution in both frequency and direction were obtained from the Southern California Regional WAM model and specified on the offshore boundary of the STWAVE shallow water wave model. STWAVE was run to coincide with the time period of available WAM and COAMPS data. The Navy Standard Surf Model (NSSM) was run for the Camp Pendelton area for the same periods that WAM and STWAVE were run: 814 Jan and 1824 Aug 1995. A refraction zone depth grid was built from a 100-m resolution bathymetric data base. Inputs included COAMPS wind speed and direction, tide levels from tide tables, WAM spectra, and a landing zone based on a linear beach slope of 0.007. WAM, STWAVE, and NSSM model outputs described in this report are available to the Modeling and Simulation community through the Master Environmental Library.
DTIC
Environment Models; Water Waves; Ocean Models

19980036974 SACLANT Undersea Research Centre, La Spezia, Italy
Observations of Mediterranean Flow into the Black Sea
DiIorio, D., SACLANT Undersea Research Centre, Italy; Yuce, H., SACLANT Undersea Research Centre, Italy; Oct. 1997; 45p; In English
Report No.(s): AD-A335065; SACLANTCEN-SR-269; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Strait of Istanbul (Bosporus) seperates the Black Sea and Marmara Sea each of which has different hydrological characteristicts. The exchange of these waters through the strait is a classic example of turbulent exchange flow. The early exit of Black Sea water is through the Strait of Istanbul (Bosporus) and by evaporation. Fresh water input to the Black Sea is from rivers and precipitation; salt water inputs is of Mediterranean origin flowing through the strait. In order to understand the exchange process, the Black Sea hydrological characteristics and the resulting effect on acoustic surveillance systems, a detailed survey of the Black Sea exit region carried out to determine the path and spreading extent of the dense Mediterranean water, the physical conditions the suppress the and the turbulent bottom boundary later characteristics associated with bottom friction. As the Mediterranean undercurrent is a strong flow, it is found that turbulent bottom velocity dominates the acoustic scattering for high frequency forward propagation systems. The spreading extent of the Mediterranean overflow water on the continental shelf(less than 100 m depth) can the effects of the sea bottom for short range acoustic backscatter systems and thus make it difficult to detect underwater objects. Future work in this will concentrate on modelling the oceanographic variability for comparison with available environmental data.
DTIC
Water Flow; Mediterranean Sea; Black Sea

51
LIFE SCIENCES (GENERAL)

19980024243 Dartmouth Coll., Dept. of Pharmacology and Toxicology, Hanover, NH USA
Interaction of Light and Clock Regulation in Neurospora *Final Report*
Loros, Jennifer J., Dartmouth Coll., USA; Sep. 1997; 11p; In English
Contract(s)/Grant(s): F49620-94-I-0260; AF Proj. 2312
Report No.(s): AD-A334721; AFRL-SR-BL-TR-98-0066; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Interest is focused on understanding the molecular mechanisms involved in how eukaryotic cells and organisms keep time on a daily basis and how visible light entrains the clock mechanism at the molecular level. In the model organism, Neurospora crassa, ambient light has been shown to act either independently of, or coordinately through the circadian pacemaker. Significant advances in our understanding of how light effects a single component of the clock and thereby results in entrainment of clock phase has been made by examination of light effects on the frequency locus transcript, a known component of the clock (Cell 81, 1003 - 1012, 1995). Analysis of clock-output genes find them involved in a diverse set of cell functions, photo-inducibility to be clock independent. Promoter resection analysis shows sequences necessary and sufficient for clock-independent light regulation.
DTIC
Neurospora; Circadian Rhythms; Eukaryotes; Molecular Biology

19980024339 NASA Washington, Washington, DC USA

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume

12th Man in Space Symposium; The Future of Humans in Space; 1997; 368p; In English; 12th; Man in Space Symposium: The Future of Humans in Space, 8-13 Jun. 1997, Washington, DC, USA; Sponsored by NASA Washington, USA; Also announced as 19980024340 through 19980024373

Contract(s)/Grant(s): NCC9-41

Report No.(s): NASA/TM-97-207601; NAS 1.15:207601; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The National Aeronautics and Space Administration (NASA) is pleased to host the 12th IAA Man in Space Symposium. A truly international forum, this symposium brings together scientists, engineers, and managers interested in all aspects of human space flight to share the most recent research results and space agency planning related to the future of humans in space. As we look out at the universe from our own uniquely human perspective, we see a world that we affect at the same time that it affects us. Our tomorrows are highlighted by the possibilities generated by our knowledge, our drive, and our dreams. This symposium will examine our future in space from the springboard of our achievements.

Author

Conferences; Manned Space Flight; Life Sciences; Gravitational Effects; Microgravity; Physiological Effects; Biological Effects; Aerospace Medicine; Aerospace Environments

19980024341 NASA Washington, Washington, DC USA

Biological Life Support Systems

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 13-20; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session MP2 includes short reports on: (1) Crew Regenerative Life Support in Long Duration Space Missions; (2) Bioconversion Systems for Food and Water on Long Term Space Missions; (3) Novel Laboratory Approaches to Multi-purpose Aquatic Biogenerative Closed-Loop Food Production Systems; and (4) Artificial Neural Network Derived Plant Growth Models.

CASI

Life Support Systems; Space Missions; Long Duration Space Flight

19980024344 NASA Washington, Washington, DC USA

Life Sciences Issues for a Mission to Mars

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 38-45; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session MP5 includes short reports on: (1) Cardiovascular Concerns for a Mars Mission: Autonomic and Biomechanical Effects; (2) Reducing the Risk of Space Radiation Induced Bioeffects: Vehicle Design and Protectant Molecules; (3) Musculoskeletal Issues for Long Duration Mission: Muscle Mass Preservation, Renal Stone Risk Factors, Countermeasures, and Contingency Treatment Planning; (4) Psychological Issues and Crew Selection for a Mars Mission: Maximizing the Mix for the Long Haul; and (5) Issues in Crew Health, Medical Selection and Medical Officer (CMO) Training for a Mission to Mars.

CASI

Aerospace Medicine; Long Duration Space Flight; Life Sciences; Mars Exploration

19980024346 NASA Washington, Washington, DC USA

Plant and Animal Gravitational Biology, Part 1

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 56-66; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Session TA2 includes short reports covering: (1) The Interaction of Microgravity and Ethylene on Soybean Growth and Metabolism; (2) Structure and G-Sensitivity of Root Statocytes under Different Mass Acceleration; (3) Extracellular Production of Taxanes on Cell Surfaces in Simulated Microgravity and Hypergravity; (4) Current Problems of Space Cell Phytobiology; (5) Biological Consequences of Microgravity-Induced Alterations in Water Metabolism of Plant Cells; (6) Localization of Calcium Ions in Chlorella Cells Under Clinorotation; (7) Changes of Fatty Acids Content of Plant Cell Plasma Membranes under Altered Gravity; (8) Simulation of Gravity by Non-Symmetrical Vibrations and Ultrasound; and (9) Response to Simulated weightlessness of In Vitro Cultures of Differentiated Epithelial Follicular Cells from Thyroid.

CASI

Gravitational Effects; Microgravity; Spacecraft Environments; Exobiology

19980024355 NASA Washington, Washington, DC USA

Plant and Animal Gravitational Biology, Part 2

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 135-144; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session WA2 includes short reports concerning: (1) The Asymmetrical Growth of Otoliths in Fish Affected by Altered Gravity and Causes Kinetosis; (2) Neurobiological Responses of Fish to Altered Gravity conditions: A Review; (3) An Age-Dependent Sensitivity of the Roll-Induced Vestibulocular Reflex to Hypergravity Exposure of Several Days in an Amphibian (Xenopus Laevis); (4) Mechanically-Induced Membrane Wounding During Parabolic Flight; and (5) Erythropoietin Stimulates Increased F Cell Numbers in Bone Marrow Cultures Established in Gravity and Microgravity Conditions.

CASI

Animals; Microgravity; Gravitational Effects; Spacecraft Environments; Biological Effects; Plants (Botany)

19980024367 NASA Washington, Washington, DC USA

Gravitational Biology: The Rat Model

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 266-278; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session JP3, the discussion focuses on the following topics: Morphology of brain, pituitary and thyroid in the rats exposed to altered gravity; Biochemical Properties of B Adrenoceptors After Spaceflight (LMS-STS78) or Hindlimb Suspension in Rats; Influence of Hypergravity on the Development of Monoaminergic Systems in the Rat Spinal Cord; A Vestibular Evoked Potentials (VsEPs) Study of the Function of the Otolith Organs in Different Head Orientations with respect to Earth Gravity Vector in the Rat; Quantitative Observations on the Structure of Selected Proprioceptive Components in Adult Rats that Underwent About Half of their Fetal Development in Space; Effects of a Nine-Day Shuttle Mission on the Development of the Neonatal Rat Nervous System, A Behavioral Study; Muscle Atrophy Associated to Microgravity in Rat, Basic Data For Countermeasures; Simulated Weightlessness by Unloading in the Rat, Results of a Time Course Study of Biochemical Events Occurring During Unloading and Lack of Effect of a rhBNP-2 Treatment on Bone Formation and Bone Mineral Content in Unloading Rats; and Cytological Mechanism of the Osteogenesis Under Microgravity Conditions.

CASI

Aerospace Medicine; Gravitational Physiology; Microgravity; Biological Effects; Gravitational Effects; Rats; Weightlessness Simulation; Physiological Responses

19980024368 NASA Washington, Washington, DC USA

Biological Bases of Space Radiation Risk

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 279-289; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session JP4, the discussion focuses on the following topics: Hematopoiesis Dynamics in Irradiated Mammals, Mathematical Modeling; Estimating Health Risks in Space from Galactic Cosmic Rays; Failure of Heavy Ions to Affect Physiological Integrity of the Corneal Endothelial Monolayer; Application of an Unbiased Two-Gel CDNA Library Screening Method to Expression Monitoring of Genes in Irradiated Versus Control Cells; Detection of Radiation-Induced DNA Strand Breaks in Mammalian Cells by Enzymatic Post-Labeling; Evaluation of Bleomycin-Induced Chromosome Aberrations Under Microgravity Conditions in Human Lymphocytes, Using ”Fish” Techniques; Technical Description of the Space Exposure Biology Assembly Seba on ISS; and Cytogenetic Research in Biological Dosimetry.

CASI

Aerospace Medicine; Radiation Effects; Extraterrestrial Radiation; Galactic Cosmic Rays; Radiation Damage; Exobiology; Physiological Effects; Biological Effects; Aerospace Environments; Irradiation; Mammals; Mathematical Models

19980034676 Brown Univ., Inst. for Brain and Neural Systems, Providence, RI USA

Neuromorphic Systems: From Biological Foundations to System Properties and Real World Applications ***Progress Report***

Davis, Joel L., Brown Univ., USA; Dec. 1997; 12p; In English

Contract(s)/Grant(s): N00014-91-J-1316

Report No.(s): AD-A333498; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is written to provide a semi-annual progress report for ’Neuromorphic Systems: From Biological Foundations to System Properties and Real World Applications.’ The major goal of our research is to elucidate the biological mechanisms that underlie learning and memory: to find principles of organization that can account both for experimental data on the cellular level and, when applied to large numbers of neurons that receive sensory and/or interneuronal information, for various higher level system proper-

ties. Then to apply this in the construction of advanced neural architectures that can be used in practical applications such as mine detection.
DTIC
Learning; Memory; Mine Detectors; Nervous System

52
AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19980024229 Naval Postgraduate School, Monterey, CA USA
Testing Effectiveness of Genetic Algorithms for Exploratory Data Analysis
Carter, Jason W., Naval Postgraduate School, USA; Sep. 1997; 76p; In English
Report No.(s): AD-A333989; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Heuristic methods of solving exploratory data analysis problems suffer from one major weakness - uncertainty regarding the optimality of the results . The developers of DaMI (Data Mining Initiative), a genetic algorithm designed to mine the CCEP (Comprehensive Clinical Evaluation Program) database in the search for a Persian Gulf War syndrome, proposed a method to overcome this weakness: reproducibility -- the conjecture that consistent convergence on the same solutions is both necessary and sufficient to ensure a genetic algorithm has effectively searched an unknown solution space. We demonstrate the weakness of this conjecture in light of accepted genetic algorithm theory. We then test the conjecture by modifying the CCEP database with the insertion of an interesting solution of known quality and performing a discovery session using DaMI on this modified database. The necessity of reproducibility as a terminating condition is falsified by the algorithm finding the optimal solution without yielding strong reproducibility. The sufficiency of reproducibility as a terminating condition is analyzed by manual examination of the CCEP database in which strong reproducibility was experienced. Ex post facto knowledge of the solution space is used to prove that DaMI had not found the optimal solutions though it gave strong reproducibility, causing us to reject the conjecture that strong reproducibile is a sufficient terminating condition.
DTIC
Genetic Algorithms; Heuristic Methods; Warfare

19980024340 NASA Washington, Washington, DC USA
Mechanisms of Orthostatic Intolerance During Real and Simulated Microgravity
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 1-12; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Session MP1 includes short reports on: (1) Orthostatic Tests after 42 Days of Simulated Weightlessness; (2) Effects of 12 Days Exposure to Simulated Microgravity on Central Circulatory Hemodynamics in the Rhesus Monkey; (3) Increased Sensitivity and Resetting of Baroflex Control of Exercise Heart Rate After Prolonged Bed-Rest; (4) Complex Cardiovascular Dynamics and Deconditioning During Head-down Bed Rest; (5) The Cardiovascular Effects of 6 Hours of Head-down Tilt Upon Athletes and Non-athletes; (6) Individual Susceptibility to Post-spaceflight Orthostatic Intolerance: Contributions of Gender-related and Microgravity-related Factors; (7) Cassiopee Mission 1996: Comparison of Cardiovascular Alteration after Short and Long-term Spaceflights; (8) Cerebral and Femoral Flow Response to LBNP during 6 Month MIR Spaceflights (93-95); and (9) Cerebrovascular Changes due to Spaceflight and Postflight Presyncope.
CASI
Microgravity; Weightlessness Simulation; Orthostatic Tolerance; Physiological Tests; Physiological Effects

19980024342 NASA Washington, Washington, DC USA
Clinical and Educational Support for Space Flight via Telemedicine
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 21-27; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session MP3 includes short reports on: (1) Telemedicine: A User's Perspective; (2) Health Care in Extreme Environments; (3) Integration of Emerging Technologies in Information and Telecommunications in Health Care Systems for Space; (4) Telemedicine and Environmental Medicine in Russia: A First Step in Basic Medical Education; and (5) Clinical Utility of Internet Telemedicine.
CASI
Telemedicine; Aerospace Medicine; Health; Spacecraft Environments

19980024345 NASA Washington, Washington, DC USA

Mechanisms of Cardiopulmonary Adaptation to Microgravity, Part 1

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 46-55; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session TA1 includes short reports covering: (1) Indices of Baroreceptor Reflex Sensitivity: The Use in Rehabilitation Medicine and Space Cardiology; (2) +Gz and +Gx Tolerance of Healthy Persons of Non-Flying Trades at Primary Selection of the Centrifuge; (3) Effect of Dry Immersion on Calf Blood Supply During Sustained Contraction and Upright Exercise in Man; (4) Cardiovascular and Valsalva Responses during Parabolic flight; (5) An Analysis of the Cardiovascular Responses under Hyper- and Hypo-Gravity Environments using a Mathematical model; (6) Effect of Very Gradual Onset Rate +Gz Exposures on the Cardiovascular System; and (7) NASA Specialized Center of Research and Training (NSCORT) in Integrated Physiology: Mechanisms of Physiological Adaptations to Microgravity.

CASI

Cardiovascular System; Spacecraft Environments; Microgravity; Gravitational Effects; Physiological Responses

19980024348 NASA Washington, Washington, DC USA

Effect of Microgravity on Bone Tissue and Calcium Metabolism

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 76-85; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session TA4 includes short reports concerning: (1) Human Bone Tissue Changes after Long-Term Space Flight: Phenomenology and Possible Mechanics; (2) Prediction of Femoral Neck Bone Mineral Density Change in Space; (3) Dietary Calcium in Space; (4) Calcium Metabolism During Extended-Duration Space Flight; (5) External Impact Loads on the Lower Extremity During Jumping in Simulated Microgravity and the Relationship to Internal Bone Strain; and (6) Bone Loss During Long Term Space Flight is Prevented by the Application of a Short Term Impulsive Mechanical Stimulus.

CASI

Calcium Metabolism; Bone Demineralization; Microgravity; Long Duration Space Flight; Gravitational Effects; Bones

19980024350 NASA Washington, Washington, DC USA

Mechanisms of Cardiopulmonary Adaptation to Microgravity, Part 2

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 93-101; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session TP1 contains short reports concerning: (1) Autonomic Regulation of Circulation and Mechanical Function of Heart at Different Stages of 14th Month Space Flight; (2) Cardiovascular Oxygen Transport in Exercising Humans in Microgravity; (3) Venous Hemodynamic Changes Assessed by Air Plethysmography During a 16-Day Space Flight; (4) Respiratory Mechanics After 180 Days Space Mission (EUROMIR'95); (5) Assessment of the Sympathetic and the Parasympathetic Nervous Activity During Parabolic Flight by Pupillary Light Reflex; and(6) Vascular Response to Different Gravity.

CASI

Microgravity; Long Duration Space Flight; Cardiovascular System; Pulmonary Functions; Adaptation; Gravitational Effects; Spacecraft Environments

19980024353 NASA Washington, Washington, DC USA

The German/Russian MIR 1997 Mission: An Overview

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 117-127; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Session TP4 includes short reports concerning: (1) Life Science Experiments During the German-Russian Mir '97 Mission; (2) Orthostatic Intolerance Following Microgravity: A Role for Autonomic Dysfunction; (3) Heart Rate Variability and Skin Blood Flow in Man During Orthostatic Stress in Weightlessness; (4) Effects of Microgravity and Lower Body Negative Pressure on Circulatory Drives from Excercising Calf Muscles; (5) The Mir Station in Its Second Decade: Crew Science Operation During Mir '97; (6) Metabolic WARD (Water, Sodium, Calcium, and Bone Metabolism) and Endocrinological Experiments During the Mir '97 Mission; (7) Long-term Monitoring of the Spine-geometry During the Mir '97 Mission: Introduction of a New Method; and (8) Effects of 20 days of Microgravity (German/Russian Mir '97 Mission) on the Mechanical and Electromyographic Characteristics of Explosive Efforts of the Lower Limbs and of Cycloergometric Exercises of Mild to Sprint-Like Intensity.

CASI

Microgravity; Mir Space Station; Life Sciences; Gravitational Effects; Weightlessness; Spacecraft Environments; Spaceborne Experiments

19980024354 NASA Washington, Washington, DC USA

Long-Duration Space Flight

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 128-134; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session WA1 includes short reports concerning: (1) Medical and Physiological Studies During 438-Day Space Flights: (2) Human Performance During a 14 Month Space Mission: (3) Homeostasis in Long-Term Microgravity Conditions; (4) Strategy of Preservation of Health of Cosmonauts in Prolonged and Superprolonged Space Flights; (5) Rehabilitation of Cosmonauts Health Following Long-Term Space Missions; and (6) Perfect Cosmonauts: Some Features of Bio-Portrait.

CASI

Microgravity; Human Performance; Space Missions; Long Duration Space Flight; Manned Space Flight; Gravitational Effects

19980024356 NASA Washington, Washington, DC USA

Technology, Part 1

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 145-158; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Session WA3 includes short reports concerning: (1) Physiolab A Cardio Vascular Laboratory; (2) MEDEX: A Flexible Modular Physiological Laboratory; (3) A Sensate Liner for Personnel Monitoring Applications; (4) Secure Remote Access to Physiological Data; (5) DARA Vestibular Equipment Onboard MIR; (6) The Kinelite Project: A New powerful Motion Analysis System for Spacelab Mission; (7) The Technical Evolution of the French Neurosciences Multipurpose Instruments Onboard the MIR Station; (8) Extended Ground-Based Research in Preparation for Life Sciences Experiments; and (9) MEDES Clinical Research Facility as a Tool to Prepare ISSA Space Flights.

CASI

Research Facilities; Space Laboratories; Spaceborne Experiments; Long Duration Space Flight

19980024359 NASA Washington, Washington, DC USA

Technology, Part 2

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 177-188; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session WP3, the discussion focuses on the following topics: Monitoring Physiological Variables With Membrane Probes; Real Time Confocal Laser Scanning Microscopy, Potential Applications in Space Medicine and Cell Biology; Optimum Versus Universal Planetary and Interplanetary Habitats; Application of Remote Sensing and Geographic Information System Technologies to the Prevention of Diarrheal Diseases in Nigeria; A Small G Loading Human Centrifuge for Space Station ERA; Use of the Bicycle Ergometer on the International Space Station and Its Influence On The Microgravity Environment; Munich Space Chair (MSC) - A Next Generation Body Restraint System for Astronauts; and Thermoelectric Human-Body Cooling Units Used by NASA Space Shuttle Astronauts.

CASI

Aerospace Medicine; Biological Effects; Bioastronautics; Physiological Effects; Manned Space Flight; Astronauts; Spaceborne Experiments; Gravitational Physiology

19980024362 NASA Washington, Washington, DC USA

Body Fluid Regulation and Hemopoiesis in Space Flight

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 217-225; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this session, Session JA2, the discussion focuses on the following topics: Bodymass and Fluid Distribution During Long-term Spaceflight with and without Countermeasures; Plasma Volume, Extracellular Fluid Volume, and Regulatory Hormones During Long-Term Space Flight; Effect of Microgravity and its Ground-Based Models on Fluid Volumes and Hemocirculatory Volumes; Seventeen Weeks of Horizontal Bed Rest, Lower Body Negative Pressure Testing, and the Associated Plasma Volume Response; Evaporative Waterloss in Space Theoretical and Experimental Studies; Erythropoietin Under Real and Simulated Micro-G Conditions in Humans; and Vertebral Bone Marrow Changes Following Space Flight.

CASI

Aerospace Medicine; Biological Effects; Physiological Effects; Aerospace Environments; Gravitational Effects; Microgravity; Manned Space Flight; Bioastronautics

19980024363 NASA Washington, Washington, DC USA

Effect of Real and Simulated Microgravity on Muscle Function

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 226-237; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session JA3, the discussion focuses on the following topics: Changes in Calf Muscle Performance, Energy Metabolism, and Muscle Volume Caused by Long Term Stay on Space Station MIR; Vibrografic Signs of Autonomous Muscle Tone Studied in Long Term Space Missions; Reduction of Muscle Strength After Long Duration Space Flights is Associated Primarily with Changes in Neuromuscular Function; The Effects of a 115-Day Spaceflight on Neuromuscular Function in Crewman; Effects of 17-Day Spaceflight on Human Triceps Surae Electrically-Evoked Contractions; Effects of Muscle Unloading on EMG Spectral Parameters; and Myofiber Wound-Mediated FGF Release and Muscle Atrophy During Bedrest.

CASI

Aerospace Medicine; Physiological Effects; Manned Space Flight; Gravitational Effects; Microgravity; Biological Effects; Long Duration Space Flight; Muscles; Bioastronautics

19980024364 NASA Washington, Washington, DC USA

Neurolab - A Space Shuttle Mission Dedicated to Neuroscience Research

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 241-249; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session JA5 includes short reports concerning: (1) NASA/NIH Neurolab Collaborations; (2) Neurolab Mission: An Example of International Cooperation; (3) Neurolab: An Overview of the Planned Scientific Investigations; (4) EDEN: A Payload for NEUROLAB, dedicated to Neuro Vestibular Research; (5) Neurolab Experiments on the Role of Visual Cues in Microgravity Spatial Orientation; and (6) The Role of Space in the Exploration of the Mammalian Vestibular System.

CASI

Visual Stimuli; Neurology; Microgravity; Space Missions; Aerospace Medicine; Gravitational Effects

19980024365 NASA Washington, Washington, DC USA

Medical, Psychophysiological, and Human Performance Problems During Extended EVA

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 250-258; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this session, Session JP1, the discussion focuses on the following topics: New Developments in the Assessment of the Risk of Decompression Sickness in Null Gravity During Extravehicular Activity; The Dynamic of Physiological Reactions of Cosmonauts Under the Influence of Repeated EVA Workouts, The Russian Experience; Medical Emergencies in Space; The Evolution from 'Physiological Adequacy' to 'Physiological Tuning'; Five Zones of Symmetrical and Asymmetrical Conflicting Temperatures on the Human Body, Physiological Consequences; Human Performance and Subjective Perception in Nonuniform Thermal Conditions; The Hand as a Control System, Implications for Hand-Finger Dexterity During Extended EVA; and Understanding the Skill of Extravehicular Mass Handling.

CASI

Aerospace Medicine; Physiological Responses; Biological Effects; Aerospace Environments; Gravitational Effects; Psychophysiology; Bioastronautics; Astronaut Performance; Extravehicular Activity

19980024366 NASA Washington, Washington, DC USA

Metabolic and Regulatory Systems in Space Flight

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 259-265; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this session, Session JP2, the discussion focuses on the following topics: The Dynamics of Blood Biochemical Parameters in Cosmonauts During Long-Term Space Flights; Efficiency of Functional Loading Test for Investigations of Metabolic Responses to Weightlessness; Human Cellular Immunity and Space Flight; Cytokine Production and Head-Down Tilt Bed Rest; Plasma and Urine Amino Acids During Human Space Flight; and DNA Fingerprinting, Applications to Space Microbiology.

CASI

Aerospace Medicine; Gravitational Effects; Biological Effects; Physiological Responses; Weightlessness; Bioastronautics; Astronaut Performance; Long Duration Space Flight; Aerospace Environments; Microbiology

19980024370 NASA Washington, Washington, DC USA

Countermeasures for Maintenance of Cardiovascular and Muscle Function in Space Flight

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 295-306; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session FA2, the discussion focuses on the following topics: Effects of Repeated Long Duration +2Gz Load on Man's Cardiovascular Function; Certain Approaches to the Development of On-Board Automated Training System; Cardiac, Arterial, and Venous Adaptation to Og during 6 Month MIR-Spaceflights with and without "Thigh Cuffs" (93-95); Space Cycle(TM) Induced Physiologic Responses; Muscular Deconditioning During Long-term Spaceflight Exercise Recommendations to Optimize Crew Performance; Structure and Function of Knee Extensors After Long-Duration Spaceflight in Man, Effects of Countermeasure Exercise Training; Force and power characteristics of an exercise ergometer designed for use in space; and The simulating of overgravity conditions for astronauts' motor apparatus at the conditions of the training for orbital flights.

CASI

Aerospace Medicine; Physiological Effects; Manned Space Flight; Gravitational Effects; Microgravity; Aerospace Environments; Biological Effects; Gravitational Physiology

19980024373 NASA Washington, Washington, DC USA

Poster Session

12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 329-346; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Poster Session, the discussion focuses on the following topics: Development of correlative measures for the assessment of attention and memory; Biodynamical Responses of the Crewmember Head/Neck System During Emergence Ejection; Fecundation in the Sky, a Ten Years Old Experiment in Microgravity; A Modified Botex Incubator as a Transport System For Developing Crickets into Space; Chromosomal Aberrations in Peripheral Lymphocytes of Cosmonauts and Astronauts after Space Flights; Method for Establishing Long term Bone Marrow; Cultures Under Microgravity Conditions Reproduction Under Simulated Weightlessness --Mammalian in vivo Experiments Under Suspension; Towards Human Movement Analysis Without the Use of Markers; Habitability Requirements For a Cogent Mars Mission; The Saucer Concept for Space Habitats; New Way In Modeling the Growth of the Organism; The Fractionation of Hydrogen and Oxygen Stable Isotopes by Life Support Systems of Space Station "MIR"; and Effect of Space Flight on Neutrophil Function.

CASI

Aerospace Medicine; Physiological Effects; Aerospace Environments; Microgravity; Biological Effects; Gravitational Effects; Weightlessness; Manned Space Flight

19980029703 NASA Johnson Space Center, Houston, TX USA

Method and Apparatus for the Collection Storage and Real Time Analysis of Blood and Other Bodily Fluids

Whitson, Peggy A., Inventor, NASA Johnson Space Center, USA; Clift, Vaughan L., Inventor, NASA Johnson Space Center, USA; Sep. 09, 1997; 8p; In English; Continuation of abandoned US-Patent-Appl-SN-247187, filed 19 May 1994

Patent Info.: Filed 26 Jan. 1996; NASA-Case-MSC-22463-1; US-Patent-5,665,238; US-Patent-Appl-SN-605300; US-Patent-Appl-SN-247187; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

The present invention provides an apparatus for separating a relatively large volume of blood into cellular and acellular fractions without the need for centrifugation. The apparatus comprises a housing divided by a fibrous filter into a blood sample collection chamber having a volume of at least about 1 milliliter and a serum sample collection chamber. The fibrous filter has a pore size of less than about 3 microns, and is coated with a mixture of mannitol and plasma fraction protein (or an animal or vegetable equivalent thereof). The coating causes the cellular fraction to be trapped by the small pores, leaving the cellular fraction intact on the fibrous filter while the acellular fraction passes through the filter for collection in unaltered form from the serum sample collection chamber.

Official Gazzette of the U.S. Patent and Trademark

Blood; Inventions; Patents; Centrifuging; Fibers; Filtration

19980031512 Mississippi Univ., Depts. of Surgery (Otolaryngology) and Anatomy, Jackson, MS USA

Otolith-Canal Convergence in Vestibular Nuclei Neurons ***Final Report***

Dickman, J. David, Mississippi Univ., USA; 1996; 17p; In English

Contract(s)/Grant(s): NAG2-786

Report No.(s): NASA/CR-97-206685; NAS 1.26:206685; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During manned spaceflight, acute vestibular disturbances often occur, leading to physical duress and a loss of performance. Vestibular adaptation to the weightless environment follows within two to three days yet the mechanisms responsible for the disturbance and subsequent adaptation are still unknown In order to understand vestibular system function in space and normal earth conditions the basic physiological mechanisms of vestibular information co coding must be determined. Information processing regarding head movement and head position with respect to gravity takes place in the vestibular nuclei neurons that receive signals From the semicircular canals and otolith organs in the vestibular labyrinth. These neurons must synthesize the information into a coded output signal that provides for the head and eye movement reflexes as well as the conscious perception of the body in three-dimensional space The current investigation will for the first time. determine how the vestibular nuclei neurons quantitatively synthesize afferent information from the different linear and angular acceleration receptors in the vestibular labyrinths into an integrated output signal. During the second year of funding, progress on the current project has been focused on the anatomical orientation of semicircular canals and the spatial orientation of the innervating afferent responses. This information is necessary in order to understand how vestibular nuclei neurons process the incoming afferent spatial signals particularly with the convergent otolith afferent signals that are also spatially distributed Since information from the vestibular nuclei is presented to different brain regions associated with differing reflexive and sensory functions it is important to understand the computational mechanisms used by vestibular neurons to produce the appropriate output signal.
Author
Vestibules; Neurons; Nuclear Chemistry; Brain; Data Processing; Otolith Organs; Weightlessness

19980032332 NASA Marshall Space Flight Center, Huntsville, AL USA
Apparatus for Assisting Childbirth
Smeltzer, Stanley S., III, Inventor, NASA Marshall Space Flight Center, USA; Lawson, Seth W., Inventor, NASA Marshall Space Flight Center, USA; Jul. 22, 1997; 3p; In English
Patent Info.: Filed 6 Dec. 1994; NASA-Case-MFS-28973-1; US-Patent-5,649,934; US-Patent-Appl-SN-351862; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche
The invention consists of novel, scissors-like forceps in combination with optical monitoring hardware for measuring the extraction forces on a fetal head. The novel features of the forceps together with knowledge of real time forces on the fetal head enable a user to make a much safer delivery for mother and baby.
Official Gazzette of the U.S. Patent and Trademark
Inventions; Extraction; Birth; Fetuses

19980034677 Brown Univ., Inst. for Brain and Neural Systems, Providence, RI USA
The Effect of Dynamic Synapses on Spatio-Temporal Receptive Fields in Visual Cortex
Artun, Omer B., Brown Univ., USA; Shouval, Harel Z., Brown Univ., USA; Cooper, Leon N., Brown Univ., USA; Dec. 08, 1997; 13p; In English
Report No.(s): AD-A333497; TR-78; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Temporal dynamics are a well known feature of synaptic transmission. Recently temporal dynamics of synaptic transmission has been reported in neocortex. Here we examine the possible effects of these dynamics on the spatio-temporal receptive fields of simple cells in 6. We do this by examining a simple model of a cortical neuron that depends on an oriented thalamocortical projection. In our model, the receptive field (RF) structure is encoded either as a structured presynaptic probability of release or as a structured postsynaptic efficacy. We show that these different assumptions about the origin of receptive field structure lead to very different spatio-temporal dynamics. The structured efficacy model (SE) leads to tuning curves that are unimodal, and although the response magnitude changes in time, the preferred orientation does not. On the other hand, the structured probability model (PR) leads to tuning curves which are not unimodal and change their preferred orientation in time. We show that the temporal code induced by the dynamic synapses can be used for distinguishing between different input that induce the same average firing rate.
DTIC
Neurons; Radio Frequencies; Synapses

53
BEHAVIORAL SCIENCES

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

19980024343 NASA Washington, Washington, DC USA
Cognitive Sciences
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 28-37; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session MP4 includes short reports on: (1) Face Recognition in Microgravity: Is Gravity Direction Involved in the Inversion Effect?; (2) Motor Timing under Microgravity; (3) Perceived Self-Motion Assessed by Computer-Generated Animations: Complexity and Reliability; (4) Prolonged Weightlessness Reference Frames and Visual Symmetry Detection; (5) Mental Representation of Gravity During a Locomotor Task; and (6) Haptic Perception in Weightlessness: A Sense of Force or a Sense of Effort?
CASI
Spacecraft Environments; Microgravity; Cognition

19980024347 NASA Washington, Washington, DC USA
Visuo-Vestibular Interactions
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 67-75; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session TA3 includes short reports covering: (1) Vestibulo-Oculomotor Interaction in Long-Term Microgravity; (2) Effects of Weightlessness on the Spatial Orientation of Visually Induced Eye Movements; (3) Adaptive Modification of the Three-Dimensional Vestibulo-Ocular Reflex during Prolonged Microgravity; (4) The Dynamic Change of Brain Potential Related to Selective Attention to Visual Signals from Left and Right Visual Fields; (5) Locomotor Errors Caused by Vestibular Suppression; and (6) A Novel, Image-Based Technique for Three-Dimensional Eye Measurement.
CASI
Weightlessness; Gravitational Effects; Spacecraft Environments; Aerospace Medicine; Vestibular Nystagmus; Eye (Anatomy)

19980024349 NASA Washington, Washington, DC USA
Cultural and Gender Issues in Long-Duration Flights
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 86-92; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session TA5 includes short reports concerning: (1) Psychological Issues During Long-Duration International Space Missions; (2) Psychosocial Issues in Crew Selection: Finding the Right Mix of the Right Stuff; (3) Culture, Gender and Mission Accomplishment: Operational Experience; (4) Interpersonal Tension in Multicultural Crews; (5) Personality and Coping in Extreme Environments; and (6) Application of Expedition and Polar Work Group Findings for Enhancing Performance in Space.
CASI
Long Duration Space Flight; Psychological Effects; Culture (Social Sciences); Sex Factor

19980024352 NASA Washington, Washington, DC USA
Posture and Movement
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 109-116; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session TP3 includes short reports on: (1) Modification of Goal-Directed Arm Movements During Inflight Adaptation to Microgravity; (2) Quantitative Analysis of Motion control in Long Term Microgravity; (3) Does the Centre of Gravity Remain the Stabilised Reference during Complex Human Postural Equilibrium Tasks in Weightlessness?; and (4) Arm End-Point Trajectories Under Normal and Microgravity Environments.
CASI
Adaptation; Human Performance; Microgravity; Gravitational Effects; Spacecraft Environments

19980024357 NASA Washington, Washington, DC USA
Human Behaviour in Long-Term Missions
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 159-169; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session WP1, the discussion focuses on the following topics: Psychological Support for International Space Station Mission; Psycho-social Training for Man in Space; Study of the Physiological Adaptation of the Crew During A 135-Day Space Simulation; Interpersonal Relationships in Space Simulation, The Long-Term Bed Rest in Head-Down Tilt Position; Psychological Adaptation in Groups of Varying Sizes and Environments; Deviance Among Expeditioners, Defining the Off-Nominal Act in Space and Polar Field Analogs; Getting Effective Sleep in the Space-Station Environment; Human Sleep and Circadian Rhythms are Altered During Spaceflight; and Methodological Approach to Study of Cosmonauts Errors and Its Instrumental Support.
CASI
Aerospace Medicine; Physiological Responses; Bioastronautics; Aerospace Environments; Gravitational Physiology; Space Psychology; Manned Space Flight; Psychological Effects; Biological Effects

19980024371 NASA Washington, Washington, DC USA
Results from the Joint US/Russian Sensory-Motor Investigations
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 307-320; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session FA3, the discussion focuses on the following topics: The Effect of Long Duration Space Flight on the Acquisition of Predictable Targets in Three Dimensional Space; Effects of Microgravity on Spinal Reflex Mechanisms; Three Dimensional Head Movement Control During Locomotion After Long-Duration Space Flight; Human Body Shock Wave Transmission Properties After Long Duration Space Flight; Adaptation of Neuromuscular Activation Patterns During Locomotion After Long Duration Space Flight; Balance Control Deficits Following Long-Duration Space Flight; Influence of Weightlessness on Postural Muscular Activity Coordination; and The Use of Inflight Foot Pressure as a Countermeasure to Neuromuscular Degradation.
CASI
Aerospace Medicine; Biological Effects; Physiological Effects; Aerospace Environments; Gravitational Effects; Microgravity; Long Duration Space Flight; Sensorimotor Performance

19980025549 Brown Univ., Inst. for Brain and Neural Systems, Providence, RI USA
Receptive Field Formation in Natural Scene Environments: Comparison of Single Cell Learning Rules
Blais, Brian S., Brown Univ., USA; Intrator, N., Brown Univ., USA; Shouval, H., Brown Univ., USA; Cooper, Leon N., Brown Univ., USA; Dec. 10, 1997; 20p; In English
Report No.(s): AD-A333495; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We study several statistically and biologically motivated learning rules using the same visual environment, one made up of natural scenes, and the same single cell neuronal architecture. This allows us to concentrate on the feature extraction and neuronal coding properties of these rules. Included in these rules are kurtosis and skewness maximization, the quadratic form of the BCM learning rule, and single cell ICA. Using a structure removal method, we demonstrate that receptive fields developed using these rules depend on a small portion of the distribution. We find that the quadratic form of the BCM rule behaves in a manner similar to a kurtosis maximization rule when the distribution contains kurtotic directions, although the BCM modification equations are computationally simpler.
DTIC
Cells (Biology); Cell Membranes (Biology); Neurophysiology; Pattern Recognition

19980032954 Veterans Administration Hospital, National Center for Post-Traumatic Stress Disorder, White River Junction, VT USA
PILOTS Database Instruments Authority List
Lerner, F., Compiler, Veterans Administration Hospital, USA; Nov. 1997; 162p; In English
Report No.(s): PB98-116825; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report lists all projective tests, self-report questionnaires, structured interviews, and other instruments that have been used in paper indexed in the PILOTS database, an electronic index to published literature on post-traumatic stress disorder and other mental health sequelae of exposure to traumatic events. Bibliographic citations are provided for most instruments.
NTIS
Data Bases; Mental Health

19980033350 State Univ. of New York, Cognitive and Psycholinguistic Dept., Binghamton, NY USA
Perception of Auditory Events: Attentional Limitations ***Final Report, 1 Jul. 1993 - 30 Jun. 1997***
Pastore, Richard, State Univ. of New York, USA; Jun. 1997; 10p; In English
Contract(s)/Grant(s): F49620-93-I-0327; AF Proj. 3484
Report No.(s): AD-A334779; AFRL-SR-BL-TR-98-0062; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The research supported under the parent grant investigated the nature and integration of auditory features which are assumed to be extracted at lower levels of all perceptual processing. The next level of perceptual processing, and the classes of perceptual errors, are well documented for vision, but have not been examined for audition. The AASERT research was based upon findings from the parent project, but investigated perceptual processes which are complimentary and supplement t he focus of the parent project. Because feature integration processes are very sensitive to the availability of attentional resources, and limits on those resources, the investigated perceptual processes are extremely critical to applied situation where stress and task demands may be great and where errors are costly. In addition to conduct of meaningful basic research (with significant, practical human factors implications), the project provided important training opportunities for future scientists.
DTIC
Human Factors Engineering; Perceptual Errors; Auditory Perception; Auditory Defects

19980033539 Mayo Clinic, Div. of Preventive Medicine and Cardiovascular Disease, Rochester, MN USA
Psychophysiological Readiness and Sustainability
Hickman, J. R., Jr., Mayo Clinic, USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 14p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

As the NATO alliance enters into a new era, with new roles and new missions, a new R&D structure will emerge. AGARD has been a splendid organization, existing at the heart of the alliance. It seems that NATO must now move beyond an information sharing and advisory role to a sponsor of multinational scientific projects. It is time to take advantage of the combined sample size in order to reach significant conclusions sooner and with greater confidence. It is time to organize our centers of excellence into a collaborative mode in order to assure that the human subsystem is both affordable and effective. In several key areas of aerospace medical research, there is no alternative to the NATO sponsored multinational project.
Derived from text
North Atlantic Treaty Organization (NATO); Research and Development; Aerospace Medicine; Psychophysiology

19980036869 Colorado Univ., Dept. of Psychology, Boulder, CO USA
Optimizing the Long-Term Retention of Skills: Structural and Analytic Approaches to Skill Maintenance ***Annual Report, May 1992 - Apr. 1993***
Healy, Alice F., Colorado Univ., USA; Aug. 1997; 26p; In English
Contract(s)/Grant(s): MDA903-90-K-0066
Report No.(s): AD-A336077; ARI-RN-97-18; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Progress has been made on the topics of tank gunner skills, Morse code reception, color naming, instrument panel scanning, tests of the procedural reinstatement framework, mental calculation, memory for instances of categories, target detection, data entry, aspects of memory for lists, aspects of memory for course schedules, and vocabulary retention.
DTIC
Optimization; Morse Code; Scanning; Abilities

19980036871 George Mason Univ., Fairfax, VA USA
Examining the Effects of Cognitive Consistency Between Training and Displays ***Final Report, Jun. 1992 - Jan. 1996***
Adelman, Leonard, George Mason Univ., USA; Christian, Matthew, System Planning Corp., USA; Gualtieri, James, Enzian Technology, Inc., USA; Johnson, Karen, George Mason Univ., USA; Aug. 1997; 67p; In English
Contract(s)/Grant(s): MDA903-92-K-0134
Report No.(s): AD-A336087; ARI-RN-97-28; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This experiment tested the display cognitive consistency hypothesis. This hypothesis states that the effectiveness of a display format for decision aiding systems, like Patriot, depends on the consistency between how the system displays its reasoning process and how the person is processing the information. Results of an experiment using a simulated Army air defense task and college students found support for the hypothesis, but only at a situation specific, not global, level. Although unexpected, these results

were consistent with other research performed on this contract, indicating the importance of situation specific context for understanding judgment and decision processes in individual and group settings.
DTIC
Human Factors Engineering; Visual Perception; Cognition; Display Devices; Education; Decision Making; Human-Computer Interface

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19980024351 NASA Washington, Washington, DC USA
Human Factors Research Under Ground-Based and Space Conditions, Part 1
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 102-108; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Session TP2 includes short reports concerning: (1) Human Factors Engineering of the International space Station Human Research Facility; (2) Structured Methods for Identifying and Correcting Potential Human Errors in Space operation; (3) An Improved Procedure for Selecting Astronauts for Extended Space Missions; (4) The NASA Performance Assessment Workstation: Cognitive Performance During Head-Down Bedrest; (5) Cognitive Performance Aboard the Life and Microgravity Spacelab; and (6) Psychophysiological Reactivity Under MIR-Simulation and Real Micro-G.
CASI
Human Factors Engineering; Mental Performance; Microgravity; Gravitational Effects; Astronaut Performance

19980024358 NASA Washington, Washington, DC USA
Human Factors Research Under Ground-Based and Space Conditions, Part 2
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 170-176; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this session, Session WP2, the discussion focuses on the following topics: Training Astronauts Using Three-Dimensional Visualizations of the International Space Station; Measurement and Validation of Bidirectional Reflectance of Shuttle and Space Station Materials for Computerized Lighting Models; Effects of Environmental Color on Mood and Performance of Astronauts in ISS; Psychophysical Measures of Motion and Orientation, Implications for Human Interface Design; and the Sopite Syndrome Revisited, Drowsiness and Mood Changes in Student Aviators.
CASI
Aerospace Medicine; Manned Space Flight; Astronaut Training; Bioastronautics; Aerospace Environments; Gravitational Effects; Microgravity; Space Psychology

19980024361 NASA Washington, Washington, DC USA
Studies Relating to EVA
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 205-216; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session JA1, the discussion focuses on the following topics: The Staged Decompression to the Hypobaric Atmosphere as a Prophylactic Measure Against Decompression Sickness During Repetitive EVA; A New Preoxygenation Procedure for Extravehicular Activity (EVA); Metabolic Assessments During Extra-Vehicular Activity; Evaluation of Safety of Hypobaric Decompressions and EVA From Positions of Probabilistic Theory; Fatty Acid Composition of Plasma Lipids and Erythrocyte Membranes During Simulation of Extravehicular Activity; Biomedical Studies Relating to Decompression Stress with Simulated EVA, Overview; The Joint Angle and Muscle Signature (JAMS) System - Current Uses and Future Applications; and Experimental Investigation of Cooperative Human-Robotic Roles in an EVA Work Site.
CASI
Extravehicular Activity; Manned Space Flight; Aerospace Medicine; Biological Effects; Physiological Effects; Aerospace Environments; Metabolism

19980032583 NASA Ames Research Center, Moffett Field, CA USA

Autogenic-Feedback Training Exercise (AFTE) Method and System

Cowings, Patricia S., Inventor, NASA Ames Research Center, USA; Dec. 09, 1997; 40p; In English

Patent Info.: Filed 3 Oct. 1995; NASA-Case-ARC-14048-1-GE; US-Patent-5,694,939; US-Patent-Appl-SN-543093; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

The Autogenic-Feedback Training Exercise (AFTE) method of the present invention is a combined application of physiologic and perceptual training techniques. such as autogenic therapy and biofeedback. This combined therapy approach produces a methodology that is appreciably more effective than either of the individual techniques used separately. The AFTE method enables sufficient magnitude of control necessary to significantly reduce the behavioral and physiologic reactions to severe environmental stressors. It produces learned effects that are persistent over time and are resistant to extinction and it can be administered in a short period of time. The AFTE method may be used efficiently in several applications, among which are the following: to improve pilot and crew performance during emergency flying conditions; to train people to prevent the occurrence of nausea and vomiting associated with motion and sea sickness, or morning sickness in early pregnancy; as a training method for preventing or counteracting air-sickness symptoms in high-performance military aircraft; for use as a method for cardiovascular training, as well as for multiple other autonomic responses, which may contribute to the alleviation of Space Motion Sickness (SMS) in astronauts and cosmonauts; training people suffering from migraine or tension headaches to control peripheral blood flow and reduce forehead and/or trapezius muscle tension; training elderly people suffering from fecal incontinence to control their sphincter muscles; training cancer patients to reduce the nauseagenic effects of chemotherapy; and training patients with Chronic Intestinal Pseudo-obstruction (CIP).

Official Gazzette of the U.S. Patent and Trademark

Aerospace Medicine; Biofeedback; Cardiovascular System; Education; Human Performance; Motion Sickness; Pilot Performance; Sicknesses

19980033531 Smiths Industries Aerospace and Defence Systems Ltd., Cheltenham, UK

Aspects of the Crew Interface for Mission Systems

Ovenden, C. R., Smiths Industries Aerospace and Defence Systems Ltd., UK; Wykes, K. M., British Aerospace Defence Ltd., UK; Semple, W. G., British Aerospace Defence Ltd., UK; Normanton, T. H., Smiths Industries Aerospace and Defence Systems Ltd., UK; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 6p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The challenge for future mission systems is to produce affordable solutions that provide the desired levels of operational effectiveness. This will be achieved by a system that enables the operator to be in ultimate control of the mission system through a manageable workload and an appropriate level of situational awareness. The crew interface is therefore vital to exploiting the full capabilities of the platform under control. The crew interface can be enhanced by the thoughtful application of technology. to be affordable however, the technology must be carefully matched with requirements. At all stages of the design, including research phases, consideration has to be given to a careful harmonisation of the capabilities of the human, the hardware and the software. To be effective, the design must evolve from the beginning through co-operation between the designers, the implementors and the users. Recognizing the benefits of extending this approach into the research phase, a collaboration has been established between British Aerospace Military Aircraft and Smiths Industries Aerospace to explore aspects of the crew interface for mission systems. This paper discusses the goals for an affordable and effective future mission system and the approach being taken to achieve these goals.

Derived from text

System Effectiveness; Crews; Human-Computer Interface; Computer Programs; Workloads (Psychophysiology)

19980033538 British Aerospace Defence Ltd., Preston, UK

Cockpit Usability - A Design Checklist

Turner, John, British Aerospace Defence Ltd., UK; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 8p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

'Usability' represents the degree of help or hindrance provided to the pilot or crew member as they attempt to complete the operational missions with which they may be tasked; it also acknowledges the financial/technological realities against which designs are developed. The factors which impact cockpit and system usability, some of the steps necessary to achieve it, and suggested items for inclusion in a usability design checklist are discussed.

Derived from text

Cockpits; Pilots; Crews; Constraints

19980033540 Armstrong Lab., Crew Systems Directorate, Wright-Patterson AFB, OH USA

The Shape of Things to Come: Revolution in Engineering Anthropometry

Robinette, Kathleen M., Armstrong Lab., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 8p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Even after discovering the world was not flat, map makers were limited to representing our three-dimensional(3-D) world on a flat piece of paper. This was fine for small regions. For large regions, however, distortions became obvious; continents were misshapen, enlarged or shrunken. Like the earth, the human body is covered with ridges, hills and valleys and is anything but flat. Scientists attempting to map the body face the same difficulty with distortions that cartographers do. For engineering purposes, researchers measure the 3-D body, but until now they have used only one- or two-dimensional tools. They have been forced to change back and forth from 3-D to 2-D to create the products. This paper describes the design impact of the limitations with traditional tools for human body measurement and illustrates the future potential of 3-D surface anthropometry technology on the engineering of aerospace systems.

Derived from text

Aerospace Systems; Anthropometry; Continents; Exploration

19980034830 Bochum Univ., Germany

Advances in Multimedia and Simulation: Human-Machine-Interface Implications

Holzhausen, Klaus Peter, Editor, Bochum Univ., Germany; Nov. 19, 1997; 488p; In English, 6-7 Nov. 1997, Bochum, Germany Contract(s)/Grant(s): F61708-97-W-0264

Report No.(s): AD-A333501; CSP-97-1070; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

The Final Proceedings for Advances in Multimedia and Simulation, 6 November 1997 - 7 November 1997 Multimedia in Information Systems, Multimedia applications in Higher Education, Multimedia applications in Architecture, Videoconferencing including Multimedia, Teleoperation in Virtual Reality, Multimedia and Virtual Environment, Modeling and Simulation of Ground Vehicles, Simulation in Traffic Environment, Flight and Air Traffic Control Simulation, Underwater Simulation, Factory Simulation, Simulation of Medical Systems, Power Plant Simulation and Training, Military and Government Simulation.

DTIC

Air Traffic Control; Control Simulation; Environment Simulation; Industrial Plants; Systems Simulation; Teleconferencing; Teleoperators; Video Communication; Virtual Reality

19980035014 Flight Test Squadron (40th), DOOB, Eglin AFB, FL USA

Reduction of Aircrew Workload Through the Use of INS/GPS While Employing Standoff Weapons

Stolz, Earl W., Flight Test Squadron (40th), USA; Kosan, Keith J., Flight Test Squadron (40th), USA; Dec. 1997; 12p; In English; Also announced as 19980035004; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Modern fighter aircraft are capable of unprecedented attack accuracy. However, the risk associated with close-in delivery against well-defended targets is often high. As a result, current tactics call for delivery of precision-guided munitions from increased standoff ranges. The AGM-130 was designed to fill this need. The AGM-130 evolved from the GBU-15 family of glide bombs and is equipped with a rocket motor to increase standoff range. With the increase in launch ranges came an increased workload due to difficulty locating targets within the seeker's Field of View (FOV). A launch heading offset or crosswind could require the Weapon Systems Officer (WSO) to scan a large area to locate both the target itself and any required waypoints. The MidCourse Guidance (MCG) program is an enhancement designed to address this difficulty by decreasing workload with an autonomous guidance capability in the midcourse portion of the flight and the ability to point the seeker at the target. The objective of the AGM-130 MCG test program is to evaluate the benefits associated with reduction of aircrew workload with the introduction of an Inertial Navigation System (INS) that is position- and velocity-aided by the Global Positioning System (GPS). This paper will discuss flight test techniques and results obtained from the Phase I test program, which focused on initial integration efforts using profiles to attack vertical targets. Phase 11 will address the capability to attack horizontal targets and is currently being tested. A secondary objective of demonstrating the advantages of guidance using Wide Area GPS Enhancement (WAGE) corrections was also accomplished. Testing involved a series of ground functional tests, captive carries in which the aircraft flew the weapon's profile, and three live launches. The stated goal of the MCG program is to ensure that the target appears in the seeker's wide FOV at 15 seconds time-to-go 95% of the time. In all cases this criteria was met. Additionally, the target was within the narrow FOV 100% of the time. Using the Subjective Workload Assessment Technique (SWAT) in a head-to-head comparison with a non-MCG-guided AGM-130, a 25% reduction of WSO workload was demonstrated. Subjective assessments of the value of the MCG modification were made using aircrew questionnaires and a modified Cooper-Harper Scale.

Author

Flight Crews; Fighter Aircraft; Workloads (Psychophysiology); Global Positioning System; Field of View; Distance

19980036975 Georgia Inst. of Tech., School of Industrial and Systems Engineering, Atlanta, GA USA
Pilot Non-Conformance to Alerting System Commands ***Final Report, 1 Jul. - 31 Dec. 1997***
Pritchett, Amy, Georgia Inst. of Tech., USA; 1997; 4p; In English
Contract(s)/Grant(s): NAG 2-1146
Report No.(s): NASA/CR-97-207659; NAS 1.26:207659; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This research project examined the effects of consonance between cockpit displays and alerting system as a technique to encourage pilots to conform to alerting system commands. An experiment used the task of collision avoidance during closely spaced parallel approaches as a case study, building upon previous experiments which identified instances of non-conformance and conflicts between the alerting criteria preferred by pilots, compared to that used by alerting systems. Using a workstation based, part-task simulator, each of 45 subjects completed 45 experiment runs. In each run, the subjects were told they were flying an approach. Their primary task was to keep their wings level despite turbulence through the use of a sidestick. The sidestick commands did not affect the path of the aircraft, however, so that consistent approach paths were be followed. Their secondary task was to indicate when an aircraft on a parallel approach is blundering towards them, as evidenced by the traffic display. Subjects were asked to press different buttons indicating whether they feel an avoidance maneuver is required by the traffic situation or not. At the completion of each run, subjects were asked to rate their confidence in their decision and, if appropriate, to rate the timeliness of automatic alerts when had been given. Three different automatic alert conditions were tested. The ”No Automatic Alerts Given” condition is self-explanatory. In the ”Automatic Alerts Based on NTZ Criteria” condition, an automatic alert was given when the NTZ criteria was triggered; this criteria is consistent with subject reactions in other studies, in which subjects were found to react, on average, when the other aircraft was 1350 min to the side of the own aircraft. In the ”Automatic Alerts Based on MIT Criteria” condition, an automatic alert was given when the MIT criteria was triggered; this criteria was developed by Carpenter and Kuchar for parallel approaches to have better performance, at the cost of increased complexity and higher sensitivity to pilot non-conformance. Three displays were tested. The ”Baseline Display” is based on a moving map display, with a top-down view, track-up orientation, iconic presentation of the other aircraft’s positions and a text presentation of the other aircraft’s altitude. The ”NTZ Alert Criteria Shown” display added to the Baseline Display an explicit presentation on the display of the boundary delineating the NTZ criteria, allowing for quick comparison of the other aircraft’s position relative to this alert criteria. Likewise, the ”MIT Alert Criteria Shown” display added to the Baseline Display an explicit presentation on the display of the boundary delineating the MIT criteria, allowing for quick comparison of the other aircraft’s position relative to this alert criteria The test matrix for this experiment was three dimensional, varying displays, alerts and traffic conflict scenarios.
Derived from text
Research and Development; Collision Avoidance; Display Devices; Simulators; Cockpits

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

19980031982 Odyssey Research Associates, Inc., Ithaca, NY USA
Formal Specification of a Flight Guidance System ***Final Report***
Fung, Francis, Odyssey Research Associates, Inc., USA; Jamsek, Damir, Odyssey Research Associates, Inc., USA; Jan. 1998; 101p; In English
Contract(s)/Grant(s): NAS1-20335; RTOP 519-30-31-01
Report No.(s): NASA/CR-1998-206915; NAS 1.26:206915; TR-97-0042; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This document contains a formal specification for the mode logic of a Flight Guidance System (FGS) and a discussion of issues raised by writing the formal specification. A flight guidance system is an example of life-critical code; this project aims to demonstrate the effectiveness of formal methods in the requirements analysis and design of life-critical systems.
Derived from text
Flight Control; Control Theory; Aircraft Control; Functional Design Specifications

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing. For components see 33 Electronics and Electrical Engineering.

19980027039 NERAC, Inc., Tolland, CT USA
Embedded Memories. (Latest citations from the Ei Compendex*Plus database)
Jan. 1998; In English; Page count unavailable.
Report No.(s): PB98-851942; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning architecture and testing of embedded memories and devices. Embedded dynamic and static random access memories are discussed. Topics include built in self tests, very large scale integration chips, multigigabit memory chip design, programmable read only memory, digital data and image storage, recurrent neural networks, and memory defects. References also review applications in the design and manufacture of semiconductor devices, integrated circuits, ferroelectric devices, and programmable gate arrays. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Random Access Memory; Architecture (Computers); Performance Tests

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

19980021257 Illinois Univ., Coordinated Science Lab., Urbana-Champaign, IL USA
An Analysis of Failure Handling in Chameleon, A Framework for Supporting Cost-Effective Fault Tolerant Services
Haakensen, Erik Edward, Illinois Univ., USA; Feb. 1998; 58p; In English
Contract(s)/Grant(s): DABT63-94-C-0045; NAG1-613
Report No.(s): NASA/CR-1998-207447; NAS 1.26:207447; UILU-ENG-98-2204; CRHC-98-01; Copyright Waived (NASA); Avail: CASI; A04, Hardcopy; A01, Microfiche

The desire for low-cost reliable computing is increasing. Most current fault tolerant computing solutions are not very flexible, i.e., they cannot adapt to reliability requirements of newly emerging applications in business, commerce, and manufacturing. It is important that users have a flexible, reliable platform to support both critical and noncritical applications. Chameleon, under development at the Center for Reliable and High-Performance Computing at the University of Illinois, is a software framework. for supporting cost-effective adaptable networked fault tolerant service. This thesis details a simulation of fault injection, detection, and recovery in Chameleon. The simulation was written in C++ using the DEPEND simulation library. The results obtained from the simulation included the amount of overhead incurred by the fault detection and recovery mechanisms supported by Chameleon. In addition, information about fault scenarios from which Chameleon cannot recover was gained. The results of the simulation showed that both critical and noncritical applications can be executed in the Chameleon environment with a fairly small amount of overhead. No single point of failure from which Chameleon could not recover was found. Chameleon was also found to be capable of recovering from several multiple failure scenarios.
Author
Reliability; Low Cost; Computer Systems Design; Cost Effectiveness; Fault Tolerance; Fault Detection

19980024238 Rutherford Appleton Lab., Dept. for Computation and Information, Chilton, UK
A Linesearch Algorithm with Memory for Unconstrained Optimization
Gould, Nicholas I. M., Rutherford Appleton Lab., UK; Lucidi, Stefano, La Sapienza Univ., Italy; Roma, Massimo, La Sapienza Univ., Italy; Toint, Philippe L., Facultes Univ. Notre-Dame de la Paix, Belgium; Jan. 1998; ISSN 1358-6254; 14p; In English
Contract(s)/Grant(s): MURST-ROM/889/95/53
Report No.(s): RAL-TR-98-003; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0QX, UK), Hardcopy, Microfiche

This paper considers algorithms for unconstrained nonlinear optimization where the model used by the algorithm to represent the objective function explicitly includes memory of the past iterations. This is intended to make the algorithm less ”myopic” in

the sense that its behaviour is not completely dominated by the local nature of the objective function, but rather by a more global view. We present a non-monotone linesearch algorithm that has this feature and prove its global convergence.
Author
Algorithms; Optimization; Iteration; Mathematical Models; Nonlinearity

19980025550 Arizona State Univ., Dept. of Computer Science, Tempe, AZ USA
Assessing PCTE, CORBA and the WWW ***Final Report, 15 May 1996 - 14 May 1997***
Lindquist, Timothy E., Arizona State Univ., USA; May 01, 1997; 4p; In English
Contract(s)/Grant(s): N00014-96-I-0900
Report No.(s): AD-A333491; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The purpose of ASU's work in this project was to examine the relative positioning of the three technologies, PCTE/PCIS, OMG CORBA and the Internet/java/WWW. Additionally, we sought to identify future directions in the context of a PCIS-II joint international project. One aspect of this work was to provide an assessment of current commercial PCTE implementations and to uncover the relationships among PCTE/PCIS, OMG CORBA and the Internet/java. This activity further extended the life-cycle process work done on the PCIS project by considering automated support for distributed software engineering processes. We have begun to outline future directions for development and use of these technologies (CORBA, Java, PCTE and automated support for distributed software processes). ASU has generated four papers, which embody the recommendation and assessments of this technology. In each case, the papers are backed by exploratory hands-on work with the underlying technologies. This has included usage of CORBA implementations, exploring aspects of the Java and JavaBeans API's and developing a Java Internet based process interoperability demonstrator tool suite.
DTIC
Internets; Software Engineering; World Wide Web

19980025554 Naval Postgraduate School, Monterey, CA USA
Utilizing Web-Based Technology to Design and Implement a Conference Information System
Kinney, Todd M., Naval Postgraduate School, USA; Sep. 1997; 196p; In English
Report No.(s): AD-A333480; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The focus is the design and implementation of a web-based information system for the Asilomar Conference on Signals, Systems and Computers. This technical conference specializes in signal and image processing, communications, sensor systems, and computer hardware and software. Organized in collaboration with the Naval Postgraduate School, San Jose State University, and the IEEE Signal Processing Society, the Conference is conducted annually at the Asilomar Conference Facility in Pacific Grove, California. Initial project efforts concentrated on article submissions and system administration (i.e., database management). The article review process and overall implementation of the improved system is the focus of this thesis. The objectives of this thesis are to: (1) Analyze the article review process of the Asilomar Conference, (2) Implement a World Wide Web (WWW) based article review process.
DTIC
Data Base Management Systems; Information Systems; World Wide Web; Information Transfer; Internets

19980027041 Michigan Univ., Ann Arbor, MI USA
Characterization of Particle Assemblies Through Digital Image Processing ***Final Report, 1 Oct. 1996 - 30 Sep. 1997***
Hryciw, Roman D., Michigan Univ., USA; Ghalib, Ali, Michigan Univ., USA; Dec. 24, 1997; 16p; In English
Contract(s)/Grant(s): F49620-96-I-0468
Report No.(s): AD-A334849; UMCEE-97-19; AFRL-SR-BL-TR-98-0039; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Imaging techniques are proving to be a viable alternative to mechanical sieving for determination of soil grain size distribution. While such distributions are relatively easily obtained when the soil grains are non-contacting, interpretation of in-situ images of contacting grains (assemblies) is considerably more difficult. As such, two approaches were developed for interpreting such images including: edge detection and completion by Hough transforms with active contouring; and pixel density analysis. A reasonably precise measure of grain size can be obtained using circular Hough transforms in conjunction with active contouring. However, the method is computationally very intensive and has only been tested on highly idealized assemblies of soil grains. Edge pixel densities (EPD) and their coefficients of variation with increasing sampling window size provide a rapid means for assessing grain size and uniformity and for detection of soil interfaces within an image.
DTIC
Grain Size; Size Distribution; Image Processing; Digital Data; Particulates

19980027712 West Virginia Univ., Software Research Lab., Fairmont, WV USA
A Case Study of 4 & 5 Cost Effectiveness
Neal, Ralph D., West Virginia Univ., USA; McCaugherty, Dan, Intermetrics, Inc., USA; Joshi, Tulasi, Fairmont State Coll., USA; Callahan, John, West Virginia Univ., USA; Jul. 14, 1997; 11p; In English
Contract(s)/Grant(s): NCC2-979; NCCw-40
Report No.(s): NASA/CR-97-207037; NAS 1.26:207037; NASA-IVV-97-007; WVU-IVV-97-007; WVU-CS-TR-97-010; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper looks at the Independent Verification and Validation (IV&V) of NASA's Space Shuttle Day of Launch I-Load Update (DoLILU) project. IV&V is defined. The system's development life cycle is explained. Data collection and analysis are described. DoLILU Issue Tracking Reports (DITRs) authored by IV&V personnel are analyzed to determine the effectiveness of IV&V in finding errors before the code, testing, and integration phase of the software development life cycle. The study's findings are reported along with the limitations of the study and planned future research.
Author
Cost Effectiveness; Proving; Life (Durability); Data Acquisition; Launch Dates

19980028487 West Virginia Univ., Software Research Lab., Fairmont, WV USA
A Taxonomy of Object-Oriented Measures Modeling the Object Oriented Space ***Final Report***
Neal, Ralph D., West Virginia Univ., USA; Weistroffer, H. Roland, Virginia Commonwealth Univ., USA; Coppins, Richard J., Virginia Commonwealth Univ., USA; Jul. 02, 1997; 13p; In English
Contract(s)/Grant(s): NCC2-979; NCCw-40
Report No.(s): NASA/CR-97-207035; NAS 1.26:207035; NASA-IVV-97-005; WVU-IVV-97-005; WVU-CS-TR-97-008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In order to control the quality of software and the software development process, it is important to understand the measurement of software. A first step toward a better comprehension of software measurement is the categorization of software measures by some meaningful taxonomy. The most worthwhile taxonomy would capture the fundamental nature of the object-oriented (O-O) space. The principal characteristics of object-oriented software offer a starting point for such a categorization of measures. This paper introduces a taxonomy of measures based upon fourteen characteristics of object-oriented software gathered from the literature. This taxonomy allows us to easily see gaps or redundancies in the existing O-O measures. The taxonomy also clearly differentiates among taxa so that there is no ambiguity as to the taxon to which a measure belongs. The taxonomy has been populated with measures taken from the literature.
Author
Taxonomy; Object-Oriented Programming; Models

19980033139 California Univ., San Diego, Dept. of Computer Science and Engineering, La Jolla, CA USA
Distributed Systems and Flow Analysis Algorithm ***Final Report, 1 Aug. 1994 - 31 Jul. 1997***
Cristian, Flaviu, California Univ., San Diego, USA; Nov. 19, 1997; 2p; In English
Contract(s)/Grant(s): F49620-94-I-0424
Report No.(s): AD-A334840; AFRL-SR-BL-TR-98-0043; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Progress has been made on the partitionable group membership problem in time-free asynchronous distributed systems. It was shown that a property similar to quorum consensus in required for the solution.
DTIC
Data Management; Distributed Processing

19980033144 Logistics Management Inst., McLean, VA USA
Maintenance of Department of Defense Mission Critical and Mission Support Software: A Preliminary Characterization ***Final Report***
Bailey, Elizabeth K., Logistics Management Inst., USA; Baker, Emanuel R., Logistics Management Inst., USA; Forbes, James A., Logistics Management Inst., USA; Hutcheson, Donald W., Logistics Management Inst., USA; Nov. 1997; 66p; In English
Contract(s)/Grant(s): DASW01-95-C-0019
Report No.(s): AD-A334790; LMI-LG518T1; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purposes of this study were to undertake an initial characterization of DoD mission critical software maintenance; to identify policy issues; and to outline the scope and major features of potential new or revised policy. We distinguished among three categories of mission related software. Within a category different organizations may use similar processes; across categories they generally do not. For six specific types of software maintenance, we accounted for about 16,000 government and contract person-

nel equivalents (55% organic and 45% contractor) maintaining 225M lines of code at an annual cost of about $1.26B. About 40 percent of the effort is corrective and 60 percent is a combination of adaptive and incremental improvement. Pure organic maintenance is the exception for any type of software; organic maintenance of embedded software is generally found only on older models of weapon systems; where attempted, competitive contract support proved both more economical and at least as effective as either sole source contract support or organic support. Written policy consists of MIL-STDs (e.g., 2167 and 498) and local operating instructions rather than DoD instructions or Service regulations. There is a lack of consensus over what software maintenance is also depot maintenance.
DTIC
Weapon Systems; Organizations; Defense Program; Computer Programs

19980033523 McDonnell-Douglas Corp., Saint Louis, MO USA
Virtual Product Definition: The Key to Affordable and Supportable Products
Coyle, John M., McDonnell-Douglas Corp., USA; Paul, Don, Wright Lab., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 14p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Virtual product definition (VPD) is an emerging process which capitalizes on recent advances in computer hardware and software to enable a Paradyne shift in the way products are developed. Engineering, tooling, manufacturing and product support data that fully define the product is created and managed in a synthetic environment. All product definition geometry developed in the VPD process is defined as three dimensional solid digital models. This data is stored in an electronic medium with a common geometry database providing the primary linkage between the product design and a newly developed set of integrated design, analysis, manufacturing and supportability tools. The geometry related information that describes the product may be viewed and interacted with in a synthetic environment in the same way physical mockups were used in previous design processes. This geometric representation forms the most visible part of a Virtual Prototype.
Derived from text
Computer Programs; Software Engineering; Design Analysis; Product Development; Data Bases

19980034671 Carnegie-Mellon Univ., Dept. of Computer Science, Pittsburgh, PA USA
Improving Demonstration Using Better Interaction Techniques
McDaniel, Richard G., Carnegie-Mellon Univ., USA; Myers, Brad A., Carnegie-Mellon Univ., USA; Jan. 14, 1997; 15p; In English
Contract(s)/Grant(s): N66001-94-C-6037
Report No.(s): AD-A333516; CMU-CS-97-103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Programming by demonstration (PBD) can be used to create tools and methods that eliminate the need to learn difficult computer languages. Gamut is a new PBD tool that can create a broader range of interactive software, including games, simulations, and educational software, than other PBD tools. To do this, Gamut uses advanced interaction techniques that make it easier for a software author to express all needed aspec ts of one's program. These techniques include a simplified way to demonstrate new examples, called nudges, and a way to highlight objects to show they are important. Also, Gamut includes new objects and metaphors like the deck of cards metaphor for demonstrating collections of objects and randomness, guide objects for drawing relationships that the system would find too difficult to guess, and temporal ghosts which simplify showing relationships with the recent past.
DTIC
Programming Languages; Software Engineering; Object-Oriented Programming

19980034831 Naval Postgraduate School, Monterey, CA USA
Channel CAT: A Tactical Link Analysis Tool
Coleman, Michael G., Naval Postgraduate School, USA; Sep. 1997; 101p; In English
Report No.(s): AD-A333505; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Tri-Service Tactical (TRI-TAC) standards for tactical data links mandate a terminal data rate of 32,000 bits per second. As greater demands for data throughput are placed upon tactical networks, it will become imperative that the design of future client/server architectures do not exceed the capacity of the TRI-TAC networks. This thesis produced an analysis tool, the Channel Capacity Analysis Tool (Channel CAT), designed to provide an automated tool for the analysis of design decisions in developing client-server software. The analysis tool, built using the Computer Aided Prototyping System (CAPS), provides designers the ability to input TRI-TAC channel parameter and view the results of the simulated channel traffic in graphical format. The size of data, period of transmission, and channel transmission rate can be set by the user, with the results displayed as a percent utiliza-

tion of the maximum capacity of the channel. Designed using fielded equipment specifications, the details of the network mechanisms closely simulate the behavior of the actual tactical links. Testing has shown Channel CAT to be stable and accurate. As a result of this effort, Channel CAT provides software engineers an ability to test design decisions for client-server software in a rapid, low-cost manner.
DTIC
Channel Capacity; Computer Programs; Computer Techniques; Data Links; Data Transmission; Traffic

19980034832 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA
The Options Approach to Software Prototyping Decisions
Chalasani, Prasad, Carnegie-Mellon Univ., USA; Jha, Somesh, Carnegie-Mellon Univ., USA; Sullivan, Kevin, Carnegie-Mellon Univ., USA; Jul. 1997; 23p; In English
Contract(s)/Grant(s): N00014-96-I-1222; F33615-93-I-1330
Report No.(s): AD-A333515; CMU-CS-97-161; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Abstract Prototyping is often used to predict, or reduce the uncertainty over, the future profitability of a software design choice. Boehm 1 pioneered the use of techniques from statistical decision theory to provide a basis for making prototyping decisions. However his approach does not apply to situations where the software engineer has the flexibility of waiting for more information before making a prototyping decision. Also, his framework considers only uncertainty over one time period, and assumes a design-choice must be made immediately after prototyping. We propose a more general multi-period approach that takes into account the flexibility of being able to postpone the prototyping and design decisions. In particular, we argue that this flexibility is analogous to the flexibility of exercise of certain financial instruments called options, and that the value of the flexibility is the value of the corresponding financial option. The field of real option theory in finance provides a rigorous framework to analyze the optimal exercise of such options, and this can be applied to the prototyping decision problem. Our approach integrates the timing of prototype decisions and design decisions within a single framework.
DTIC
Software Engineering; Statistical Decision Theory; Computer Programs

19980035473 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
A Study in the Use of CORBA in Real-Time Settings: Model Problems for the Manufacturing Domain ***Final Report***
Polze, Andreas, Carnegie-Mellon Univ., USA; Plakosh, Daniel, Carnegie-Mellon Univ., USA; Wallnau, Kurt C., Carnegie-Mellon Univ., USA; Dec. 1997; 43p; In English
Contract(s)/Grant(s): F19628-95-C-0003
Report No.(s): AD-A335653; CMU/SEI-97-TR-011; ESC-TR-97-011; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Object Management Group's (OMG) Common Object Request Broker Architecture (CORBA) is an important and popular technology that supports the development of object based, distributed applications. The benefits promised by CORBA (abstraction, heterogeneity, etc.) are appealing in many application domains, including those that satisfy real-time requirements such as manufacturing. Unfortunately, CORBA was not specified in light of real-time requirements, and so the question remains whether existing object request brokers (ORBs) can be used in real-time settings, or whether developers of real-time systems must await future extensions of CORBA that address real-time issues or use non-CORBA compliant ORBs. In this report, we describe the application of an off the shelf ORB to two real-time model problems. Based on our experiences, we believe that today's ORBs can be used in real-time settings, with certain caveats as outlined in this report. We also outline the concept of composite objects, an approach for extending the range of non-real-time ORBs into a greater variety of real-time settings.
DTIC
Distributed Processing; Computer Aided Manufacturing; Object-Oriented Programming; Real Time Operation

19980035775 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA
Lattice Based Language Models
Dupont, Pierre, Carnegie-Mellon Univ., USA; Rosenfeld, Ronald, Carnegie-Mellon Univ., USA; Sep. 1997; 29p; In English
Contract(s)/Grant(s): MDA904-97-1-0006
Report No.(s): AD-A333294; CMU-CS-97-173; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper introduces lattice based language models, a new language modeling paradigm. These models construct multi-dimensional hierarchies of partitions and select the most promising partitions to generate the estimated distributions. We discussed a specific two dimensional lattice and propose two primary features to measure the usefulness of each node: the training-set history count and the smoothed entropy of its prediction. Smoothing techniques are reviewed and a generalization of the conventional

backoff strategy to multiple dimensions is proposed. Preliminary experimental results are obtained on the SWITCHBOARD corpus which lead to a 6.5% perplexity reduction over a word trigram model.
DTIC
Entropy; Hierarchies; Words (Language); Mathematical Models; Speech Recognition

19980036614 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
The PESKI Intelligent User Interface
Harrington, Robert A., Air Force Inst. of Tech., USA; Banks, Sheila, Air Force Inst. of Tech., USA; Santos, Eugene, Jr., Air Force Inst. of Tech., USA; Jul. 1996; 14p; In English
Report No.(s): AD-A324223; AFIT/EN/TR96-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Generic expert systems are reasoning systems that can be used in many application domains, thus requiring application domain independence. The user interface for a generic expert system must contain an intelligence in order to maintain this domain independence and manage the complex interactions between the user and generic expert system. This paper explores the uncertainty-based reasoning contained in an intelligent user interface called GESIA. GESIA's interface architecture and dynamically constructed Bayesian network are examined in detail to show how uncertainty-based reasoning enhances the capabilities of this generic expert system user interface.
DTIC
Expert Systems; Algorithms; Neural Nets; Data Management; Bayes Theorem; Graphical User Interface

19980036641 Carnegie-Mellon Univ., Dept. of Computer Science, Pittsburgh, PA USA
The Fox Project: Advanced Development of Systems Software, *1 Oct. - 31 Dec. 1997*
Dec. 1997; 7p; In English
Contract(s)/Grant(s): F19628-95-C-0050; ARPA Order 8313
Report No.(s): AD-A335390; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The long-term objectives of the Carnegie Mellon Fox Project are to improve the design and construction of systems software and to further the development of advanced programming language technology. We use principles and techniques from the mathematical foundations of programming languages, including semantics, type theory, and logic, to design and implement systems software, including operating systems, network protocols, and distributed systems. Much of the implementation work is conducted in the Standard ML (SML) language, a modern functional programming language that provides polymorphism, first-class functions, exception handling, garbage collection, a parameterized module system, static typing, and a formal semantics. This Project involves several faculty members and spans a wide range of research areas, from (1) experimental development of systems software to (2) advanced compiler development to (3) language design.
DTIC
Computer Systems Programs; Programming Languages

19980036654 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
RASSP Benchmark 4 Technical Description *Progress Report*
Shaw, G. A., Massachusetts Inst. of Tech., USA; Anderson, A. H., Massachusetts Inst. of Tech., USA; Anderson, J. C., Massachusetts Inst. of Tech., USA; Jan. 09, 1998; 68p; In English
Contract(s)/Grant(s): F19628-95-C-0002
Report No.(s): AD-A335545; PR-RASSP-5; ESC-TR-96-118; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This document describes the fourth in a series of application tasks designed to measure performance of a process for the rapid prototyping of embedded digital signal processors. The rapid prototyping process is being developed for the DARPA/Tri-Services rapid prototyping of application specific signal processors (RASSP) program. The benchmark task described here involves virtual and physical prototype development for portions of a real-time digital signal processing image intelligence (IMINT) system that performs semi-automated IMINT processing (SAIP). The task addresses hardware and software development issues relating to the high-definition imaging (HDI) and minimum mean square error (MSE) target classifier portions of SAIP. Application details and design constraints are provided in this document, as well as a description of product and process metrics collected to derive measures of product and process performance. The application task and associated performance metrics comprise what is termed a benchmark technical description (BTD).
DTIC
Signal Processing; Digital Systems

19980036873 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA

The Personal Software Process(service mark) (PSP(service mark)): An Empirical Study of the Impact of PSP on Individual Engineers ***Final Report***

Hayes, Will, Carnegie-Mellon Univ., USA; Over, James W., Carnegie-Mellon Univ., USA; Dec. 1997; 75p; In English

Contract(s)/Grant(s): F19628-95-C-0003

Report No.(s): AD-A335543; CMU/SEI-97-TR-001; ESC-TR-97-001; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents the results of a study that is important to everyone who manages or develops software. The study examines the impact of the Personal Software Process (PSP) on the performance of 298 software engineers. The report describes the effect of PSP on key performance dimensions of these engineers, including their ability to estimate and plan their work, the quality of the software they produced, the quality of their work process, and their productivity. The report also discusses how improvements in personal capability also improve organizational performance in several areas: cost and schedule management, delivered product quality, and product cycle time.

DTIC

Computer Programming; Software Engineering

19980036874 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

Microprogramming a Writeable Control Memory using Very Long Instruction Word (VLIW) Compilation Techniques

Whitman, Randall S., Air Force Inst. of Tech., USA; Dec. 1997; 77p; In English

Report No.(s): AD-A335547; AFIT/ENG/GCS/97D-19; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Microprogrammed Digital Signal Processors (DSP) are frequently used as a solution to embedded processor applications. These processors utilize a control memory which permits execution of the processor's instruction set architecture (ISA). The control memory can take the form of a static, read only memory (ROM) or a dynamic, writeable control memory (WCM), or both. Microcoding the WCM permits redefining the processor's ISA and provides speedup due to its instruction level parallelism (ILP) potential. In the past, code generation efforts for microprogrammable processors focused on creating assembly and microcode as two separate steps. In this thesis, an alternative approach was chosen which combines the separate code generation steps into one automated, dual-target compilation process using the advanced techniques of VLIW compiler technology. The architecture chosen for this effort is a microprogrammable DSP being developed by Rome Labs, New York. The prototype compiler developed in this effort has demonstrated the potential for speedup of microcoded program portions over their assembly code counterparts. Therefore, the feasibility of program speedup produced by a dual-target compiler using VLIW compilation techniques has been validated.

DTIC

Digital Systems; Control Units (Computers); Microprogramming; Memory (Computers)

19980036879 Defence Science and Technology Organisation, Electronics and Surveillance Research Lab., Salisbury, Australia

Computer Support for Schema Integration

Ewald, C. A., Defence Science and Technology Organisation, Australia; Sep. 1997; 16p; In English

Report No.(s): AD-A335348; DSTO-TN-0072; DODA-AR-010-309; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Currently, as part of an organization-wide move for greater interoperability and reduction of duplication, Defence is examining a number of existing information systems in order to make them work more closely together. Schema integration is the merging of different database design specifications which have commonality. In this report, we examine support for schema integration provided by commercial off the shelf (COTS) software products, in particular computer aided software engineering (CASE) tools, and suggest desirable features which current products do not support. We examine which of the two products tested provides cost-effective support for schema evolution. The two products chosen for examination are InfoModeler version 2 (chosen for its support of the rich object-role modelling methodology, and natural language interface) and ERwin Version 2.6.1 (the market leader both in Australia and the U.S.A.). It appears that no existing product provides a full schema merge capability, and this would not be expected, as schema integration needs to involve human creativity. However, some tasks within the integration process lend themselves to automation, and it is worthwhile examining tools to perform these tasks.

DTIC

Data Bases; Software Engineering; Information Systems; Computer Programs

62
COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

19980025548 Carnegie-Mellon Univ., Dept. of Computer Science, Pittsburgh, PA USA
Filesystems for Network-Attached Secure Disks
Gibson, Garth A., Carnegie-Mellon Univ., USA; Nagle, David F., Carnegie-Mellon Univ., USA; Amiri, Khalil, Carnegie-Mellon Univ., USA; Chang, Fay W., Carnegie-Mellon Univ., USA; Gobioff, Howard, Carnegie-Mellon Univ., USA; Jul. 1997; 18p; In English
Contract(s)/Grant(s): N000174-96-0002; ARPA Order D306
Report No.(s): AD-A333522; CMU-CS-97-118; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Network-attached storage enables network-striped data transfers directly between client and storage to provide clients with scalable bandwidth on large transfers. Network-attached storage also decouples policy and enforcement of access control, avoiding unnecessary reverification of protection checks, reducing file manager work and increasing scalability. It eliminates the expense of a server computer devoted to copying data between peripheral network and client network. This architecture better matches storage technologies sustained data rates, now 80 Mb/s and growing at 40% per year. Finally, it enables self-managing storage to counter the increasing cost of data management. The availability of cost-effective network-attached storage depends on it becoming a storage commodity, which in turn depends on its utility to a broad segment of the storage market. Specifically, multiple distributed and parallel file systems must benefit from network-attached storage's requirement for secure, direct access between client and storage, for reusable, asynchronous access protection checks, and for increased license to efficiently manage underlying storage media.
DTIC
Asynchronous Transfer Mode; Computer Networks; Bandwidth; Rates (Per Time)

19980027030 NERAC, Inc., Tolland, CT USA
Electronic Commerce. (Latest citations from the INSPEC Database)
Jan. 1998; In English; Page count unavailable.
Report No.(s): PB98-851967; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning architecture and assessment of electronic commerce and systems. Electronic commerce is a new concept for the conduct of business transactions including advertising, ordering, payment, and delivery using a variety of computer technologies. Internet and world wide web electronic commerce are discussed. References also review electronic data interchange, remote and secure commercial transactions, micro-digital money and micropayment, multimedia information delivery, electronic forms, and the Java language. Retail data processing, global business strategies, and market opportunities are examined. (Contains 50-250 citations and includes a subject term index and title list.)
NTIS
Bibliographies; Commerce

19980028453 Boston Univ., Boston, MA USA
Implementation of the Boston University Space Physics Acquisition Center ***Final Report, 1 Jan. 1995 - 31 Dec. 1996***
Spence, Harlan E., Boston Univ., USA; 1998; 8p; In English
Contract(s)/Grant(s): NAGw-5030; NAGw- 4282
Report No.(s): NASA/CR-96-207473; NAS 1.26:207473; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The tasks carried out during this grant achieved the goals as set forth in the initial proposal. The Boston University Space Physics Acquisition CEnter (BUSPACE) now provides World Wide Web access to data from a large suite of both space-based and ground-based instruments, archived from different missions, experiments, or campaigns in which researchers associated with the Center for Space Physics (CSP) at Boston University have been involved. These archival data sets are in digital form and are valuable for retrospective data analysis studies of magnetospheric as well as ionospheric, thermospheric, and mesospheric physics. We have leveraged our grass-roots effort with the NASA seed money to establish dedicated hardware (computer and hard disk augmentation) and student support to grow and maintain the system. This leveraging of effort now permits easy access by the space physics community to many underutilized, yet important data sets, one example being that of the SCATHA satellite.
Author
Atmospheric Physics; Education; Universities; Satellite-Borne Instruments; World Wide Web

19980030799 NASA Pasadena Office, CA USA

Parallel Proximity Detection for Computer Simulation

Steinman, Jeffrey S., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Wieland, Frederick P., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Jul. 29, 1997; 18p; In English

Patent Info.: Filed 10 Apr. 1995; NASA-Case-NPO-19423-1; US-Patent-5,652,871; US-Patent-Appl-SN-425751; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

The present invention discloses a system for performing proximity detection in computer simulations on parallel processing architectures utilizing a distribution list which includes movers and sensor coverages which check in and out of grids. Each mover maintains a list of sensors that detect the mover's motion as the mover and sensor coverages check in and out of the grids. Fuzzy grids are includes by fuzzy resolution parameters to allow movers and sensor coverages to check in and out of grids without computing exact grid crossings. The movers check in and out of grids while moving sensors periodically inform the grids of their coverage. In addition, a lookahead function is also included for providing a generalized capability without making any limiting assumptions about the particular application to which it is applied. The lookahead function is initiated so that risk-free synchronization strategies never roll back grid events. The lookahead function adds fixed delays as events are scheduled for objects on other nodes.

Official Gazzette of the U.S. Patent and Trademark

Proximity; Parallel Processing (Computers); Computerized Simulation; Inventions

19980031511 Japan Atomic Energy Research Inst., Center for Promotion of Computational Science and Engineering, Tokyo, Japan

The kpx, a program analyzer for parallelization

Matsuyama, Yuji, Japan Atomic Energy Research Inst., Japan; Orii, Shigeo, Japan Atomic Energy Research Inst., Japan; Ota, Toshiro, Japan Atomic Energy Research Inst., Japan; Kume, Etsuo, Japan Atomic Energy Research Inst., Japan; Aikawa, Hiroshi, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 162p; In Japanese

Report No.(s): JAERI-Tech-97-017; DE97-750698; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The kpx is a program analyzer, developed as a common technological basis for promoting parallel processing. The kpx consists of three tools. The first is ktool, that shows how much execution time is spent in program segments. The second is ptool, that shows parallelization overhead on the Paragon system. The last is xtool, that shows parallelization overhead on the VPP system. The kpx, designed to work for any FORTRAN cord on any UNIX computer, is confirmed to work well after testing on Paragon, SP2, SR2201, VPP500, VPP300, Monte-4, SX-4 and T90. (author)

DOE

Parallel Processing (Computers); Architecture (Computers)

19980036968 NASA Washington, Washington, DC USA

Evaluating a Web-Based Interface for Internet Telemedicine

Lathan, Corinna E., Catholic Univ. of America, USA; Newman, Dava J., Massachusetts Inst. of Tech., USA; Sebrechts, Marc M., Catholic Univ. of America, USA; Doarn, Charles R., NASA Washington, USA; 1997; 43p; In English

Contract(s)/Grant(s): NAGw-4498

Report No.(s): NASA/CR-97-207484; NAS 1.26:207484; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective is to introduce the usability engineering methodology, heuristic evaluation, to the design and development of a web-based telemedicine system. Using a set of usability criteria, or heuristics, one evaluator examined the Spacebridge to Russia web-site for usability problems. Thirty-four usability problems were found in this preliminary study and all were assigned a severity rating. The value of heuristic analysis in the iterative design of a system is shown because the problems can be fixed before deployment of a system and the problems are of a different nature than those found by actual users of the system. It was therefore determined that there is potential value of heuristic evaluation paired with user testing as a strategy for optimal system performance design.

Author

Technologies; Evaluation; Design Analysis; Product Development; Telemedicine; Internets

63
CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also 54 Man/System Technology and Life Support.

19980025546 Army Research Lab., Information Science and Technology Directorate, Aberdeen Proving Ground, MD USA
Battlefield Robot Cybernation and Navigation ***Final Report, Oct. 1996 - May 1997***
Celmins, Aivars, Army Research Lab., USA; Dec. 1997; 36p; In English
Report No.(s): AD-A333932; ARL-TR-1571; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes a paradigm of battlefield robot cybernation and presents, within that paradigm, a navigation technique for such robots. The navigation technique is an algorithm for route planning in an open terrain that contains areas with different characteristics, such as navigation speed or level of threat. Optimal routes for battlefield robots in such a terrain are task specific: for instance, the fastest route, the safest route, a hidden route, a combination of the three, etc. The robot route planning in this report is based on a granulation of the space-time world of the robot The terrain map is represented by a rectangular mesh, and terrain properties are specified as average properties for each cell. The robot's position is assumed to be in the center of a cell, and its movements are restricted from one cell center to one of the eight neighbor cell centers. The algorithm for finding optimal routes in the granulated terrain uses Huygens' principle of wave propagation and provides a complete solution for the navigation problem. This report presents the navigation technique for a stationary destination and fixed terrain, but, because of its simplicity, it can be easily adapted to follow moving destination points and accommodate changing environments.
DTIC
Robots; Warfare; Computer Vision; Surface Navigation; Terrain Following

19980033140 University of Southern California, Inst. for Robotics and Intelligent Systems, Los Angeles, CA USA
Object Description and Recognition in Complex Environments ***Final Report, 1 Jun. 1995 - 30 Sep. 1997***
Nevatia, R., University of Southern California, USA; Medioni, G., University of Southern California, USA; Price, K., University of Southern California, USA; Dec. 19, 1997; 53p; In English
Contract(s)/Grant(s): F49620-95-I-0457
Report No.(s): AD-A334833; AFRL-SR-BL-TR-98-0072; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This final report describes our work on three topics. First is construction of 3-D models by use of smart 3-D pen which enables direct 3-D input and manipulations. The other two efforts deal with the problem of aerial image analysis. First of these is about detecting changes in man made structures using a paradigm of comparing new images to 3-D models constructed from previous images rather than the previous images directly. The second is about detecting and describing building structures from multiple views using hierarchical grouping and matching techniques to overcome ambiguity problems.
DTIC
Image Analysis; Three Dimensional Models; Computer Graphics

19980036257 Illinois Univ., Chicago, IL USA
Automatic Target Recognition and Indexing by Non-Orthogonal Image Expansion and Data-Dependent Normalization with Implementation ***Final Report, 1 Aug. 1983 - 31 Jul. 1997***
Ben-Arie, Jezekiel, Illinois Univ., USA; Atkin, G., Illinois Univ., USA; Sep. 20, 1997; 49p; In English
Contract(s)/Grant(s): N00014-83-I-1088
Report No.(s): AD-A333426; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research is concerned with the development of a neural system for robust projective-invariant recognition of multiple targets which may be partially occluded in a cluttered background based on single gray-level images. For this purpose we have developed in the research a new method for affine-invariant iconic representation and recognition of targets using a novel set of Gabor/Fourier kernels with multi-dimensional indexing in the frequency domain. An affine-invariant representation of local image patches is extracted in the form of spectral signatures, by directly convolving the image with our novel configuration of these kernels. We achieved 100% correct recognition rates with a model library of 26 models over a wide range of viewing poses and distances (360 of rotation and tilt and 82 of slant and 4 octaves of scale). The system also maintains its 100% recognition rate in high levels of noise/clutter (up to -17 dB) and to resolution degradation (1:5 reduction). A novel method for representation and recognition of 3D Object/Targets based on 3D frequency domain representation was also developed and tested.
DTIC
Clutter; Frequencies; Octaves; Rotation; Spectral Signatures; Target Recognition

19980036343 Army Construction Engineering Research Lab., Champaign, IL USA
Development of the Neptune On-Stream Robotic Inspection System for Above-Ground Storage Tanks ***Final Report***
Weber, Robert A., Army Construction Engineering Research Lab., USA; Sommers, Tagore, Army Construction Engineering Research Lab., USA; Schmidt, Karl, Army Construction Engineering Research Lab., USA; Schempf, Hagen, Army Construction Engineering Research Lab., USA; Dec. 1997; 38p; In English
Report No.(s): AD-A335549; USACERL-TR-98/20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Owners of petroleum storage tanks are required by the Environmental Protection Agency (EPA) to conduct inspections that conform to American Petroleum Institute (API) practices. These API recommended practices specify that inspections be conducted every 5 years to make sure storage tanks are not leaking. Compliance with these requirements is essential, but it is especially costly and time consuming for the operators of industrial scale tank farms. The U.S. Army Construction Engineering Research Laboratories (USACERL) and Raytheon Engineers and Constructors of Lyndhurst, NJ, worked in partnership to develop a remotely operated robotic system capable of onstream inspection of submerged infrastructure components for corrosion and other damage. The prototype system comprised a dualtracked platform mounted with ultrasonic and visual inspection technology. The unit was to be selfcontained and explosionproof according to applicable National Fire Protection Association Class 1, Division 1 standards. The prototype system could not pass applicable safety tests. Connectors were designed incorrectly for service in explosive environments and unprotected wires on the outside of the robot were out of compliance with applicable guidance. Other mechanical trouble with robot components are noted. However, it is concluded that the prototype system demonstrated the viability of the concept of onstream testing of storage tanks and water structures.
DTIC
Storage Tanks; Petroleum Products; Environment Protection; Robotics

64
NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

19980023497 Rutherford Appleton Lab., Dept. for Computation and Information, Chilton, UK
Subspace-by-Subspace Preconditioners for Structured Linear Systems
Dayde, MicheL J., Centre National de la Recherche Scientifique, France; Decamps, Jerome P., Centre National de la Recherche Scientifique, France; Gould, Nicholas I. M., Rutherford Appleton Lab., UK; Jan. 1998; ISSN 1358-6254; 24p; In English
Report No.(s): RAL-TR-98-005; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0QX, UK), Hardcopy, Microfiche

We consider the iterative solution of symmetric positive-definite linear systems whose coefficient matrix may be expressed as the outer-product of low-rank terms. We derive suitable preconditioners for such systems, and demonstrate their effectiveness on a number of test examples. We also consider combining these methods with existing techniques to cope with the commonly-occurring case where the coefficient matrix is the linear sum of elements, some of which are of very low rank.
Author
Linear Systems; Iterative Solution; Matrices (Mathematics)

19980024239 Rutherford Appleton Lab., Dept. for Computation and Information, Chilton, UK
Subspace-by-Subspace Preconditioners for Structured Linear Systems
Dayde, Michel J., Centre National de la Recherche Scientifique, France; Decamps, Jerome P., Centre National de la Recherche Scientifique, France; Gould, Nicholas I. M., Rutherford Appleton Lab., UK; Jan. 1998; ISSN 1358-6254; 24p; In English
Report No.(s): RAL-TR-98-005; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0QX, UK), Hardcopy, Microfiche

We consider the iterative solution of symmetric positive-definite linear systems whose coefficient matrix may be expressed as the outer-product of low-rank terms. We derive suitable preconditioners for such systems, and demonstrate their effectiveness on a number of test examples. We also consider combining these methods with existing techniques to cope with the commonly-occurring case where the coefficient matrix is the linear sum of elements, some of which are of very low rank.
Author
Linear Systems; Matrices (Mathematics); Iterative Solution

19980027092 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden

Deformation of the Yangian of Lie Algebra sl(2)

Khoroshkin, S., Royal Inst. of Tech., Sweden; Stolin, A., Royal Inst. of Tech., Sweden; Tolstoy, V., Royal Inst. of Tech., Sweden; Sep. 1995; 19p; In English

Report No.(s): PB96-142393; TRITA/MAT-95/MA-17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors present explicitly a quantization of a non-standard rational solution of CYBE. The corresponding quantum object turns out to be a deformed Yangian Y(sl2).

NTIS

Lie Groups; Matrices (Mathematics)

19980027093 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden

Eigenvalue Behaviour for a Class of Differential Operators on Semiaxis

Birman, M. S., Royal Inst. of Tech., Sweden; Laptev, A., Royal Inst. of Tech., Sweden; Solomyak, M., Royal Inst. of Tech., Sweden; Nov. 1995; 31p; In English

Report No.(s): PB96-142336; TRITA/MAT-1995/MA-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors study the eigenvalue behavior of a class of ODE acting on a semiaxis. Using interpolation of quasinormed spaces as one of their main tools, the authors obtain sharp estimates of the counting function of eigenvalues n(lambda). In particular some of their results become reversible if a matrix-valued 'weight' - function is nonnegative. The asymptotic behavior of n(lambda) is also discussed.

NTIS

Eigenvalues; Operators (Mathematics)

19980027101 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden

Fluctuations of Eigenvalues of Random Hermitian Matrices

Johansson, K., Royal Inst. of Tech., Sweden; Jun. 27, 1995; 54p; In English

Report No.(s): PB96-142377; TRITA/MAT-95/MA-19; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The authors consider ensembles of N x N hermitian matrices including the Gaussian Unitary Ensemble. The eigenvalues behave as a log-gas on R confined by a polynomial potential V at the inverse temperature Beta = 2. For certain V the asymptotic eigenvalue distribution as N approaches infinity is supported on a single interval, and for these ensembles the authors prove a central limit theorem for the global fluctuations of the eigenvalues around the asymptotic distribution. This result is an analogue of the strong Szego limit theorem for Toeplitz determinants, which gives the global fluctuations of the eigenvalues of random unitary matrices with respect to Haar measure. As a by-product the authors analyze the asymptotics of the recursion coefficients for the orthonormal polynomials with respect to the weight exp(-NV(t)) on R. The weak convergence to the asymptotic eigenvalue distribution is proved for more general V. The authors also prove the central limit theorem for a log-gas at an arbitrary inverse temperature Beta greater than 0; the cases Beta = 1 and Beta = 4, V(t) = t squared correspond to the Gaussian Orthogonal Ensemble and the Gaussian Symplectic Ensemble respectively.

NTIS

Hermitian Polynomial; Matrices (Mathematics); Eigenvalues

19980027685 Japan Atomic Energy Research Inst., Center for Promotion of Computational Science and Engineering, Tokyo, Japan

A user's manual of Tools for Error Estimation of Complex Number Matrix Computation

Ichihara, Kiyoshi, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 31p; Version 1.0; In Japanese

Report No.(s): JAERI-Data/Code-97-011; DE97-750696; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

'Tools for Error Estimation of Complex Number Matrix Computation' is a subroutine library which aids the users in obtaining the error ranges of the complex number linear system's solutions or the Hermitian matrices' eigenvalues. This library contains routines for both sequential computers and parallel computers. The subroutines for linear system error estimation calculate norms of residual vectors, matrices's condition numbers, error bounds of solutions and so on. The error estimation subroutines for Hermitian matrix eigen values' derive the error ranges of the eigenvalues according to the Korn-Kato's formula. This user's manual contains a brief mathematical background of error analysis on linear algebra and usage of the subroutines.

DOE

Eigenvalues; Matrices (Mathematics); Hermitian Polynomial

19980027688 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Random Matrices from the Compact Classical Groups
Johansson, K., Royal Inst. of Tech., Sweden; Jun. 21, 1995; 31p; In English
Report No.(s): PB96-142385; TRITA/MAT-1995/MA-18; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

If M is a matrix taken randomly with respect to normalized Haar measure on U(n), O(n) or Sp(n), then the random variables Tr(M(sup k)), k equal to or greater than 1, converge to a normal random variable with explicit mean and variance as the size n of the matrix goes to infinity. For the unitary group this is a direct consequence of the strong Szego theorem for Toeplitz determinants. The authors will prove a conjecture by Diaconis saying that for U(n) the rate of convergence is O(n(sup -delta)) for some delta greater than 0, and for O(n) and Sp(n) it is O(e (sup -cn)) for some c greater than 0.
NTIS
Matrices (Mathematics); Random Variables

19980033142 Massachusetts Inst. of Tech., Dept. of Electrical Engineering and Computer Science, Cambridge, MA USA
Rapid Solution of Potential Integral Equations in Complicated 3-Dimensional Geometries ***Final Report***
Phillips, Joel R., Massachusetts Inst. of Tech., USA; Jun. 1997; 137p; In English
Report No.(s): AD-A334811; AFRL-SR-BL-TR-98-0016; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Analysis of many electromagnetic problems in engineering, such as electromagnetic interference (EMI) calculations or estimation of interconnected coupling capacitances and inductance's, is often performed via numerical methods based on integral equations. Analysis of the complicated three-dimensional geometries of modern engineering structures required efficient algorithms to solve the large, dense linear systems generated by integral equation techniques. This thesis develops and analyzes a grid-based, "precorrected-FFT" method which preserves the efficiency of recently developed fast-multipole techniques but is more easily generalizable to a variety of kernels, and may have substantial performance benefits for commonly encountered geometries. The proposed algorithm is intended to be particularly efficient for problems with Helmholtz kernels where the size of the problem domain is of the order of a few wavelengths, such as typically occurs in EMI calculations, and for problems with planar interfaces, such as integrated circuits or interconnect in layered media (dielectrics and groundplanes).
DTIC
Electromagnetic Interference; Fast Fourier Transformations; Integrated Circuits

19980035139 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA
Well-Spaced Points for Numerical Methods
Talmor, Dafna, Carnegie-Mellon Univ., USA; Aug. 1997; 173p; In English
Contract(s)/Grant(s): NSF CCR-95-05472
Report No.(s): AD-A333297; CMU-CS-97-164; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

A numerical method for the solution of a partial differential equation (PDE) requires the following steps: (1) discretizing the domain (mesh generation); (2) using an approximation method and the mesh to transform the problem into a linear system; (3) solving the linear system. The approximation error and convergence of the numerical method depend on the geometric quality of the mesh, which in turn depends on the size and shape of its elements. For example, the shape quality of a triangular mesh is measured by its element's aspect ratio. In this work, we shift the focus to the geometric properties of the nodes, rather than the elements, of well shaped meshes. We introduce the concept of well-spaced points and their spacing functions, and show that these enable the development of simple and efficient algorithms for the different stages of the numerical solution of PDEs. We first apply well-spaced point sets and their accompanying technology to mesh coarsening, a crucial step in the multigrid solution of a PDE. A good aspect-ratio coarsening sequence of an unstructured mesh M0 is a sequence of good aspect-ratio meshes M1,...,Mk such that Mi is an approximation of M(i-1) containing fewer nodes and elements. We present a new approach to coarsening that guarantees the sequence is also of optimal size and width up to a constant factor - the first coarsening method that provides these guarantees. We also present experimental results, based on an implementation of our approach, that substantiate the theoretical claims. In three dimensions, we apply well-spaced points to mesh generation. We introduce a new aspect-ratio condition, the radius-edge ratio, which corresponds to well-spaced points. Radius-edge ratio is weaker than the standard aspect-ratio condition in that it allows slivers.
DTIC
Aspect Ratio; Grid Generation (Mathematics); Linear Systems; Numerical Analysis; Partial Differential Equations; Unstructured Grids (Mathematics)

19980036979 Maryland Univ., Inst. for Advanced Computer Studies, College Park, MD USA
Application of Geometric and Physical Invariants to Object Recognition ***Final Report, 1 Jul. 1996 - 30 Jun. 1997***
Weiss, Isaac, Maryland Univ., USA; Dec. 12, 1997; 3p; In English
Contract(s)/Grant(s): F49620-96-I-0355
Report No.(s): AD-A336144; AFRL-SR-BL-TR-98-0081; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The project was a continuation of a previous one, entitled Geometric Invariants in Object Recognition. We have developed and applied new ideas within the framework of the concepts used in the earlier grant. We list here some of the publications that have resulted from this continuation grant along with representative abstracts.
DTIC
Image Processing; Computer Vision; Abstracts; Pattern Recognition

66
SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

19980033518 Wright Lab., Wright-Patterson AFB, OH USA
Trends in Future Combat Aircraft Development
Davis, R. W., Wright Lab., USA; Selegan, D. R., Wright Lab., USA; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 16p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The USA Air Force is currently going through a planning process to structure itself for the 21st Century. There have been several studies on this subject such as ”Joint Vision 2010” that discuss mission requirements and the Air Force Scientific Advisory Board’s ”New World Vistas” that discuss relevant technology issues for the future. Figure 1 shows the six core competencies that the Air Force will maintain into the 21st Century. These core competencies will focus the Air Force mission areas and shorten the lines of communication between the user and the acquisition/research community through a new concept for the Air Force called Battle Labs. Purpose of the Battle Labs is to provide for the rapid assessment of technology on operational requirements under realistic conditions. This paper provides an update to these initiatives and provides the reader with an overview of the current Air Force Modernization Planning Process (AFMPP) and how it is effecting the Air Force Science and Technology Plans into the next millennium. This paper highlights several technology thrusts that will have an impact on air operations in the next Century.
Derived from text
Trends; Aircraft Design; Fighter Aircraft; Research and Development; Mission Planning

19980033519 Daimler-Benz Aerospace A.G., Military Aircraft Div., Munich, Germany
Future Combat Aircraft Development in Europe
Bridel, G., Daimler-Benz Aerospace A.G., Germany; Ross, H. G., Daimler-Benz Aerospace A.G., Germany; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 12p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Within the last decade three new combat aircraft have been developed in parallel in Europe: The Eurofighter, the Rafale and the Gripen. This happened probably for the last time. New scenarios and missions, but in particular reduced defence budgets, the growing integration into a European Union and strong competition on the European and world market, in particular from the US and Russia, will eventually force (1) European nations to formulate common requirements; (2) the national Governments to coordinate their research and development efforts; (3) the airforces to coordinate their training, operation and maintenance activities; and (4) the national industries to form a common European military aircraft company, if a truly competitive military aircraft development and production capability in Europe is to be maintained.
Author
Aircraft Design; Fighter Aircraft; Research and Development; JAS-39 Aircraft

19980033521 National Defence Headquarters, Project Management Office, Armed Forces Utility Tactical Transport Helicopter, Ottawa, Ontario Canada

Cost Benefits in the Acquisition of a Utility Tactical Transport Helicopter Fleet for the Canadian Forces

Caux, L. A., National Defence Headquarters, Canada; Delaney, R. G., National Defence Headquarters, Canada; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 10p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The requirement for a Utility Tactical Transport Helicopter (UTTH) fleet is derived from the roles of the Canadian Forces and the specific missions assigned to the Land and Air Forces. In general, UTTH resources can be called upon to conduct operations in any of the following general mission areas: (a) Operational and training support to the land forces and other CF organizations; (b) International peacekeeping operations; and (c) Operations in aid of the civil authority.

Derived from text

Helicopters; Military Operations; Military Aircraft; Costs

67
THEORETICAL MATHEMATICS

Includes topology and number theory.

19980036929 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France

Relations between Asymptotic and Fredholm Representations

Manuilov, V. M., Institut des Hautes Etudes Scientifiques, France; Mishchenko, A. S., Institut des Hautes Etudes Scientifiques, France; Oct. 1997; 26p; In English; Figures in this document may not be legible in microfiche

Contract(s)/Grant(s): DFG-06-01-00028; RFBR-96-01-00276

Report No.(s): PB98-111040; IHES/M/97/74; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors prove that for (n.n) complex matrix algebras Mn there exists a monomorphism into the Calkin algebra which induces an isomorphism of the K1-groups. As a consequence they show that every vector bundle over a classifying space B(phi) which can be obtained from an asymptotic representation of a discrete group phi can be obtained also from a representation of the ground phi x Z into the Calkin algebra. The authors give also a generalization of the notion of Fredholm representation and show that asymptotic representations can be viewed as asymptotic Fredholm representations.

NTIS

Isomorphism; Matrices (Mathematics)

70
PHYSICS (GENERAL)

For precision time and time interval (PTTI) see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

19980036916 Society for Industrial and Applied Mathematics, Philadelphia, PA USA

Fourth SIAM Conference on Applications of Dynamical Systems ***Final Report, 15 Jun. - 14 Nov. 1997***

Kolata, William G., Society for Industrial and Applied Mathematics, USA; Sep. 10, 1997; 3p; In English, 18-22 May 1997, Snowbird, UT, USA

Contract(s)/Grant(s): F49620-97-I-0474

Report No.(s): AD-A336146; AFRL-SR-BL-TR-98-0078; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Fourth SIAM Conference on Applications of Dynamical Systems was designed to provide a forum for the continued interdisciplinary development of nonlinear dynamics and its applications. The conference was a great success. We had unprecedented attendance of over 592, including many of the leaders in the field from around the world, and from disciplines ranging from oceanography to molecular biology to quantum chaos. There was a sense of excitement in the air, perhaps because dynamical

systems theory is finally living up to i ts promise to have a genuine impact on applied fields, and also because of our emerging understanding of the mathematical connections among many of the phenomena being studied.
DTIC
Conferences; Dynamical Systems; Molecular Biology; Oceanography

71
ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see 45 Environmental Pollution.

19980025555 Naval Postgraduate School, Monterey, CA USA
Analysis of Modal Travel Time Variability Due to Mesoscale Ocean Structure
Smith, Amy R., Naval Postgraduate School, USA; Jun. 1997; 119p; In English
Report No.(s): AD-A333356; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This dissertation examines the effects of ocean mesoscale variability on acoustic arrival time patterns for two separate ocean environments. First, for an open ocean environment away from strong boundary currents, the effects of randomly phased linear baroclinic Rossby waves on acoustic travel time are shown to produce a variable overall spreading in the arrival pattern, primarily producing a delay in the later, axial arrivals. Second, using the state-of-the-art Semtner-Chervin eddy resolving global ocean circulation model coupled with the University of Miami Parabolic Equation (UMPE) acoustic propagation model, the effects of a fluctuating frontal region created by the California Current on the temporal, spatial and seasonal variability in the individual modal arrivals of the first thirty modes over a one-model-year time span is assessed. The mesoscale bias variability is also examined by comparing the various peak arrival times for the range-averaged environment to that of the range-dependent environment. to support this work, approximate 'wide angle PE mode functions' were newly developed which form a different basis set for modal expansion from that obtained using standard normal mode theory. These new mode functions provide the proper basis set for modal expansion of the field computed by wide angle PE models.
DTIC
Acoustic Propagation; Annual Variations; Baroclinic Waves; Marine Environments; Ocean Currents; Ocean Dynamics; Ocean Models; Oceanography

19980037002 NASA Langley Research Center, Hampton, VA USA
Design and Use of Microphone Directional Arrays for Aeroacoustic Measurements
Humphreys, William M., Jr., NASA Langley Research Center, USA; Brooks, Thomas F., NASA Langley Research Center, USA; Hunter, William W., Jr., NASA Langley Research Center, USA; Meadows, Kristine R., NASA Langley Research Center, USA; 1998; 26p; In English; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-1998-207321; NAS 1.15:207321; AIAA Paper 98-0471; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An overview of the development of two microphone directional arrays for aeroacoustic testing is presented. These arrays were specifically developed to measure airframe noise in the NASA Langley Quiet Flow Facility. A large aperture directional array using 35 flush-mounted microphones was constructed to obtain high resolution noise localization maps around airframe models. This array possesses a maximum diagonal aperture size of 34 inches. A unique logarithmic spiral layout design was chosen for the targeted frequency range of 2-30 kHz. Complementing the large array is a small aperture directional array, constructed to obtain spectra and directivity information from regions on the model. This array, possessing 33 microphones with a maximum diagonal aperture size of 7.76 inches, is easily moved about the model in elevation and azimuth. Custom microphone shading algorithms have been developed to provide a frequency- and position-invariant sensing area from 10-40 kHz with an overall targeted frequency range for the array of 5-60 kHz. Both arrays are employed in acoustic measurements of a 6 percent of full scale airframe model consisting of a main element NACA 632-215 wing section with a 30 percent chord half-span flap. Representative data obtained from these measurements is presented, along with details of the array calibration and data post-processing procedures.
Author
Aeroacoustics; Microphones; Aerodynamic Noise; Noise Measurement

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

19980024237 Rutherford Appleton Lab., ISIS Facility, Chilton, UK
Diffraction and Absorption of X-Rays by 3d Transition Ions: The 1s Yields 3d Process
Lovesey, Stephen, Rutherford Appleton Lab., UK; Jan. 1998; ISSN 1358-6254; 17p; In English
Contract(s)/Grant(s): CEC-ERBFMBI-CT96-1209
Report No.(s): RAL-TR-98-010; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0QX, UK), Hardcopy, Microfiche

The resonant scattering-length for K shell absorption and an E2 transition is calculated for 3d transition ions, on the basis of an atomic model. It is applied to the evaluation of the intensity of X-rays Bragg reflected from a magnetic salt, e.g. NiO, and the circular dichroic signal in the attenuation coefficient. The information which can be extracted from these quantities relates to the orbital properties of the 3d valence shell. An exception is the s-state ion 3d(sup 5), for which the leading-order effect is zero. For the 3d(sup 5) ion it shown that, inclusion of core polarization in the calculation leads to a weak effect which contains the spin magnetic-moment.
Author
X Ray Diffraction; Absorption; Ions; Scattering; Dichroism; Attenuation Coefficients; Bragg Angle

19980024360 NASA Washington, Washington, DC USA
Radiation: Physical Characterization and Environmental Measurements
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 189-202; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this session, Session WP4, the discussion focuses on the following topics: Production of Neutrons from Interactions of GCR-Like Particles; Solar Particle Event Dose Distributions, Parameterization of Dose-Time Profiles; Assessment of Nuclear Events in the Body Produced by Neutrons and High-Energy Charged Particles; Ground-Based Simulations of Cosmic Ray Heavy Ion Interactions in Spacecraft and Planetary Habitat Shielding Materials; Radiation Measurements in Space Missions; Radiation Measurements in Civil Aircraft; Analysis of the Pre-Flight and Post-Flight Calibration Procedures Performed on the Liulin Space Radiation Dosimeter; and Radiation Environment Monitoring for Astronauts.
CASI
Aerospace Medicine; Extraterrestrial Radiation; Radiation Measurement; Solar Corpuscular Radiation; Environmental Monitoring; Cosmic Rays; Charged Particles; Astronauts; Radiation Effects

19980026053 California Univ., Dept. of Chemistry and Biochemistry, Los Angeles, CA USA
Massively Parallel Complete Active Space Self Consistent Field Molecular Dynamics ***Final Report, 1 Jun. 1993 - 31 May 1997***
Carter, Emily A., California Univ., USA; Sep. 10, 1997; 4p; In English
Contract(s)/Grant(s): N00014-93-I-0908
Report No.(s): AD-A333494; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report briefly summarizes the research developments in ab initio dynamics made possible by this augmentation award to the parent ONR grant. A full description of the research accomplishments will appear in the final technical report.
DTIC
Massively Parallel Processors; Molecular Dynamics; Parallel Processing (Computers); Molecular Structure

19980027707 Pittsburgh Univ., Dept. of Physics and Astronomy, Pittsburgh, PA USA
Electron-Ion Recombination Rate Coefficient Measurements in a Flowing Afterglow Plasma
Gougousi, Theodosia, Pittsburgh Univ., USA; Golde, Michael F., Pittsburgh Univ., USA; Johnsen, Rainer, Pittsburgh Univ., USA; Chemical Physics Letters; 1996; ISSN 0009-2614; Volume 265, pp. 399-403; In English
Contract(s)/Grant(s): NAG5-4116; NAGw-1764
Report No.(s): NASA/CR-96-207334; NAS 1.26:207334; LC-68-26532; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

The flowing-afterglow technique in conjunction with computer modeling of the flowing plasma has been used to determine accurate dissociative-recombination rate coefficients alpha for the ions O2(+), HCO(+), CH5(+), C2H5(+), H3O(+), CO2(+), HCO2(+), HN2O(+), and N2O(+) at 295 K. We find that the simple form of data analysis that was employed in earlier experiments

was adequate and we largely confirm earlier results. In the case of HCO(+) ions, published coefficients range from 1.1 X 10(exp -7) to 2.8 x 10(exp -7) cu cm/S, while our measurements give a value of 1.9 x 10(exp -7) cu cm/S.
Author
Afterglows; Electron-Ion Recombination; Dissociation; Molecular Ions; Recombination Coefficient; Plasmas (Physics); Polyatomic Molecules; Radicals; Electron Probes; Electrons

19980028465 Rutherford Appleton Lab., Central Lab. of the Research Councils, Chilton, UK
CKM Matrix and Fermion Masses in the Dualized Standard Model
Bordes, Jose, Valencia Univ., Spain; Chan, Hong-Mo, Rutherford Appleton Lab., UK; Faridani, Jacqueline, Rutherford Appleton Lab., UK; Pfaudler, Jakov, Oxford Univ., UK; Tsou, Sheung Tsun, Oxford Univ., UK; Dec. 1997; ISSN 1358-6254; 42p; In English; Supported in part by the Spanish Government
Contract(s)/Grant(s): CICYT-AEN97-1718
Report No.(s): RAL-TR-97-068; hep-ph/9712276; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11 0QX, UK), Hardcopy, Microfiche

A Dualized Standard Model recently proposed affords a natural explanation for the existence of Higgs fields and of exactly 3 generations of fermions, while giving at the same time the observed fermion mass hierarchy together with a tree-level CKM matrix equal to the identity matrix. It further suggests a method for generating from loop corrections the lower generation masses and nondiagonal CKM matrix elements. In this paper, the proposed calculation is carried out to 1-loop. It is found first that with the method suggested one can account readily for the masses of the second generation fermions as a 'leakage' from the highest generation. Then, with the Yukawa couplings fixed by fitting the masses of the 2 higher generations, one is left with only 2 free parameters to evaluate the CKM matrix and the masses in the lowest generation. One obtains a very good fit to the CKM matrix and sensible values for the masses of d and e, though, for a valid reason, not of u. In addition, the fitted values of the Yukawa couplings and vacuum expectation values of the dual colour Higgs fields show remarkable features perhaps indicative of a deeper significance.
Author
Fermions; Matrices (Mathematics); Couplings; Standard Model (Particle Physics); Higgs Bosons

19980033143 Johns Hopkins Univ., Dept. of Chemistry, Baltimore, MD USA
Weak Interactions of Boron, Aluminum, and Carbon Atoms: Experiment ***Final Report, 01 Nov. 1994 - 31 Oct. 1997***
Dagdigian, Paul J., Johns Hopkins Univ., USA; Dec. 12, 1997; 16p; In English
Contract(s)/Grant(s): F49620-95-I-0046; AF Proj. 2303
Report No.(s): AD-A334797; AFRL-SR-BL-TR-98-0069; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A primary goal of this project has been the characterization of non-bonding interactions of the boron atom, in its ground and, resonance-excited electronic states with the hydrogen molecule and rare gases. These interaction potentials are critical ingredients in the theoretical modeling of cryogenic media doped with isolated boron atoms. Since electronic spectroscopy is the primary diagnostic tool in the experimental investigation of such doped cryogenic matrices, knowledge of the interaction between the matrix species and dopant in both its ground and electronically excited states is required to interpret such spectra. Because of the need for a close interaction between experiment and theory in the elucidation of the dopant-matrix bimolecular interactions and the structure of small complexes of these species.
DTIC
Aluminum; Cryogenics; Doped Crystals; Electron States; Ground Resonance; Mathematical Models; Molecules; Rare Gases

19980033175 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Evidence of Momentum Conservation at a Nonepitaxial Metal/Semiconductor Interface Using Ballistic Electron Emission Microscopy
Bell, L. D., Jet Propulsion Lab., California Inst. of Tech., USA; Physical Review Letters; Oct. 28, 1996; ISSN 0031-9007; Volume 77, No. 18, pp. 3893-3896; In English
Report No.(s): NASA/CR-96-207305; NAS 1.26:207305; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

Ballistic-Electron-Emission Microscopy (BEEM) spectroscopy has been performed on Au/Si(111) structures as a function of Au thickness and temperature. At 77 K a direct signature of parallel momentum conservation at the Au/Si interface is observed in the BEEM spectra. The variation in spectral shape with both Au thickness and temperature places restrictions on allowable values of inelastic and elastic mean-free paths in the metal, and also requires the presence of multiple electron passes within the

Au layer. An independent indication of multiple reflections is directly observed in the attenuation of BEEM current with Au thickness.
Author
Emission Spectra; Electron Emission; Thickness; Temperature; Gold Alloys; Silicon Compounds

19980033365 Rutherford Appleton Lab., Chilton, UK
Fast Neutron Irradiation of Some APDs Proposed for Application in the CMS ECAL
Bateman, J. E., Rutherford Appleton Lab., UK; Bell, K. W., Rutherford Appleton Lab., UK; Burge, S. R., Rutherford Appleton Lab., UK; Lintern, A. L., Rutherford Appleton Lab., UK; Marsh, A. S., Rutherford Appleton Lab., UK; Spill, E. J., Rutherford Appleton Lab., UK; Stephenson, R., Rutherford Appleton Lab., UK; Torbet, M. J., Rutherford Appleton Lab., UK; Dec. 1997; 32p; In English
Report No.(s): RAL-TR-97-075; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0QX, UK), Hardcopy, Microfiche
The results of a programme of measurements of the effects of fast neutron irradiation on the performance of various APDs proposed for the barrel ECAL in CMS are reported.
Author
Fast Neutrons; Neutron Irradiation; Viability; Infrared Detectors

19980034684 Oregon State Univ., Dept. of Physics, Corvallis, OR USA
Matter-Wave Interferometry With Laser Cooled Atoms ***Final Report, 1 Oct. 1993 - 30 Sep. 1997***
McIntyre, David H., Oregon State Univ., USA; Dec. 15, 1997; 21p; In English
Contract(s)/Grant(s): N00014-91-J-1198
Report No.(s): AD-A333323; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We have developed a cold atomic beam source to be used as the input beam for a three-grating atom interferometer. Using laser cooling and trapping techniques, we have slowed and cooled a thermal atomic beam, trapped the slow atoms, and redirected them into a cold beam with an adjustable velocity. The cold atomic beam has a temperature of approximately 500 muK and has a controllable velocity from 2-20 in/s. The gratings for the interferometer have been microfabricated in silicon nitride and have a grating spacing of 250 nm.
DTIC
Atomic Beams; Interferometers; Interferometry; Laser Cooling; Fabrication

19980035777 California Univ., Berkeley, CA USA
Optimization of Molecular Structures ***Final Report, 1 Dec. 1993 - 30 Nov. 1996***
Head-Gordon, Teresa L., California Univ., USA; May 07, 1997; 4p; In English
Contract(s)/Grant(s): F49620-94-I-0081
Report No.(s): AD-A335815; AFRL-SR-BL-TR-98-0099; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
There has been improvement in robust prediction of secondary structure of real proteins. New models of aqueous solvation have been used to predict energy surface descriptions for protein structure.
DTIC
Molecular Structure; Proteins

19980036327 Defence Research Establishment Suffield, Ralston, Alberta Canada
Determination of Bioactive Peptide Molecular Mass Using Electrospray and Matrix Assisted Laser Desorption Ionization Mass Spectrometry
DAgostino, P. A., Defence Research Establishment Suffield, Canada; Hancock, J. R., Defence Research Establishment Suffield, Canada; Provost, Lionel R., Defence Research Establishment Suffield, Canada; Tornes, John A., Norwegian Defence Research Establishment, Norway; Dai, Y., Alberta Univ., Canada; Jan. 1998; 28p; In English
Report No.(s): AD-A335612; DRES-SM-1497; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Twelve bioactive peptides, ranging in molecular masses from 600 and 4500 u, were selected for ESI-MS and MALDI-TOF-MS analysis in order to assess the spectrometric data that could be accessed for rapid CB screening purposes. Monoisotopic molecular mass data were obtained for all the peptides by ESI-MS with a tri-focusing magnetic sector instrument in the continuum mode using resolutions between 3000 and 6000 (10% valley definition). MALDI-TOF-MS data were collected with an instrument that featured a four-plate source design, pulsed ion extraction for time-lag focusing, and a 1-m linear flight tube. High resolution mass measurements with the tri-focusing magnetic sector instrument were the most accurate. Errors between theoretical and calculated

monoisotopic (or average) molecular mass were in the 0.3 to 18 ppm and 10 to 96 ppm range during ESI-MS and MALDI-TOF-MS analysis, respectively. ESI-MS data may be acquired with as little as 1 to 10 pmoles of peptide at resolutions of 2000 to 3000 (10% valley definition) with the tri-focussing magnetic sector instrument. The MALDI-TOF-MS instrument described offered improved sensitivities with only 0.1 to 1 pmole of peptide being required. In both cases analyses times were rapid, with analyses taking 2 to 5 minutes per sample. Both ionization techniques, ESI and MALDI, would be suitable for rapid molecular mass screening purposes.
DTIC
Mass Spectroscopy; Molecular Weight; Time Lag

19980036653 Technische Univ., Inst. fuer Festkoerperelektronik, Vienna, Austria
THz Radiation Source Trough Periodically Modulated Structures ***Interim Report No. 8, Sep. - Nov. 1997***
Gornik, Erich, Technische Univ., Austria; Rauch, C., Technische Univ., Austria; Strasser, G., Technische Univ., Austria; Unterrainer, K., Technische Univ., Austria; Kersting, R., Technische Univ., Austria; Dec. 04, 1997; 7p; In English
Contract(s)/Grant(s): N68171-96-C-9015
Report No.(s): AD-A335542; R/D-7372-EN-01; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The work on the development of new injection structures was continued. These experiments demonstrate the transition from coherent transport to band like scattering induced transport in a superlattice miniband. A mean free path of an injected electron in the order of 75 nm can be estimated for our ten period superlattices by using the experimental results for coherent and incoherent current at a fixed negative bias of 20 meV. This bias value corresponds exactly to the miniband width. Thus the onset of the Bloch oscillation regime appears at the value predicted by the ESAki-Tsu model. In the next period of the project we will manufacture individual bow-tie antennas coupled to the small mesas to enhance the emitted radiation. This step is also necessary for the other emission devices which are grown to demonstrate THz emission from plasma instabilities. We have observed THz emission from coherent plasma oscillations vertical to the surface of bulk semiconductors. The THz emission results from the response of carriers to the field screening induced by the ultrafast photoexcitation. Carriers are accelerated vertically to the surface and perform coherent oscillations around their new equilibrium state which leads to the emission of THz radiation. Our time-resolved measurements of the THz emission give insight into the dynamics of these plasma oscillations and their generation processes.
DTIC
Radiation Sources; Charge Carriers; Superlattices; Quantum Wires

73
NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory. For space radiation see 93 Space Radiation.

19980033990 Joint Inst. for Nuclear Research, Dubna, USSR
Three-dimensional trim coil field in the VINCY cyclotron
Vorozhtsov, S. B., Joint Inst. for Nuclear Research, USSR; Titkova, I. V., Joint Inst. for Nuclear Research, USSR; Lomakina, O. V., Joint Inst. for Nuclear Research, USSR; Altiparmakov, D. V., Institut za Nuklearne Nauke Boris Kidric, Yugoslavia; Lazovic, M., Institut za Nuklearne Nauke Boris Kidric, Yugoslavia; 1996; 8p; In English
Report No.(s): JINR-E-9-96-320; DE97-622368; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The trim coil magnetic field in the VINCY cyclotron was performed with the help of the three-dimensional (3D) software. The comparison of the 2D and 3D trim coil calculation results are presented. The 3d calculations of trim coil show some difference in their radial gradients as compared with the 2D results. The noticeable trim coil response dependence on the magnetic field level also occurs.
DOE
Cyclotrons; Magnetic Fields; Magnetic Coils

74
OPTICS

Includes light phenomena; and optical devices. For lasers see 36 Lasers and Masers.

19980024034 Honeywell Technology Center, Plymouth, MN USA
LIGA-Based Tunable Optical Filters for Multispectral IR Imagers and Gas Analyzers ***Semiannual Report, 14 Sep. 1993 - 30 Nov. 1997***
Ohnstein, Thomas, Honeywell Technology Center, USA; Nov. 30, 1997; 35p; In English
Contract(s)/Grant(s): DABT63-93-C-0066
Report No.(s): AD-A334870; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Honeywell Technology Center and the University of Wisconsin have developed microelectromechanical tunable IR filters for IR spectral analysis. The filters and integral actuators are fabricated by the MEMS LIGA process for making high-aspect-ratio metallic microstructures. The tunable IR filter is a mechanically deformable structure consisting of an array of parallel metal plates joined by spring flexures and driven by an integral linear actuator. The plates form an array of identical waveguides whose transmittance properties can be varied by changing the spacing between them. The filter can be coupled with IR detectors or even 2-D imaging arrays such as Honeywell's uncooled IR focal plane arrays to form IR detection and imaging systems. In this program, the transmission filter concept was verified and tunable filters were demonstrated. Filters with a tunable range for the transmission wavelength cutoff from 8 micrometer s to 25 micrometers were demonstrated. An integral linear electromagnetic actuator technology was developed to drive the tunable filters. Linear actuators with large travel (+/- 1.0 mm) and large force (2-3 mN) were demonstrated. The initial feasibility of using the tunable IR filters for gas identification and analysis was shown with a laboratory demonstration of a gas point detector.
DTIC
Optical Filters; Tunable Filters; Actuators

19980025485 Office of Naval Research, Arlington, VA USA
Infrared Optical Fiber Coupler, Background of the Invention
Schaafsma, David T., Inventor, Office of Naval Research, USA; Sanghera, Jasbinder S., Inventor, Office of Naval Research, USA; Aggarwal, Ishwar D., Inventor, Office of Naval Research, USA; Nov. 26, 1997; 24p; In English
Report No.(s): AD-D018674; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An infrared fiber optic coupler and a method for making an infrared fiber optic coupler are disclosed. The method comprises the steps of: braiding first and second infrared transmitting glass fibers to form first and second arms of the infrared fiber optic coupler; inserting the braided first and second infrared transmitting glass fibers through a furnace; securing the braided glass fibers by two clamping mechanisms on first and second sides of the furnace; purging the furnace of water vapor and oxygen with steady flow of inert gas through the furnace; allowing infrared light to pass through one of the first and second arms of the coupler; detecting the infrared signals from the first and second arms of the coupler in first and second infrared detectors; comparing the detected signals to develop a coupling ratio between the first and second arms of the coupler; turning the furnace on to heat the first and second braided glass fibers to the point where the glass fibers begin to darken in color; translating the second clamping mechanism to produce a tautness on the first and second braided glass fibers until the desired coupling ratio has been achieved; turning the furnace off; maintaining tension on the first and second braided glass fibers until the fibers cool to rigidity; and turning off the gas flow.
DTIC
Infrared Detectors; Optical Relay Systems; Fiber Optics; Inventions; Technologies; Patent Applications

19980027591 ThermoAnalytics, Inc., Calumet, MI USA
Research to Develop Automated Target Building Capabilities for ACT/EOS ***Final Report, Jul. 1996 - Aug.***
Rodriguez, Leonard J., ThermoAnalytics, Inc., USA; Johnson, Keith R., ThermoAnalytics, Inc., USA; Aug. 29, 1997; 26p; In English
Contract(s)/Grant(s): F19628-96-C-0114; AF Proj. 2688
Report No.(s): AD-A335129; PL-TR-97-2115; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research program developed a new modeling tool, which allows the user to build new target models for infrared signature prediction and scene simulation. A methodology is used that provides the user with an ease-of-use target building capability. The program was comprised of a task that gives the user an efficient tool to build targets for ACT/EOS (and other related government

programs such as SWOE). This development program focused on tools for a research environment with direct extensions for future application to field operations.
DTIC
Infrared Signatures; Computer Programs; Computerized Simulation; Graphical User Interface

19980028457 NASA Pasadena Office, CA USA
Polarization Independent Electro-Optic Modulator
Yao, Xiao-Tian Steve, Inventor, NASA Pasadena Office, USA; Aug. 05, 1997; 8p; In English
Patent Info.: Filed 9 Feb. 1996; NASA-Case-NPO-19430-1; US-Patent-5,654,818; US-Patent-Appl-SN-599200; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A polarization insensitive electro-optic modulator is constructed by providing a polarization beamsplitter to separate an incoming light beam into two orthogonally plane polarized beams. Each of the polarized beams passes through a separate electro-optic modulator where each beam is modulated by the same data signal. After modulation the beams are combined to yield a modulated beam having modulated components that are orthogonally polarized. Not only is this device insensitive to changes in polarization of the input beam, the final modulated beam can be detected by optical receivers without regard to polarization alignment of the modulated beam and the receiver.
Official Gazzette of the U.S. Patent and Trademark
Modulators; Electro-Optics; Fabrication

19980032331 NASA Pasadena Office, CA USA
Point Relay Scanner Utilizing Ellipsoidal Mirrors
Manhart, Paul K., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Pagano, Robert J., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Jul. 22, 1997; 7p; In English
Patent Info.: Filed 5 May 1995; NASA-Case-NPO-18756-1; US-Patent-5,650,869; US-Patent-Appl-SN-435400; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A scanning system uses a polygonal mirror assembly with each facet of the polygon having an ellipsoidal mirror located thereon. One focal point of each ellipsoidal mirror is located at a common point on the axis of rotation of the polygonal mirror assembly. As the mirror assembly rotates. a second focal point of the ellipsoidal mirrors traces out a scan line. The scanner can be utilized for scanned output display of information or for scanning information to be detected.
Official Gazzette of the U.S. Patent and Trademark
Scanners; Mirrors; Polygons; Display Devices

19980032579 NASA Johnson Space Center, Houston, TX USA
Light-Directed Ranging System Implementing Single Camera System for Telerobotics Applications
Wells, Dennis L., Inventor, NASA Johnson Space Center, USA; Li, Larry C., Inventor, NASA Johnson Space Center, USA; Cox, Brian J., Inventor, NASA Johnson Space Center, USA; Sep. 30, 1997; 9p; In English
Patent Info.: Filed 10 Apr. 1995; NASA-Case-MSC-22549-1; US-Patent-5,673,082; US-Patent-Appl-SN-425003; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A laser-directed ranging system has utility for use in various fields, such as telerobotics applications and other applications involving physically handicapped individuals. The ranging system includes a single video camera and a directional light source such as a laser mounted on a camera platform, and a remotely positioned operator. In one embodiment, the position of the camera platform is controlled by three servo motors to orient the roll axis, pitch axis and yaw axis of the video cameras, based upon an operator input such as head motion. The laser is offset vertically and horizontally from the camera, and the laser/camera platform is directed by the user to point the laser and the camera toward a target device. The image produced by the video camera is processed to eliminate all background images except for the spot created by the laser. This processing is performed by creating a digital image of the target prior to illumination by the laser, and then eliminating common pixels from the subsequent digital image which includes the laser spot. A reference point is defined at a point in the video frame, which may be located outside of the image area of the camera. The disparity between the digital image of the laser spot and the reference point is calculated for use in a ranging analysis to determine range to the target.
Official Gazzette of the U.S. Patent and Trademark
Rangefinding; Laser Range Finders; Cameras

19980033137 Rutherford Appleton Lab., Chilton, UK

Photophysics of Cyanine Dyes Adsorbed onto Surfaces: Sub-Nanosecond Fluorescence Lifetime Measurements of 3,3'-Diethyloxadicarbocyanine Iodide and Photoisomer

Ferreira, L. F. Vieira, Instituto Superior Tecnico, Portugal; Oliveira, A. S., Instituto Superior Tecnico, Portugal; Henbest, K., Rutherford Appleton Lab., UK; Worrall, D., Loughborough Univ. of Technology, UK; Wilkinson, F., Loughborough Univ. of Technology, UK; Danson, C. N., Rutherford Appleton Lab., UK; Booth, G., Rutherford Appleton Lab., UK; Jan. 1998; ISSN 1358-6254; 11p; In English; Original contains color illustrations

Contract(s)/Grant(s): ERBFMGE-CT950053

Report No.(s): RAL-TR-98-012; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11 0QX, UK), Hardcopy, Microfiche

This report describes the experiment entitled 'Photophysics of Cyanine dyes on Surfaces'; carried out at the Central Laser Facility (CLF) from the 6th to the 20th January 1997. The experiment, funded by the Framework IV Large-Scale Facilities Access Scheme, was proposed by Prof. LF Vieira Ferreira, Centro de Quimica-Fisica Molecular, Complexo I, IST, 1096 Lisboa Codex, Portugal, and carried out by visiting researchers from the Institute. They were supported by researchers from the Central Laser Facility, Rutherford Appleton Laboratory.

Derived from text

Iodides; Dyes; Lasers; Fluorescence; Adsorption

19980034674 Lebedev Physical Inst., Moscow, Russia

Dynamic Dual-Frequency Control of Nematic Liquid Crystals in Adaptive Optics Systems ***Final Report***

Naoumov, Alexandre, Lebedev Physical Inst., Russia; Jan. 1997; 32p; In English

Contract(s)/Grant(s): F61708-97-W-0047

Report No.(s): AD-A333511; SPC-97-4015; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Laser Measuring Branch, P. N. Lebedev Physical Institute, Samara Branch as follows: The contractor will investigate dual-frequency control of liquid crystals in order to establish limits on rise and fall times as outlined in the proposal. He will also investigate control methods for liquid crystal modulators. The contractor will design and construct a programmable generator that he will use to study the possibility of improving the response time of liquid crystal modulators by controlling the voltage time history.

DTIC

Crystal Optics; Dynamic Control; Electric Potential; Frequency Control; Liquid Crystals; Adaptive Optics; Nonlinear Optics

19980036652 Army Research Lab., Information Science and Technology Directorate, Adelphi, MD USA

Light Scattering from an Optically Active Sphere into a CIrcular Sensor Aperture ***Progress Report, Oct. 1993 - Jul. 1997***

Pendleton, J. D., Army Research Lab., USA; Rosen, David L., Army Research Lab., USA; Gillespie, James B., Army Research Lab., USA; Dec. 1997; 43p; In English

Report No.(s): AD-A335446; ARL-TR-1474; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two methods are developed to average V and I Stokes parameters over a circular sensor aperture collecting light scattered from an optically active sphere. One method uses a two-dimensional numerical integration of Bohren's theory in scalar form, which explicitly shows the connection with Mueller matrix elements. The second method uses expansions of vector spherical harmonics in Bohren's theory to integrate over apertures of any size without convergence checks since numerical integration is avoided. Equations simplifying the analytical results for 4 pi scattering are obtained. Sample computations of average Stokes parameters are performed with both methods, and agreement to six decimal places is obtained.

DTIC

Light Scattering; Spheres

19980036934 Department of the Navy, Washington, DC USA

Optical Notch Filters Based on Two-Dimensional Photonic Band-Gap Materials

Tonucci, Ronald J., Inventor, Department of the Navy, USA; Rosenberg, Armand, Inventor, Department of the Navy, USA; Apr. 08, 1997; 33p; In English

Patent Info.: US-Patent-Appl-SN-847171

Report No.(s): AD-D018665; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A band-gap spectral filter is made of a nanochannel glass structure having a two-dimensional array of parallel dielectric rods arranged in a matrix material. The materials for the dielectric rods and the matrix material are selected so that the difference between the refractive index of the dielectric rods and the refractive index of the matrix material is equal to or less than about 0.5.
DTIC
Bandstop Filters; Matrix Materials; Optical Filters

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see90 Astrophysics.

19980027040 National Inst. for Fusion Science, Theory and Computer Simulation Center, Toki, Japan
Low-Dimensional Model of Resistive Interchange Convection in Magnetized Plasma
Bazdenkov, Sergey, National Inst. for Fusion Science, Japan; Sato, Tetsuya, National Inst. for Fusion Science, Japan; Sep. 1997; ISSN 0915-633X; 26p; In English
Contract(s)/Grant(s): MESSC-08044109
Report No.(s): NIFS-505; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Self-organization and generation of large shear flow component in turbulent resistive interchange convection in magnetized plasma is considered. The effect of plasma density-electrostatic potential coupling via the inertialess electron dynamics along the magnetic field is shown to play significant role in the onset of shear component. The results of large-scale numerical simulation and low-dimensional (reduced) model are presented and compared.
Author
Models; Plasma Density; Magnetic Fields; Convection

19980027091 Japan Atomic Energy Research Inst., Dept. of Fusion Plasma Research, Tokyo, Japan
The design study of the JT-60SU device, No. 9, Fuel Handling, Confinement and Clean up Systems for JT-60SU
Hayashi, Takumi, Japan Atomic Energy Research Inst., Japan; Miya, Naoyuki, Japan Atomic Energy Research Inst., Japan; Kikuchi, Mitsuru, Japan Atomic Energy Research Inst., Japan; Toyoshima, Noboru, Japan Atomic Energy Research Inst., Japan; Ushigusa, Kenkichi, Japan Atomic Energy Research Inst., Japan; Masaki, Kei, Japan Atomic Energy Research Inst., Japan; Kaminaga, Atsushi, Japan Atomic Energy Research Inst., Japan; Kital, Tatsuya, Japan Atomic Energy Research Inst., Japan; Kurita, Gen-ichi, Japan Atomic Energy Research Inst., Japan; Nagashima, Keisuke, Japan Atomic Energy Research Inst., Japan; Nagami, Masayuki, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 162p; In Japanese
Report No.(s): JAERI-Research-97-007; DE97-750702; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Fuel handling system and confinement and clean up system for JT-60SU are designed in order to process 2000 Ci/y of tritium generated by DD reaction and to perform DT reaction experiment (D:T = 1:1, fueling flow rate = 30 mol/hr) using about 100 grams of tritium safely. Fuel handling system consists of vacuum system, fuel clean up system, isotope separation system, effluent tritium removal system (ERS), fuel injection systems (pellet injection and gas puff), and fuel storage system. to design the system as safe as possible, the main considering points are (1) to control the tritium inventory in each sub-system or sub-component to less than 5 grams, and (2) to optimize each sub-system under the operation scenario of the main plasma experimental phases. Tritium is handled safely under multiple confinement concept following general laws for radioisotopes handling in Japan. Each confinement stage has its own tritium clean up system, such as the above ERS for primary containment, inert gas processing system for glove box etc. (secondary one), and atmosphere detritiation system for room (tertiary one). In addition, normal ventilation system, dryers regeneration system, waste storage system, and monitoring and controlling system are also considered. The major safety design conditions for tritium confinement are (1) to control the tritium loss, which can not be recycled, to less than 1 g/y, and (2) to control environmental tritium release to less than 1 Ci/y. This report summarizes the recent progress of the above system design studies, with flow diagram, main component specifications, layout, and the tritium inventory.
DOE
Tokamak Devices; Tritium

19980027592 National Inst. for Fusion Science, Theory and COmputer Simulation Center, Toki, Japan
Intensification of Magnetic Field by Concentrate-and-Stretch of Magnetic Flux Lines
Kitauchi, Hideaki, National Inst. for Fusion Science, Japan; Kida, Shigeo, National Inst. for Fusion Science, Japan; Sep. 1997; ISSN 0915-633X; 52p; In English; Original contains color illustrations

Report No.(s): NIFS-506; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The mechanism of generation of magnetic field by thermal convection is investigated by analyzing the numerical solution to the Boussinesq magneto- hydrodynamic equations in a rotating spherical shell. The magnetic flux lines are intensified by concentrate-and-stretch around sinks in the outer boundary layer, on the equatorial plane and in the inner boundary layer, and the strong magnetic field is generated downstream of them. The magnetic flux lines are being stretched there irrespective as to whether fluid elements accelerate or decelerate. keywords: MHD dynamo, thermal convection, rotating spherical shell, concentrate-and-stretch.

Author

Magnetic Fields; Magnetic Flux; Stretching

19980027686 Japan Atomic Energy Research Inst., Tokyo, Japan

Development of the computer system for the JT-60 negative-ion based NBI

Kawai, Mikito, Japan Atomic Energy Research Inst., Japan; Oohara, Hiroshi, Japan Atomic Energy Research Inst., Japan; Honda, Atsushi, Japan Atomic Energy Research Inst., Japan; Kuriyama, Masaaki, Japan Atomic Energy Research Inst., Japan; Aoyagi, Tetsuo, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 75p; In Japanese

Report No.(s): JAERI-Tech-97-012; DE97-750689; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The negative-ion based NBI system (N-NBI) for JT-60 is the first NBI system using a negative-ion source in the world. The N-NBI is designed do deliver a neutral beam injection power of 10 MW at 500 keV. The computer for the N-NBI system is composed of UNIX workstations and VMEbus systems, and has the functions of ion source operation and data acquisition and processing. Since a real-time operating system compatible with the UNIX is adopted for the VMEbus systems, the software development environment both for the workstation and the VMEbus system is unified with the UNIX. The software has been developed with a priority to the software required for the verification tests which are performed in accordance with the progress of the N-NBI construction. The first beam injection with the N-NBI has been conducted in March using the newly developed software, and the deuterium neutral beam injection of 350 keV, 2.5 MW has achieved as of the end of October 1996.

DOE

Computer Systems Design; Tokamak Devices; Negative Ions; Computer Systems Programs

76
SOLID-STATE PHYSICS

Includes superconductivity. For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

19980033145 Minnesota Univ., Dept. of Electrical Engineering, Minneapolis, MN USA

Epitaxial Metallizations of III-V Semiconductors ***Final Report, 30 Jun. 1994 - 29 Jun. 1997***

Cohen, P. I., Minnesota Univ., USA; Jun. 1997; 18p; In English

Contract(s)/Grant(s): F49620-94-I-0330

Report No.(s): AD-A334789; AFRL-SR-BL-TR-98-0067; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The nucleation and growth of three intermetallic systems on III-V semiconductors have been examined or begun. FeAl and CoGa have been grown on GaAs(100) and their structural and magnetic properties examined. For their nucleation and growth, the main techniques used were ultrahigh vacuum scanning tunneling microscopy and reflection high energy electron diffraction. Direct confirmation of the growth transition from single-layer to bilayer for FeAl was obtained. Magnetooptical Kerr effect measurements showed the transition in magnetic properties of FeAl. These results suggest that fundamental aspects crucial to spin-valve devices could be studied without the complication of a heterointerface. Studies of CoGa on GaAs showed how to prepare smooth films of CoGa and observed a fourfold anisotropy. However it left unanswered the controversy of whether lattice matching would allow preparation of pinhole free films. Finally, an effort to grow prepare high quality GaN was started, to serve as a substrate for the in situ growth of HfN films. A source was constructed and GaN films were prepared. However, deposition of this promising material has not yet been attempted.

DTIC

Anisotropy; Electron Diffraction; Epitaxy; High Energy Electrons; Intermetallics; Magnetic Properties; Pinholes; Scanning Tunneling Microscopy; Semiconductors (Materials); Ultrahigh Vacuum

19980036892 Daresbury Nuclear Physics Lab., UK

Recent Advances in Phasing

Wilson, K. S., Compiler, York Univ., UK; Davies, G., Compiler, York Univ., UK; Ashton, A. W., Compiler, Daresbury Nuclear Physics Lab., UK; Bailey, S., Compiler, Daresbury Nuclear Physics Lab., UK; Aug. 1997; ISSN 1362-0193; 221p; In English; Proceedings of the CCP4 Study Weekend, Jan. 1997, UK; Also announced as 19980036893 through 19980036911

Report No.(s): DL-CONF-97-001; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

Solving the phase problem is the crucial step in obtaining a crystal structure. For macromolecular crystallographers it may also be the most difficult and time-consuming step. The traditional methods used are Multiple Isomorphous Replacement and Molecular Replacement. This meeting covered aspects of some of the newer methods that are in use and some potential methods for the future. Multiwavelength Anomalous Dispersion (MAD) was covered in some detail. In the first session, John Helliwell described the basic principles of anomalous scattering, Andy Thompson explained the bean-dine requirements of MAD and Janet Smith introduced us to MAD on proteins. This introduction to the method was followed by several case studies (Valerie Biou, Mark Peterson, Ian Glover and Harry Powell). Eric de la Fortelle described the use of the program SHARP for MAD phasing and Phil Evans talked about multiple wavelength simultaneous scaling. Rather more unusual uses of anomalous diffraction were described by Bill Shepard and Edgar Weckert. The second day of the meeting was more theoretical. An introduction to direct methods was given by Zbyszek Dauter followed by two talks on ab-initio phasing of proteins (and the limitations of the method) by the Shake-and Bake method (Charles Weeks) and using ShelX (George Sheldrick). Gerard Bricogne covered maximum entropy techniques and Abraham Szoke introduced to us the application of holographic methods to crystallography. Case studies of using WARP to improve your phasing were presented by Anastassis Perrakis. The final presentations were on low resolution phasing strategies, based on solution scattering (Dimitri Svergun) or crystallographic images (Alexandre Urzhumtsev). Kevin Cowtan summarised what we had leamt in the meeting and led the discussion. The meeting, this year, was held at York University for the first time. There were 418 participants in total, including 111 participants from Europe, 16 from the Americas and 2 from Japan. Bursaries, covering the cost of registration and accomodation were given to 232 young scientists, and an additional contribution was made to the travel costs of 23 young scientists from outside the UK. The speakers comprised 8 from the UK, 9 from elsewhere in Europe and 3 from the USA. The meeting was organised and supported by the BBSRC Collaborative Computational Project in Protein Crystallography (CCP4).

Author

Crystal Structure; Crystallography; Conferences; Maximum Entropy Method

19980036893 Manchester Univ., Dept. of Chemistry, UK

Basic Principles of Anomalous Scattering and MAD

Helliwell, John R., Manchester Univ., UK; Recent Advances in Phasing; Aug. 1997, pp. 1-8; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The phase problem in macromolecular crystallography is amenable to the multi wavelength anomalous dispersion method, which is now known as the MAD method. The theory of various approaches has been developed over a long period (see e.g. Okaya and Pepinsky (1956), Mitchell (1957), Herzenberg and Lau (1967), Karle (1967, 1980), Hoppe and Jakubowski (1975)). The harnessing of synchrotron radiation and the chance thereby to finely tune the X-ray wavelength around the X-ray absorption edge of a target (heavy) atom, so as to vary the scattering in amplitude and phase of that atom, has made the method practical. If an anomalous scatterer can certainly be introduced, as with the seleno-methionine labelling of proteins (Hendrickson (1991)), then relatively speedy structure determination of a new protein structure is practicable. The protein size that is tractable is advancing as synchrotron machine, and beamline, as well as detector capability, improves. Experimental knowledge of anomalous dispersion effects has also improved. This involves fundamental studies whereby very fine profiles (Arndt et al. (1982)) or anisotropies (Templeton and Templeton (1985)) have been investigated for bound atoms. Moreover different strategies in macromolecular crystal phase determination (Peterson et al. (1996)) as well as phase improvement and extension methods (Chayen et al. (1996)) have given practical ideas of these capabilities. The growth of the number of SR instruments in the last 15 years is testimony to a confidence in these approaches. For an overview see Helliwell (1992) and for an update see Chayen et al. (1996), as well as ideas and plans at the outset see Helliwell (1979). The purpose of this paper is to set down the principles and basis of anomalous scattering for MAD.

Author

Crystallography; Anomalies; Scattering Amplitude; Dispersions

19980036894 European Molecular Biology Lab., Grenoble, France

Design of Synchrotron Beamlines for MAD Protein Crystallography - ESRF BM14

Thompson, A., European Molecular Biology Lab., France; Recent Advances in Phasing; Aug. 1997, pp. 9-24; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The method of Multiple Wavelength Anomalous Diffraction (MAD) has been developed extensively in recent years by Hendrickson, Fourme and Smith. Small variations in intensity of diffraction spots due to resonant scattering of a heavy atom excited by the frequency of the incoming X-rays can be used in order to solve the crystallographic phase problem. The techniques and physics involved are described in the above reviews. The method is best pursued using the variable wavelength of radiation available at synchrotron sources, although in cases where the anomalous scattering is strong with respect to the size of the molecule allied techniques may be used on rotating anode sources. The ”anomalous” intensity changes produced in the diffraction patterns are typically of the order of a few percent, and are (unfortunately) of a similar size to the errors (random and systematic) in good data! The methods of designing a beamline to maximize the chance of being able to collect MAD data by being aware of where error may creep into measurements are discussed in conjunction with the design of the MAD beamline (BM14) at the ESRF, its advantages and drawbacks.

Author

Design Analysis; Synchrotrons; Beams (Radiation); Diffraction Patterns; Creep Properties

19980036895 Purdue Univ., Dept. of Biological Sciences, West Lafayette, IN USA

Multiwavelength Anomalous Diffraction in Macromolecular Crystallography

Smith, Janet L., Purdue Univ., USA; Recent Advances in Phasing; Aug. 1997, pp. 25-40; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

Multiwavelength anomalous diffraction (MAD) is the fastest growing method of structure determination in macromolecular crystallography. At least twenty-five new structures solved with MAD were published in the past year. Many factors contribute to the growth of MAD, and its future is extremely bright. The experience gained over the past several years is now being generalized to make MAD more accessible. This paper aims to present a practical overview of MAD. I first review the observational equation for MAD and describe the basis of the phasing signal and how it is estimated for specific problems. This is followed by a discussion of the design of a MAD experiment, schemes for data analysis and phasing, and considerations in solving the anomalous-scatterer partial structure. Finally, there is a discussion of selenomethionine as a phasing vehicle. More comprehensive reviews of MAD have been published by W. A. Hendrickson, who pioneered its development and application in macromolecular crystallography (Hendrickson, 1991; Hendrickson & Ogata, 1997).

Author

Anomalies; Wavelengths; Diffraction; Crystallography

19980036896 Commissariat a l’Energie Atomique, Lab. de Cristallographie Macromoleculaire, Grenoble, France

Phasing MAD Data Using MIR Programs

Biou, Valerie, Commissariat a l’Energie Atomique, France; Recent Advances in Phasing; Aug. 1997, pp. 41-54; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

Many structures have been solved using Multiwavelength Anomalous Diffraction (MAD) data during the last few years, and their number is increasing exponentially. The aim of this paper is to give a practical approach to MAD, and in particular to the use of MIR programs to phase MAD data, and to discuss the limitations and advantages of the method. In the presence of anomalously scattering atoms in the protein crystal, one can use two types of signal to calculate phases from a diffraction data set: (1) dispersive difference signal- due to the contribution of F’a to the structure factor, the intensity of a given reflection changes with the wavelength, (2) anomalous signal: the intensity of symmetry related reflections is different due to the contribution of F”a. These signals can be used in a MAD experiment with tuneable synchrotron radiation, so that both the dispersive and anomalous differences are maximized. This takes at least 3 wavelengths, which we shall define as follows: (lambda)1 is measured at the minimum of f’, i.e., the inflection point of the fluorescence spectrum; (lambda)2 is taken at the maximum of f” (and of the fluorescence spectrum); (lambda)3 is taken on the high energy side of the spectrum. Thus, that (lambda)1 and (lambda)3 maximize the dispersive difference signal, and (lambda)2 maximizes the anomalous signal. A fourth wavelength, remote on the low energy side of the edge, can also be useful. Briefly, it is obvious that one overcomes anizomorphism problems between native and derivative by using MAD. One can collect three data sets on a single, flash frozen crystal containing an appropriate element. On the other hand, the anomalous signal is generally much less intense than the isomorphous signal for the same element. Just consider the

example of the replacement of sulphur by selenium in selenomethionine. The K edge of selenium contributes 10 electrons at the maximum dispersive difference, whereas it gives 18 electrons isomorphous signal compared to sulphur. Even for such a light atom as selenium, the isomorphous difference will be roughly twice as large as the dispersive difference. In the case of mercury, the difference between the anomalous and the isomorphous contributions is even larger. Therefore, the problem is to measure small differences between large figures. This has been said before, but it should be stressed: it is vital for a MAD experiment to get accurate measurements. Synchrotron beamlines have been developed that allow to do this in a shorter and shorter time, and in the next few months there should be less shortage of beam time for MAD.
Author
Data Bases; Data Management; Technology Transfer; Anomalies; Diffraction; Wavelengths

19980036897 Medical Research Council, Lab. of Molecular Biology, Cambridge, UK
Advances in MIR and MAD Phasing: Maximum-Likelihood Refinement in a Graphical Environment, With SHARP
deLaFortelle, E., Medical Research Council, UK; Irwin, J., Medical Research Council, UK; Bricogne, G., Medical Research Council, UK; Recent Advances in Phasing; Aug. 1997, pp. 55-68; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The problem of estimating heavy-atom parameters (esp. occupancies) from acentric reflexions in the MIR method has a long history of difficulties, and a conceptually satisfactory solution allowing bias-free refinement of all parameters (including the lack of isomorphism) has only recently been obtained by a recourse to the method of maximum-likelihood estimation. The situation is essentially identical in the case of MAD phasing. The maximum-likelihood method needs to be invoked to exploit incomplete phase information in a heavy-atom parameter refinement while preventing that information from biasing the results. We have designed and written from scratch a computer program - SHARP (Statistical Heavy-Atom Refinement and Phasing) - that fully implements the maximum-likelihood approach. It can refine simultaneously scale, a model for the lack of isomorphism and all heavy-atom parameters from MIR and MAD data, or any mixture of them. The program has been systematically tested, both on synthetic and on measured data, and compared to MLPHARE. The results show the superiority of our approach, especially in cases of low signal-to-noise ratio. The likelihood function has also been used as a detection tool to plot residual Fourier maps and probe for minor sites, and for the calculation of phase probability distributions encoded in Hendrickson-Lattman coefficients.
Author
Heavy Elements; Computer Programs; Maximum Likelihood Estimates; Probability Theory

19980036898 Dundee Univ., Dept. of Biochemistry, UK
Multiwavelength Anomalous Dispersion Phasing Strategies Investigated With a Brominated Oligonucleotide
Peterson, Mark R., Dundee Univ., UK; Recent Advances in Phasing; Aug. 1997, pp. 69-76; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

Multiwavelength anomalous dispersion methods were used to analyse the crystal structure of d(CGCG(Br)CG) in extension of the work presented in Petersons Harrop, McSweeney. Leonard, Thompson, Hunter and Helliwell (1996) J. Synch. Rad. 3, 24-34. The brominated oligonucleotide d(CGCG(Br)CG) of chemical formula Cl14N48O68Pl0Br2 crystallises in space group P2(1)2(1)2(1) with unit cell dimensions a = 17.97, b = 30.98, c = 44.85A, (alpha) = (beta) = (gamma) =90 deg. It was chosen as a test crystal to evaluate the MAD method itself and to commission station PX9.5 for several reasons; it was radiation insensitive; it had a very good concentration of anomalous scatterers, i.e. two bromines in two hundred and forty light atoms; and the bromine K edge was very near to the critical wavelength flux output of the SRS wiggler. It also diffracted strongly, due to the relatively small unit cell, in spite of the rather small crystal volume. Data to a resolution of 1.65 A were collected at four wavelengths about the bromine atom K absorption edge using synchrotron radiation at Station PX9.5, SRS, Daresbury. Traditionally the maximum of f" not coincident with the minimum in f', however, in this case both are observed on the same data set, (lambda)(sub 2). Hence (Delta)(sub anom) and (Delta)f' could be maximised using only two wavelengths. Various wavelength combinations phasing strategies were then studied, ranging from 4 to 2 wavelengths. DM phase improvement procedures were also employed on these combinations giving highly interpretable maps even for unoptimised 2 wavelength cases.
Author
Wavelengths; Anomalies; Bromine; Crystal Structure; Dispersing

19980036899 Keele Univ., Physics Dept., UK
MAD Phasing of Desulphoredoxin, an Fe Metalloprotein
Glover, Ian D., Keele Univ., UK; Nguti, Don, Keele Univ., UK; Recent Advances in Phasing; Aug. 1997, pp. 77-88; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire,

WA4 4AD, UK), Hardcopy, Microfiche

Desulphoredoxin is a small iron containing metalloprotein, consisting of a dimer of 36 residue chains each coordinating an iron atom. Data collected about the Fe absorbtion edge of 1.74A, wavelengths being set with reference to XANES spectra recorded from a single crystal, were used to determine the positions of the anomalously scattering Fe atom and hence, using MLPHARE calculate an electron density map. Desulphoredoxin is an Fe-S protein isolated from Desulphovibrio gigas, (Mouri et al,, 1977, Bruschi et al., 1979) comprised of two 36 residue monomers, each coordinating an iron atom, which form a dimers with an M(sub r) of 7740. Each of the monomers has four Cys residues expected to coordinate the iron atom. Most biochemical and spectroscopic evidence points to a similar coordination of iron but in relation to rubredoxin, higher symmetry in Fe binding is anticipated . Good quality crystals of desulphoredoxin were first reported in 1980 (Seiker et al., 1980, but no suitable derivatives have been prepared. As a small metalloprotein it presented a good case for structure determination using MAD methods. With two Fe atoms in a small protein significant anomalous scattering contributions are expected, the maximal anomalous diffraction ratios (Hendrickson, 1991) of 5% and 4.8% for the absorptive and dispersive contributions respectively.

Author

Iron; Data Acquisition; Atomic Physics; Absorption; Single Crystals

19980036900 Cambridge Univ., Cambridge, UK

MAD-DM at Elettra: A Case Study

Powell, Harold R., Cambridge Univ., UK; Recent Advances in Phasing; Aug. 1997, pp. 89-96; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

MAD is an extremely demanding technique which can yield good phases from high quality crystals and data. However, in combination with DM, usable maps can be obtained from datasets which are little better than average. The present work is intended to show that provided some care is taken in the early stages of the process, it is a straightforward technique which is of particular applicability to oligonucleotide crystallography. Here I concentrate on the aspects of the technique as I have applied it, treating the problem as a variation on MIR using MLPHARE for heavy atom refinement. The data for the three structures discussed here were all collected at the new synchrotron in Trieste, Italy, on the protein crystallography beamline 5.2R on visits in February and May 1996; they were the first three MAD datasets that I collected, and among the first to be collected at Elettra. The beamline at Trieste is well suited to MAD because of the easily tunable X-ray source from approx. 0.62 A to approx. 3.1 A. It supplies 10(exp 12) to 10(exp 13) monochromatic photons per second; although the X-rays are not quite as well focussed as at the ESRF, it is still an extremely bright source, and the reliability and stability are very high. It is necessary to process the diffraction data as well as possible; small errors can lead to failure of MAD-DM as it uses extremely small differences between Bijvoet pairs, which are expected to be only slightly larger than the errors in the data themselves. Without concentrating on the data processing here, it should nevertheless be remembered that any outliers flagged in the output from scaling should be noted and if the deviations are particularly large, these reflections should be omitted manually from further processing, at least until the heavy atoms have been located; Patterson maps in particular are very sensitive to the presence of rogue reflections. The SCALEIT statistics for the merging R factors of and between datasets should also be examined; if the differences between the datasets are all about the same, then location of heavy atoms is unlikely to be successful by any means. The majority of the calculations performed in these analyses were carried out with standard CCP4 programs; the data for the first example have been made available as part of a worked example on the CCP4 server. Data reduction from raw images was carried out with Denzo and Scalepack; processing with other programs (e.g.MOSFLM and SCALA) will yield data of similar quality.

Author

Wavelengths; Anomalies; Diffraction; Data Processing; Crystallography

19980036901 Medical Research Council, Lab. of Molecular Biology, Cambridge, UK

Scaling of MAD Data

Evans, Philip R., Medical Research Council, UK; Recent Advances in Phasing; Aug. 1997, pp. 97-102; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The integrated intensities from any data collection experiment are not all on the same scale, because of various systematic differences in the collection procedure. It is the task of the ”data reduction” protocol to place all observations on a common scale, to detect and reject outliers (reflections for which the data collection has gone badly wrong), and to produce a list of vertical bar F vertical bar and (sigma)(vertical bar F vertical bar) for the structure determination. There are some special considerations in the optimum treatment of data intended for MAD phasing, in that we want very accurate differences between amplitudes, for the anomalous differences (Delta)F(sub +/-) and the dispersive differences (Delta)F(sub lambda), rather than the most accurate abso-

lute values. This means a difference both in data collection strategy, designing the experiment to minimize the systematic errors in the differences, and in the scaling strategy, in which relative scaling can reduce, though probably not eliminate, the systematic errors. In the MAD phasing method, we need accurate differences because the small signal is easily swamped by systematic errors, and we also need to be careful about eliminating outliers, since a small number of spurious large differences can confuse both Patterson and direct methods of locating the anomalous diffracting centres. to aid designing data collection and scaling strategies, it is helpful to enumerate the reasons for the observed intensities not being on the same scale. These factors can be roughly divided into those that can be in principle calculated, and those that must be determined empirically from the data.
Author
Data Acquisition; Experimentation; Systematic Errors

19980036902 Paris-Sud Univ., Orsay, France
MASC: A Combination of Multiple-Wavelength Anomalous Diffraction and Contrast Variation
Shepard, W., Paris-Sud Univ., France; Ramin, M., Paris-Sud Univ., France; Kahn, R., Commissariat a l'Energie Atomique, France; Fourme, R., Paris-Sud Univ., France; Recent Advances in Phasing; Aug. 1997, pp. 103-118; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

Contrast variation methods have primarily been applied and developed in low angle scattering studies as a means of extracting information on the shape of a particle dispersed in a solvent medium (for a review see Williams et al., 1994). This method deals with the changes invoked in the scattered intensities of a small angle scattering experiment when the density of the particle is varied relative to its solvent medium. The difference between the particle and solvent densities is defined as the "contrast" (Stuhrmann & Kirste, 1965; Ibel & Stuhrmann. 1975). The term ' density' in this context refers to the electronic density in an X-ray scattering experiment, the isotopic substitution ratio (H/D) in a neutron scattering experiment, or any other physical density which scatters the incident beam. Contrast v variation techniques can be extended to macromolecular crystal systems since such crystals!sttlls typically consist of 30-70% solvent, which is a phase of rapidly interchanging molecules. Bragg & Perutz (1952) applied such methods to a hemoglobin crystal and observed changes in the intensites of low resolution X-ray reflections after altering the electronic density of the mother liquor. In particular, they related these changes to the Fourier transform of the solvent accessible regions of the crystal. In other words, the data from a contrast v variation series provides information on the macromolecular envelope. Others have since applied contrast variation techniques in either X-ray or neutron diffraction experiments to glean low resolution structures from macromolecular crystals. In particular, Carter et al. (1990) used a formalism which separated the diffraction effects of the molecular envelope and the internal fluctuations (Bricogne, unpublished) in the direct phase determination of the molecular envelope of tryptophanyl-tRNA synthetase. Anomalous dispersion has also been employed in small angle scattering experiments to produce contrast variation. Examples on biological systems are the harnessing of the iron Kedge in ferritin (Stuhrman, 1980) and the phosphorous K-edge in ribosomes (Hutsch, 1993). In crystallography, the use of anomalous scattering effects from the solvent has been suggested by Wyckoff and others where it could be used as a supplement to a standard contrast variation series (Dumas. 1988; Crumley, 1989; and Carter et al., 1990).
Author
Wavelengths; Anomalies; Variability; Crystals; Neutron Diffraction; Neutron Scattering

19980036903 Karlsruhe Univ., Inst. fuer Kristallographie, Germany
Direct Phase Determination by Multi-Beam Diffraction
Weckert, Edgar, Karlsruhe Univ., Germany; Hoelzer, Kerstin, Karlsruhe Univ., Germany; Schroer, Klaus, Karlsruhe Univ., Germany; Recent Advances in Phasing; Aug. 1997, pp. 119-128; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The knowledge of the three-dimensional structure of a molecule is for many questions in science extremely important since nearly all properties do not depend only on the chemical composition but also on the arrangement of the atoms. For the determination of the three dimensional structure of such molecules X-ray crystallography plays an important role. However, other methods like NMR (Wuthrich, 1995) gained more importance recently. The electron density p(r) of a crystal is periodic in three dimensions. Therefore, the Fourier transform of p(r) of the whole crystal is discrete if the crystal is assumed to be infinite. Owing to this fact it is sufficient to restrict all considerations to one unit cell. The latter term is only valid if absorption is small. This means, an X-ray experiment with a single reflection delivers only the modulus but not the phase of the structure factors. This is well-known as the phase problem of X-ray crystallography. Since the discovery of X-rays many methods have been worked out to surmount the phase problem for both small and macromolecular structures. This is true if reflections up to atomic resolution can be measured. For that case, powerful computer programs are available to solve the structures directly from the measured structure amplitudes by statistical methods called 'Direct Methods' (Debaerdemaeker. Tate .k\Voolfson. 1988; Sheldrick. 1990: Altomare et al.. 1994;

Miller. Gallo. Khalak & Weeks. 1994). For structures where no information up to atomic resolution is available additional information has to be provided for a successful solution of the structure. This can be the position of one or more heavy atoms with or without anomalous dispersion contributions (SIR, MIR and MAD) or a significant part of the molecule (molecular replacement). All relevant methods have been reviewed in a recent text book (Woolfson and Fan. 1995) and are the object of continuous improvement. Triplet phases play a key role in 'Direct Methods' and it will be shown that they are physically measurable quantities. They consist of a sum of three structure-factor phases. In some cases, however, it is even possible to measure the phase of a single reflection if one reflection is a seminvariant reflection and if the other two are correlated by symmetry. Seminvariant reflections do not change their phase if one of the symmetrically equivalent origins of the unit cell is chosen. The direct measurement of phase relationships between X-ray reflections is only possible by means of an interference experiment. Hereby, it is necessary to superpose two waves with exactly the same wave vector K. The idea how this can be achieved in a diffraction experiment by means of a three-beam case was born already in 1949 by Lipscomb.
Derived from text
Diffraction; Atomic Energy Levels; Beams (Radiation); Molecular Beams; Molecular Structure; Three Dimensional Models

19980036904 York Univ., Dept. of Chemistry and Physics, UK
Direct Methods - Overview for Macrocrystallographers
Dauter, Zbigniew, York Univ., UK; Main, Peter, York Univ., UK; Recent Advances in Phasing; Aug. 1997, pp. 129-138; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The term 'direct methods' is used in small molecule crystallography to describe methods of structure solution, that is to say methods for phase derivation, by purely mathematical means utilising the measured structure amplitudes only. The Fourier transform of the amplitudes gives a function very similar to the Patterson, which has a huge peak at the origin and does not correspond to the actual electron density p(xyz). Most of the information about positions of the atoms in the crystal, or peaks in p(xyz), must be contained in the phases of the structure factors. Therefore the fundamental problem in the crystallographic diffraction analysis is the phase problem.
Derived from text
Crystallography; Diffraction; Amplitude Distribution Analysis

19980036905 Hauptman-Woodward Medical Research Inst., Inc., Buffalo, NY USA
Macromolecular Phasing by Shake-and-Bake
Weeks, Charles M., Hauptman-Woodward Medical Research Inst., Inc., USA; Miller, Russ, Hauptman-Woodward Medical Research Inst., Inc., USA; Recent Advances in Phasing; Aug. 1997, pp. 139-146; In English; Also announced as 19980036892 Contract(s)/Grant(s): NIH-GM-46733; NSF IRI-94-12415; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

Shake-and-Bake is a direct methods procedure which has provided ab initio solutions for protein structures containing as many as 600 independent non-H atoms, provided that good-quality diffraction data are available to l.lA resolution. Its ultimate potential is unknown. The Shake-and-Bake algorithm extends the range of conventional direct methods by repetitively, unconditionally, and automatically alternating reciprocal-space phase refinement with filtering in real space to impose constraints.
Author
Molecular Structure; Proteins; Technologies

19980036906 Technische Hochschule, Inst. fuer Anorganische Chemie, Aachen, Germany
Direct Methods Based on Real / Reciprocal Space Iteration
Sheldrick, George M., Technische Hochschule, Germany; Recent Advances in Phasing; Aug. 1997, pp. 147-158; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

It appears that direct methods inspired by Shake & Bake involving iteration between real and reciprocal space are able to solve structures with several hundred independent atoms, but still require data to atomic resolution (say 1.2A). Applications to the ab initio phasing of proteins (given very high resolution data) and to the location of anomalous scatterers from lower resolution (Delta)F or MAD F(sub A) data are discussed.
Author
Atoms; High Resolution; Iteration

19980036907 Medical Research Council, Lab. of Molecular Biology, Cambridge, UK

Maximum-Entropy Methods and the Bayesian Programme

Bricogne, G., Medical Research Council, UK; Recent Advances in Phasing; Aug. 1997, pp. 159-178; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The success of direct methods programs at providing a quasi-automatic solution to the phase problem for small molecules has over the years dimmed the perception of the basic inference processes involved in such crystal structure determinations. Greater awareness of this sequence of inference steps has persisted in the macromolecular field, where the dialogue between numerical computation and human decision is still part of the daily experience of most crystallographers. The final step of turning the determination of macromolecular crystal structures itself into a purely computational and automatic process is therefore likely to involve - and even require - that a common basis be found for all phase determination methods used in these two fields. The purpose of this article is to present an overview of one such unifying scheme, the Bayesian programme formulated some years ago by the writer, partial implementations of which have given several encouraging results along the way to a full implementation. Special attention is paid here to those areas where this viewpoint is having a practical impact on real applications in macromolecular crystallography. Its application to ab initio phasing at typical macromolecular resolutions will require in addition the incorporation of stereochemical information into structure factor statistics.

Author

Molecules; Computation; Bayes Theorem; Maximum Entropy Method

19980036908 Lawrence Livermore National Lab., Livermore, CA USA

Holographic Methods in X-ray Crystallography

Szoeke, Abraham, Lawrence Livermore National Lab., USA; Szoeke, Hanna, Lawrence Livermore National Lab., USA; Somoza, John R., California Univ., USA; Recent Advances in Phasing; Aug. 1997, pp. 179-190; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The holographic method for finding the electron density of macromolecules is based on the expansion of the electron density into Gaussian basis functions. The computer program searches for the optimum set of such basis functions in physical space. Therefore it is capable of changing the phases of the structure factors in reciprocal space. The technique makes consistent use of real and reciprocal space information to produce electron density maps. It enforces positivity of the recovered electron density and makes effective use of prior knowledge about the electron density, such as that of a solvent region or of a partial structure. In this paper we summarize the theory underlying the holographic method and describe how we deal with Multiple Isomorphous Replacement (MIR) data, Multiple Anomalous Dispersion (MAD) data and knowledge of non-crystallographic symmetry. We discuss the convergence properties and the limiting accuracy of the method. We illustrate its power for synthetic problems and we apply the method to experimentally measured MIR data from kinesin, a recently solved motor protein domain.

Author

Holography; X Rays; Crystallography; Electron Density (Concentration); Macromolecules; Normal Density Functions

19980036909 Netherlands Cancer Inst., Dept. of Molecular Carcinogenesis, Amsterdam, Netherlands

The World According to wARP: Improvement and Extension of Crystallographic Phases

Perrakis, Anastassis, Netherlands Cancer Inst., Netherlands; Sixma, Titia K., Netherlands Cancer Inst., Netherlands; Wilson, Keith S., York Univ., UK; Lamzin, Victor S., European Molecular Biology Lab., Germany; Recent Advances in Phasing; Aug. 1997, pp. 191-198; In English; Also announced as 19980036892; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

We have developed procedures for the improvement of crystallographic phases resulting either from the position of a heavy atom within the native molecule, or from a multiple isomorphous replacement experiment. In the first case the position of a heavy atom as located from native Patterson maps is used as a starting model for least squares or maximum likelihood refinement and iterative model updating in an ARP procedure. Automatic update and completion of the model by ARP, results to maps of excellent quality. Furthermore. the atomic positions of the final ARP model are very accurate and can be used to initiate automatic model building techniques, currently under development. For the second case, the best initial map is used to construct a number of dummy free atom models which are subjected to ARP refinement. Averaging of the phase sets calculated from the refined models and weighting of structure factors by their similarity to an average vector, results in a phase set that improves and extends the initial

phases if the native data set has sufficiently high resolution (beyond - 2.4 A). This procedure allows shortening of the time consuming step of model building in a lot of crystallographic structure solutions.
Author
Technologies; Crystallography; Atoms; Improvement

19980036910 European Molecular Biology Lab., Hamburg, Germany
Experimental Low Resolution Envelopes From Solution Scattering
Svergun, D. I., European Molecular Biology Lab., Germany; Recent Advances in Phasing; Aug. 1997, pp. 199-206; In English; Also announced as 19980036892
Contract(s)/Grant(s): INTAS 93-645; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

Solution scattering is one of the most effective methods for investigating low resolution structure of biopolymers and their complexes (Feigin & Svergun, 1987). The scattering intensity I(s) from a dilute monodisperse solution is proportional to the scattering from a single particle averaged over all orientations (here s denotes the modulus of the scattering vector s, s = (4(pi/lambda)sin(theta), lambda is the wavelength, and 2(theta) the scattering angle). Main advantage of solution scattering is the possibility to study the structure and structural dynamics of native particles in physiological solutions; its main disadvantage is the loss of information due to the chaotic orientation of particles. Information content in solution scattering data is usually estimated with the Shannon sampling theorem (Shannon & Weaver, 1949). A scattering curve I(s) is the Fourier image of the spherically averaged Patterson function of the particle P(r) = zone access group (P(r)) which equals to zero beyond r = D(sub max), where D(sub max), is the maximum particle size. I(s) is therefore an analytical function. The sampling theorem states that the number of parameters (Shannon channels) required to represent an analytical function on an interval (s(sub min), s(sub max)) is equal to N(sub s) = D(sub max)(s(sub max) - s(sub min) / pi. In practice, solution scattering curves decay rapidly with s and they are normally recorded only at low (not better than 1 nm) resolution, so that the typical number of the Shannon channels does not exceed 10 to 15. In keeping with the low resolution of the solution scattering studies, the data interpretation is usually performed in terms of homogeneous bodies. Homogeneous approximation reduces the number of free parameters N(sub p) in the model and is well justified in X-ray studies of single component particles (e.g. proteins) in water solutions. In conventional modelling, however, the particle is represented by hundreds of spheres, so that Np much greater than Ns thus making only trial and error approach possible. Below an ab initio method is presented which utilizes spherical harmonics to economically describe low resolution particle envelopes and to restore them from solution scattering curves. Examples of the application of the method are given and possibilities of the joint use of crystallographic and solution scattering data are discussed.
Author
Data Acquisition; Biopolymers; Crystallography; Scattering; Dynamic Structural Analysis

19980036911 Institut de Genetique et de Biologie Moleculaire et Cellulaire, UPR de Biologie Structurale, Illkirch, France
Low Resolution Crystallographic Images
Urzhumtsev, A., Institut de Genetique et de Biologie Moleculaire et Cellulaire, France; Lunin, V., Academy of Sciences (USSR), USSR; Podjarny, A., Institut de Genetique et de Biologie Moleculaire et Cellulaire, France; Recent Advances in Phasing; Aug. 1997, pp. 207-214; In English; Also announced as 19980036892
Contract(s)/Grant(s): RFBR-94-04-12844; UPR-9004; Copyright; Avail: Issuing Activity (CLRC, Daresbury Lab., Daresbury, Warrington, Cheshire, WA4 4AD, UK), Hardcopy, Microfiche

The definition of 'low resolution' depends on the traditions of a specific laboratory and, first of all, on their typical subjects. In the case of small molecules it can be 3 A. In the case of typical proteins, it is rather about 6-8 A. Another meaning of the term 'low resolution' is about 20-25 A, the limit below which X-ray data are quite often not collected. This paper deals with the analysis of macromolecules, and the resolution below 6-8 A will be referred to as 'low resolution' and the one below 20-25 A as 'very low resolution' (VLR in what follows). It should be noted that these two limits define the resolution zone where the contribution of the bulk solvent is strong and uncorrelated to that from the macromolecule itself. At higher resolutions the contribution is negligible, and at lower resolutions it is strong but roughly proportional to the one of the macromolecule (Urzhumtsev & Podjarny, 1995). Measuring the very low resolution X-ray data is technically difficult, and many research groups do not collect them. However, they carry information that can be useful. This paper discuss their importance for improving the molecular images as well as the possibilities of an independent use of these data.
Author
Crystallography; Images; Macromolecules

77
THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

19980027723 Rutherford Appleton Lab., Central Lab. of the Research Councils, Chilton, UK
Standard Model with Duality: Physical Consequences
Chan, Hong-Mo, Rutherford Appleton Lab., UK; Tsou, Sheung Tsun, Oxford Univ., UK; Dec. 1997; ISSN 1358-6254; 20p; In English
Report No.(s): RAL-TR-97-070; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11 0QX, UK), Hardcopy, Microfiche

The Dualized Standard Model offers a natural place both to Higgs fields and to fermion generations with Higgs fields appearing as frame vectors in internal symmetry space and generation appearing as dual colour. If they are assigned those niches, it follows that there are exactly 3 generations of fermions, and that at the tree-level, only one generation has a mass (fermion mass hierarchy) while the CKM matrix is the identity. However, loop corrections lift this degeneracy giving nonzero CKM mixing and masses to fermions of the two lower generations. A recent calculation to 1-loop level, with just a few parameters, yields a very good fit to the empirical CKM matrix and sensible values also to the lower generation masses. In addition, predictions are obtained, in areas ranging from low energy flavour-changing neutral current decays to extremely high energy cosmic rays, which are testable in experiments now being planned.
Author
Standard Model (Particle Physics); Duality Principle; Symmetry; Energy Spectra; Neutral Currents; Cosmic Rays

19980027724 Rutherford Appleton Lab., Central Lab. of the Research Councils, Chilton, UK
Standard Model with Duality: Theoretical Basis
Chan, Hong-Mo, Rutherford Appleton Lab., UK; Tsou, Sheung Tsun, Oxford Univ., UK; Dec. 1997; ISSN 1358-6254; 18p; In English; Theoretical Physics, May - Jun. 1997, Zakopane, Poland
Report No.(s): RAL-TR-97-069; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11 0QX, UK), Hardcopy, Microfiche

The Dualized Standard Model which has a number of very interesting physical consequences is itself based on the concept of a nonabelian generalization to electric-magnetic duality. This paper explains first the reasons why the ordinary (Hodge) does not give duality for the nonabelian theory and then reviews the steps by which these difficulties are surmounted, leading to a generalized duality transform formulated in loop space. The significance of this in relation to the Dualized Standard Model is explained, and possibly also to some other areas.
Author
Standard Model (Particle Physics); Electromagnetic Properties; Yang-Mills Theory; Duality Theorem; Quantum Theory

19980035776 Tennessee Univ., Dept. of Mechanical and Aerospace Engineering, Knoxville, TN USA
A Strain-Based Formulation for the Coupled Viscoelastic/Damage Behavior, *1 Feb. 1997 - 30 Sep. 1998*
Abdel-Tawab, Khaled, Tennessee Univ., USA; Weltsman, Y.J., Tennessee Univ., USA; Jul. 07, 1997; 25p; In English
Contract(s)/Grant(s): N00014-96-I-0821
Report No.(s): AD-A333430; MAES97-3.0-CM; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A strain-based thermodynamics framework is proposed for modeling the continuum damage behavior of viscoelastic materials. Damage is represented by an internal state variable in the form of a symmetric second rank tensor. The effect of damage on the constitutive behavior is introduced through direct coupling between the damage variable and the viscoelastic internal state variables. This approach accounts for time-dependent damage as well as damage-induced changes in material symmetry. Also, damage evolution is modeled by employing the concept of damage surfaces.
DTIC
Continuums; Damage; Tensors; Thermodynamics; Viscoelasticity

80
SOCIAL SCIENCES (GENERAL)

Includes educational matters.

19980036339 Ohio Aerospace Inst., Brook Park, OH USA
NASA/OAI Collaborative Aerospace Internship and Fellowship Program ***Final Report, 1 May 1996 - 22 May 1997***
Feb. 1998; 102p; In English
Contract(s)/Grant(s): NCC3-473
Report No.(s): NASA/CR-97-207661; NAS 1.26:207661; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The NASA/OAI Collaborative Aerospace Internship and Fellowship Program is a collaborative undertaking by the Office of Educational Programs at the NASA Lewis Research Center and the Department of Workforce Enhancement at the Ohio Aerospace Institute. This program provides 12 or 14 week internships for undergraduate and graduate students of science and engineering, and for secondary school teachers. Each item is assigned a NASA mentor who facilitates a research assignment. An important aspect of the program is that it includes students with diverse social, cultural and economic backgrounds. The purpose of this report is to document the program accomplishments for 1996.
Author
Education; Students; Data Bases; Losses; Computer Programs; Tracking Networks

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

19980032590 Research and Technology Organization, Neuilly-sur-Seine, France
Technical Programme 1998 ***Le Programme Technique, 1998***
Feb. 1998; 36p; In English
Report No.(s): RTO-TP-98; AC/323-(HQ)D/11; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This publication presents the 1998 Technical Programme of meetings, lecture series and courses of the Research and Technology Organization of NATO (RTO). Note that some of the dates and venues are not yet known and there may be changes in others. Section I is an overall list of the activities, and Section H gives a detailed description of each one. This list does not include business meetings, working groups, field trials, or publications. All the activities listed are open to participation by at least some people who are not members of the sponsoring body, and announcements will be distributed a few months beforehand giving details of who can take part and how to apply. Those marked 'O' in Section I are open to PfP nations, those marked 'U' are not, and those marked 'C' require an appropriate security clearance.
Derived from text
North Atlantic Treaty Organization (NATO); Lectures; Commerce

19980033136 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Report to the Secretary of Transportation. Air Traffic Control: Good Progress on Interim Replacement for Outage-Plagued System, but Risks Can be Further Reduced
Oct. 1996; 42p; In English
Report No.(s): GAO/AIMD-97-2; B-274149; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the last year, certain air traffic control (ATC) centers have experienced a series of major outages, some of which were caused by the Display Channel Complex or DCC - a mainframe computer system that processes radar and other data into displayable images on controllers' screens. For example, four major DCC outages occurred at the Chicago center from May through September 1995, including one that lasted roughly 5 days and another one that produced 234 flight delays. Because the permanent replacement for Dcc and other aging center ATC systems has been delayed until the end of the century, the Federal Aviation Administration (FAA) recently decided to acquire an interim replacement, calling it the DCC Rehost (DCCR), and deploy it to all affected centers by early 1998. In light of the importance of DCc-and its to be short-lived replacement (DCCR)-to FAA's ATC mission, as well as FAA's limited success in delivering promised ATC system capabilities on time and within budget, we reviewed the DCCR project. Our objectives were to determine: (1) the portion of the recent major outages experienced at the five DCC-equipped en route centers that were attributable to DCC; (2) whether DCC was meeting its system availability requirement; (3) FAA's projections of future DCC outages and availability; and (4) whether FAA was effectively managing the DCCR acquisition

to ensure delivery of specified capabilities on schedule and within estimated cost. Appendix 1 provides more detailed information on our objectives, scope, and methodology.
Author
Congressional Reports; Air Traffic Control; Replacing; Controllers; Central Processing Units

19980033524 British Aerospace Defence Ltd., Military Aircraft, Preston, UK
Qualification by Analysis - A Framework for the Future
Wright, B. D., British Aerospace Defence Ltd., UK; Broome, M. J., British Aerospace Defence Ltd., UK; Future Aerospace Technology in the Service of the Alliance; Dec. 1997; Volume 1; 6p; In English; Also announced as 19980033517; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper provides a framework for exploring ways of reducing the amount of testing required in the process of structural qualification. From a review of the current process, it identifies five areas for particular consideration: structural analysis, design data, loading and environment, the structure, and qualification testing. For each, a brief description of the implications of reduced testing is given together with areas for improvement which are either ongoing or proposed.
Derived from text
Performance Tests; Qualifications; Structural Analysis

19980034681 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Air Force Privitization-in-Place: Analysis of Aircraft and Missile Guidance System Depot Repair Costs
Dec. 1997; 30p; In English
Report No.(s): AD-A333385; GAO/NSIAD-98-35; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

AGMC was closed as a result of a 1993 decision of the Base Realignment and Closure (BRAC) Commission. In recommending the closure of the Newark Air Force Base/AGMC, the Commission noted that the workload could be privatized or moved to other depot maintenance activities. The BRAC recommendation states The Aerospace Guidance and Metrology center (AGMC) depot will be closed; some workload will move to other depot maintenance activities including the private sector. After the BRAC recommendation to close AGMC was finalized, (1) the Air Force moved a small portion of AGMC's Air Force workload to other Air Force depots, (2) the Navy moved most of its AGMC workload to other sites, and (3) the Army moved all of its AGMC workload to other sites. The Air Force decided to privatize in place the remaining AGMC workloads. At the time it made this decision, the Air Force relied on an analysis that estimated privatizing would save about $5 million in 1997. However, the preaward analysis was not documented and Air Force officials do not know the basis for the costs included. Consequently, the Air Force was not able to reconcile its current interim study to its precontract award analysis.
DTIC
Missile Control; Missile Design; Estimating; Costs

19980036331 Washington Univ., Seattle, WA USA
Leadership Experience and Organizational Performance ***Final Report, Sep. 1989 - Sep. 1994***
Fiedler, Fred E., Washington Univ., USA; Aug. 1997; 14p; In English
Contract(s)/Grant(s): MDA903-89-K-0193
Report No.(s): AD-A335798; ARI-RN-97-19; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the major findings of a 20-year program of research on the role of cognitive resources in organizational performance. By cognitive resources we mean principally intellectual abilities, job-relevant technical knowledge, and experience. This particular report focuses primarily on the role and function of leadership experience.
DTIC
Mental Performance; Leadership

19980036375 Air Force Inst. of Tech., Graduate School of Logistics and Aquisition Management, Wright-Patterson AFB, OH USA
Group Decision Support Systems (GDSS) and Influence Modes: A Comparative Field Study Between GDSS Mediated Groups and Non-GDSS Mediated Groups
Bridgewater, L. Grant, Air Force Inst. of Tech., USA; Dec. 1997; 94p; In English
Report No.(s): AD-A335425; AFIT-GIR-LAS-97D-3; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This study examined the effect of Group Decision Support System (GDSS) technology on perceived influence modes. The researcher measured perceived influence modes in two group treatments: GDSS groups and non-GDSS (N-GDSS) mediated groups. Actual groups in both treatments performed judgmental tasks of their own choosing. Group members then completed a

survey which measured their perceptions regarding five influence sources: expert influence, influence from legitimate authority, referent influence, reward influence, and coercive influence. The survey also measured the extent to which members perceived an ”opportunity to influence” other group members. For each variable measured in both treatment groups, mean scores were calculated from respondents’ ratings. Analysis indicated that ODSS technology significantly reduces the amount of influence perceived by group members when compared to members in N-ODSS groups. Results also indicated that there was no significant difference between treatment groups regarding members’ perceived ”opportunity to influence” other group members.
DTIC
Decision Support Systems; Group Dynamics

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.

19980027038 National Inst. of Standards and Technology, Advanced Network Technologies Div., Gaithersburg, MD USA
Federal Implementation Guideline for Electronic Data Interchange: ASC X12 003050 Transaction Set 251 Pricing Support. Implementation Convention
Favreau, J. P., National Inst. of Standards and Technology, USA; Sep. 1997; 68p; In English
Report No.(s): PB98-117450; NIST/SP-881-26; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The ASC X12 003050 Transaction Set 251, Pricing Support, Implementation Convention defines the Federal Government interpretation of the use of ASC X12 003050 standards. This implementation convention provides the information necessary for the user to be able to develop an interface program between the computer application and the ASC X12 translator.
NTIS
Data Transmission; Regulations; Commerce

19980027725 Rutherford Appleton Lab., Dept. for Computation and Information, Chilton, UK
Interoperating Database Systems: Issues and Architectures
Hamill, Sean, Leeds Metropolitan Univ., UK; Dixon, Maurice, London Guildhall Univ., UK; Read, Brian J., Rutherford Appleton Lab., UK; Kalmus, John R., Rutherford Appleton Lab., UK; Nov. 1997; ISSN 1358-6254; 38p; In English
Report No.(s): RAL-TR-97-063; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11, 0Qx, UK), Hardcopy, Microfiche

Information systems have been developed in recent years to meet particular local business needs. The information residing in those local systems represents a major business asset. However business needs change during the lifetime of an information system. The changes can arise either through the discovery of new business needs or through the restructuring of business departments. In many cases this leads to the need for several information systems to be used in a collaborative way. The outcome is that business has to contend with information systems which are distributed, autonomous and heterogeneous. The systems are distributed in the sense that they are physically residing on different computers, possibly separated by substantial distances. The systems are autonomous because they have been acquired and operated independently; indeed even when they are required to co-operate operational independence may still be required. The systems are heterogeneous because they have been designed separately, implemented on different hardware and software platforms, and used by operations staff with different world views.
Author
Information Systems; Computer Programs; Data Bases; Heterogeneity

19980036337 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
A Performance Analysis of the Faugeras Color Space as a Component of Color Histog ram-Based Image Retrieval
VanderMear, Chad A., Air Force Inst. of Tech., USA; Dec. 1997; 96p; In English
Report No.(s): AD-A335595; AFIT/GCS/ENG/97D-18; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The use of color histograms for image retrieval from databases has been implemented in many variations. Selecting the appropriate color space for similarity comparisons is an important part of a color histogram technique. This paper serves to introduce and evaluate the performance of a color space through the use of color histograms. Performance is evaluated by correlating the similarity results obtained from various color feature vector techniques (including color histgramming) to those gathered through a human perceptual test. The perceptual test required 36 human subjects to evaluate the similarity of 10 military aircraft images. The same 10 images were also compared via the color feature vector techniques. The results obtained for the Faugeras

color space are compared against those of the Red, Green, Blue (RGB) and Hue, Saturation, Value (HSV) color spaces. While the correlation results for the Faugeras color space were unexpected and unfavorable, a Pearson correlation coefficient of 0.91 was obtained for the HSV space suggesting that HSV is an excellent color space for judging color image similarity. A discussion of the Faugeras space's performance and future research directions are presented at the conclusion of the paper.
DTIC
Information Retrieval; Technology Transfer; Data Retrieval

19980036373 Massachusetts Univ., Dept. of Environmental, Earth and Atmospheric Sciences, Lowell, MA USA
Calculations of Self-Broadened Line Widths and Database Maintenance for HITRAN ***Final Report, 6 May 1992 - 6 Aug. 1997***
Gamache, Robert R., Massachusetts Univ., USA; Aug. 1997; 136p; In English
Contract(s)/Grant(s): F19628-92-K-0018; AF Proj. 2310
Report No.(s): AD-A335405; PL-TR-97-2094; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Total internal partition functions were calculated and polynomial coefficients determined for all species present on the 1992 HITRAN database and for some of the additional species on the 1996 HITRAN database. All spectroscopic parameters for the oxygen molecule have been recalculated and files created for HITRAN96. Halfwidths and line shifts for a number of bands of water vapor have been calculated using the Complex Robert-Bonamy Formalism (CRBF) method developed at UMass Lowell and a comparison with experimental measurements made. The results of the calculations are summarized. The calculations of spectral parameters for other species on HITRAN are discussed. These include work done on ozone, hydrogen halides, carbon monoxide, NH3, H2O2, Transition moment squared, the addition of other molecules to the database, and degeneracy factors. A discussion of the work done on the high temperature molecular database, HITEMP, is discussed. Finally, important relationships between the Einstein coefficients, line intensities, integrated line intensities, transition moments squared, oscillator strengths, and gereneracy factors are derived and presented. Warnings of numerous errors in the literature for these factors are discussed and corrections issued.
DTIC
Molecular Spectroscopy; Atmospheric Physics; Data Bases

19980036374 Naval Research Lab., Monterey, CA USA
The Master Environmental Library: An Environmental Data Source for DOD Applications
Siquig, Richard A., Naval Research Lab., USA; Lowe, Steven J., Science Applications International Corp., USA; Oct. 1996; 4p; In English
Report No.(s): AD-A335410; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The Master Environmental Library (MEL) is a World Wide Web (WWW) based data discovery and retrieval system providing access via a consistent single interface to oceanographic, terrain, atmospheric, and near space data bases and related tools residing in geographically distributed resource sites with arbitrary data base configurations and data formats. The key features of MEL are a consistent standard for metadata contents, a common user-friendly interface, a generic order/delivery system under resource site control, and use of standard transfer formats. In the Modeling and Simulation Resource Repository (MSRR), MEL provides access to the environmental domain.
DTIC
Data Bases; Information Retrieval

19980036384 Defense Automated Printing Service Office, Philadelphia, PA USA
Defense Standardization Program Automation Plan, FY 1998 Update
Jan. 1998; 23p; In English
Report No.(s): AD-A336051; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Defense Standardization Program Automation Plan FY 1997 Update published in November 1996 is superceded in its entirety by this document. During the course of the FY, the DODSSP collection of active military specifications, standards, and standardization documents in Portable Document Format (PDF) was indexed and loaded into the new ASSIST DOC database. This collection of digital documents totaled 48,600. by the midpoint of the FY, all Preparing Activities were submitting documents for this collection in either PDF (approximately 70 percent of all submittals) or Postscript Description Language (PDL - approximately 30 percent). The latter category of documents was converted to PDF by the ASSIST staff. An accelerated growth in PDF submittals over PDL submittals was noted.
DTIC
Standardization; Data Bases; User Manuals (Computer Programs)

19980036642 Trusted Information Systems, Inc., Glenwood, MD USA

DTE Firewalls, Phase 2, Measurement and Evaluation Report ***Progress Report***

Fraser, Timothy J., Trusted Information Systems, Inc., USA; Petkac, Michael J., Trusted Information Systems, Inc., USA; Morrison, Wayne G., Trusted Information Systems, Inc., USA; Badger, M. L., Trusted Information Systems, Inc., USA; Uecker, Ben, Trusted Information Systems, Inc., USA; Jul. 22, 1997; 65p; In English

Contract(s)/Grant(s): DABT63-95-C-0018

Report No.(s): AD-A335442; TIS-0682; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This document is the second of three progress reports concerning the DARPA contract DABT63-95-C-0018 'Internet Safety and Security Task: Internet Safety Through Type-Enforcing Firewalls.' The goals of this project are to assess the security and practicality of DTE firewalls - an advanced firewall technology based on Domain and Type Enforcement (DTE), and to construct a DTE firewall prototype. The first phase of the project demonstrated how DTE firewalls enabled secure enclaves to extend limited trust relationships to entities outside their perimeters, allowing organizations to safely import and export a greater variety of services than would be practical with traditional firewalls. The second phase takes this concept a step further by providing the infrastructure needed to create a secure virtualization of enclaves which we refer to as enterprise zones. The enterprise zone concept is a tool which allows carefully-controlled collaboration between organizations. Enterprise zones are distributed computing environments which may span two or more DTE firewall-protected enclaves. An enterprise zone provides user processes with carefully-controlled access to a well-defined subset of the resources belonging to each organization that sponsors the enterprise zone. It also allows user processes which are distributed among several firewall-protected enclaves to communicate as securely as if they were physically located in the same enclave.

DTIC

Data Processing; Computer Information Security

19980036937 National Inst. for Fusion Science, Nagoya, Japan

Object-Oriented Design for LHD Data Acquisition Using Client-Server Model

Kojima, M., National Inst. for Fusion Science, Japan; Nakanishi, H., National Inst. for Fusion Science, Japan; Hidekuma, S., National Inst. for Fusion Science, Japan; Nov. 1997; ISSN 0915-6356; 10p; In English

Report No.(s): NIFS-TECH-6; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The LHD data acquisition system handles a huge amount of data exceeding over 600 MB per shot. The fully distributed processing and the object-oriented system design are the main principles of this system. Its wide flexibility has been realized by introducing the object-oriented method into the data processing, in which the object-sharing and the class libraries will provide the unified way of data handling for both servers and clients program developments. The object class libraries are written in C++, and the network object-sharing is provided through a commercial software called HARNESS. As for the CAMAC setup, the Java script can use the C++ class libraries and thus establishes the relationship between the object-oriented database and the VW server. In LHD experiments, the CAMAC system and the Windows NT operating system are applied for digitizing and acquiring data, respectively. For the purpose of the LHD data acquisition, the new CAMAC handling softwares which work on Windows NT have been developed to manipulate the SCSI-connected crate controllers. The CAMAC command lists and diagnostic data classes are shared between clients and servers. A lump of diagnostic data mass is treated as a part of an object by the object-oriented programming.

Author

Object-Oriented Programming; Experimentation; Product Development; Plasma Jets

19980036951 United Nations Educational, Scientific and Cultural Organization, Paris, France

Information and Informatics: UNISIST Newsletter, Volume 25

1997; 54p; In English

Report No.(s): PB98-112824; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The contents of this paper include the following: Information and Information Activities; Regional Offices; Other CII Activities; UNESCO Clearinghouse; Information News; and New Publications.

NTIS

Information Management; Information Adaptive System

19980036967 Library of Congress, National Library Service for the Blind and Physically Handicapped, Washington, DC USA

Talking Book Topics, Volume 63

1997; ISSN 0039-9183; 122p; In English

Report No.(s): PB98-112741; LC-60-46157; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Books listed in this issue of Talking Book Topics were recently sent to cooperating libraries. The complete collection contains books by many authors on fiction and nonfiction subjects, including biographies, classics, gothics, mysteries, romances, and others. Contact your cooperating library to learn more about the wide range of books available in the collection. Cassette books are labeled with the code RC and play at 15/16 ips.
NTIS
Libraries; Tape Recorders; Talking

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

19980036973 Physics and Electronics Lab. TNO, The Hague, Netherlands
Feasibility Study CD-i Application for Training at the Royal Netherlands Airforce ***Mogelijkheden CD-i voor opleidingen Koninklijke Luchtmacht***
Kuiper, H., Physics and Electronics Lab. TNO, Netherlands; Ambagtsheer, A. F., Physics and Electronics Lab. TNO, Netherlands; vanRijt, Q. G. N., Physics and Electronics Lab. TNO, Netherlands; Jun. 1997; 52p; In Dutch
Report No.(s): AD-A332929; FEL-96-A233; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The report describes the feasibility of Compact Disc Interactive (CD-i) for the Royal Netherlands Airforce training program. At the School for Military Leadership and Educational Science a proper domain for CD-i experimentation was selected, the domain of training media. As there was no good authoring system available for creating a CD-i, the production of the B-version as well as the final production of the research CD-i was carried out by a CD-i specialized firm, whereas the scenarios were designed by TNO in cooperation with the Royal Netherlands Airforce. The project learned that the best approach for producing a CD-i is to prototype a CD-i with an authoring system for CBT on a PC environment and then convert it to CD-i. Overall conclusion is that CD-i for training is less flexible than a multimedia PC environment, but for presentation like subjects with much video and requiring only mouse interaction and no storing of student results between sessions, CD-i could be a sufficient solution. However decreasing prices of multimedia PCs and more flexible options for video presentations make it really worthwhile to consider using multimedia PCs instead of using CD-i players.
DTIC
Multimedia; Optical Disks; Training Devices; Computer Assisted Instruction

89
ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

19980024240 Oxford Univ., Dept. of Astrophysics, Oxford, UK
Aquila X-1: A Low Inclination Soft X-Ray Transient
Shahbaz, T., Oxford Univ., UK; Thorstensen, J. R., Dartmouth Coll., USA; Charles, P. A., Oxford Univ., UK; Sherman, N. D., Dartmouth Coll., USA; Jan. 27, 1998; 7p; In English
Report No.(s): OUAST/98/2; Copyright; Avail: Issuing Activity (Oxford Univ., Dept. of Physics, Astrophysics, Keble Rd., Oxford, OX1, 3RH, UK), Hardcopy, Microfiche

We have obtained I-band photometry of the neutron star X-ray transient Aql X-1 during quiescence. We find a periodicity at 2.487 c/d, which we interpret as twice the orbital frequency (19.30+/-0.05 h). Folding the data on the orbital period, we model the light curve variations as,the ellipsoidal modulation of the secondary star. We determine the binary inclination to be 20 deg-31 deg (90 per cent confidence) and also 95 per cent upper limits to the radial velocity semi-amplitude and rotational broadening of the secondary star to be 117 km/s and 50 km/s respectively.
Author
Neutron Stars; X Rays; Astronomical Photometry; Ellipsoids

19980028454 NASA Ames Research Center, Moffett Field, CA USA
Spectral Irradiance Calibration in the Infrared. 7. 5-14 microns Spectroscopy of the Asteroids Ceres, Vesta, and Pallas
Cohen, Martin, California Univ., USA; Witteborn, Fred C., NASA Goddard Space Flight Center, USA; Roush, Ted, NASA Ames Research Center, USA; Bregman, Jesse, NASA Ames Research Center, USA; Wooden, Diane, NASA Ames Research Center,

USA; 1997; 16p; In English
Contract(s)/Grant(s): NAG5-3343
Report No.(s): NASA/TM-97-207480; NAS 1.15:207480; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We describe our efforts to seek ”closure” in our infrared absolute calibration scheme by comparing spectra of asteroids, absolutely calibrated through reference stars, with ”Standard Thermal Models” and ”Thermophysical Models” for these bodies. Our use of continuous 5-14 microns airborne spectra provides complete sampling of the rise to, and peak, of the infrared spectral energy distribution and constrains these models. Such models currently support the absolute calibration of ISO-PHOT at far-infrared wave- lengths (as far as 300 microns), and contribute to that of the Mid-Infrared Spectrometer on the ”Infrared Telescope in Space” in the 6-12 microns region. The best match to our observed spectra of Ceres and Vesta is a, standard thermal model using a beaming factor of unity. We also report the presence of three emissivity features in Ceres which may complicate the traditional model extrapolation to the far-infrared from contemporaneous ground-based N-band photometry that is used to support calibration of, for example, ISO-PHOT. While identification of specific materials that cause these features is not made, we discuss families of minerals that may be responsible.

Author

Spectral Energy Distribution; Infrared Radiation; Asteroids; Vesta Asteroid; Spectral Emission; Reference Stars; Calibrating; Emissivity

19980029723 California Inst. of Tech., Palomar Observatory, Pasadena, CA USA

Infrared Spectrum of the Cool Brown Dwarf GI 229B

Oppenheimer, B. R., California Inst. of Tech., USA; Kulkarni, S. R., California Inst. of Tech., USA; Matthews, K., California Inst. of Tech., USA; Nakajima, T., California Inst. of Tech., USA; Science; Dec. 01, 1995; Volume 270, pp. 1478-1479; In English; Copyright; Avail: Issuing Activity (American Inst. of Aeronautics and Astronautics, Washington, DC), Hardcopy, Microfiche

Spectroscopic measurements of a cool brown dwarf, GI 229B, reveal absorption features attributable to methane in the near infrared much like those of Jupiter. These features are not seen in any star. The presence of methane indicates that the surface temperature of GI 229B is below 1000 kelvin. Features attributed to water vapor also indicate that GI 229B is much cooler than any known star.

Author

Brown Dwarf Stars; Near Infrared Radiation; Surface Temperature; Water Vapor; Methane; Infrared Spectra

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also 75 Plasma Physics.

19980027037 California Univ., Dept. of Earth and Space Sciences, Los Angeles, CA USA

Development of a High Resolution-High Sensitivity Ion Microprobe Facility for Cosmochemical Applications *Final Report, 1 Jun. 1994 - 31 May 1997*

McKeegan, Kevin D., California Univ., USA; Feb. 27, 1998; 5p; In English
Contract(s)/Grant(s): NAGw-4112
Report No.(s): NASA/CR-97-207469; NAS 1.26:207469; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

NASA NAGW-4112 has supported development of the CAMECA ims 1270 ion microprobe at UCLA for applications in cosmochemistry. The instrument has been brought to an operational status and techniques developed for accurate, precise microbeam analysis of oxygen isotope ratios in polished thin-sections. We made the first oxygen isotopic (delta(18)O and delta(17)O) measurements of rare mafic silicates in the most chemically primitive meteorites, the a chondrites (Leshin et al., 1997). The results have implications for both high temperature processing in the nebula and low-T aqueous alteration on the CI asteroid. We have performed measurements of oxygen isotopic compositions of magnetite and co-existing olivine from carbonaceous (Choi et al., 1997) and unequilibrated ordinary chondrites (Choi et al., in press). This work has identified a significant new oxygen isotope reservoir in the early solar system: water characterized by a very high Delta(17)) value of approx. 5 % per thousand. We have determined the spatial distributions of oxygen isotopic anomalies in all major mineral phases of a type B CAI from Allende. We have also studied an unusual fractionated CAI from Leoville and made the first oxygen isotopic measurements in rare CAIs from ordinary chondrites.

Author

Research Facilities; High Resolution; Isotopes; Ion Probes; Microorganisms

19980029707 Smithsonian Astrophysical Observatory, Cambridge, MA USA

US Participation in the GOME and SCIAMACHY Projects ***Final Report, 1 Apr. 1991 - 30 Sep. 1997***

Chance, K. V., Smithsonian Astrophysical Observatory, USA; Geary, J. C., Smithsonian Astrophysical Observatory, USA; Spurr, R. J. D., Smithsonian Astrophysical Observatory, USA; Mar. 1998; 86p; In English

Contract(s)/Grant(s): NAGw-2541

Report No.(s): NASA/CR-97-207500; NAS 1.26:207500; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report summarizes research done under NASA Grant NAGW-2541 through September 30, 1997. The research performed under this grant includes development and maintenance of scientific software for the GOME retrieval algorithms, consultation on operational software development for GOME, sensitivity and instrument studies to define GOME and SCIAMACHY instruments, consultation on optical and detector issues for both GOME and SCIAMACHY, consultation and development for SCIAMACHY near-real-time (NRT) and off-line (OL) data products, and development of infrared line-by-line atmospheric modeling and retrieval capability for SCIAMACHY. The European Space Agency selected the SAO to participate in GOME validation and science studies, part of the overall ERS AO. This provided access to all GOME data; The SAO activities that are carried out as a result of selection by ESA were funded by the present grant. 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 scheduled for launch in early 2000. The first two European ozone monitoring instruments (OMI), to fly on the q series of operational meteorological satellites being planned by Eumetsat, have been selected to be GOME-type instruments (the first, in fact, will be the refurbished GOME flight spare). K. Chance is the U.S. member of the OMI Users Advisory Group.

Derived from text

Atmospheric Models; Computer Programming; Meteorological Satellites; Software Engineering; Real Time Operation; European Space Agency; Launching

19980032584 Columbia Univ., Dept. of Astronomy and Physics, New York, NY USA

Neutron Star Phenomena ***Final Report, 15 Jan. 1995 - 14 Jan. 1998***

Ruderman, Malvin, Columbia Univ., USA; 1998; 6p; In English

Contract(s)/Grant(s): NAG5-2841

Report No.(s): NASA/CR-1998-207488; NAS 1.26:207488; CAL-2787; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Various phenomena involving neutron stars are addressed. Electron-positron production in the near magnetosphere of gamma-ray pulsars is discussed along with magnetic field evolution in spun-up and spinning-down pulsars. Glitches and gamma-ray central engines are also discussed.

Derived from text

Neutron Stars; Pulsars; Gamma Rays

19980032588 Massachusetts Univ., Dept. of Physics and Astronomy, Gloucester, MA USA

A Search for Interstellar Oxiranecarbonitrile (C3H3NO)

Dicken, J. E., Massachusetts Univ., USA; Irvine, W. M., Massachusetts Univ., USA; Ohishi, M., Nobeyama Solar Radio Observatory, Japan; Arrhenius, G., Scripps Institution of Oceanography, USA; Bauder, A., Eidgenoessische Technische Hochschule, Switzerland; Mueller, F., Eidgenoessische Technische Hochschule, Switzerland; Eschenmoser, A., Eidgenoessische Technische Hochschule, Switzerland; Origins of Life and Evolution of the Biosphere; 1996; Volume 26, pp. 97-110; In English

Contract(s)/Grant(s): NAGw-2881; NAGw-436

Report No.(s): NASA/CR-96-207591; NAS 1.26:207591; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

We report a search in cold, quiescent and in 'hot core' type interstellar molecular clouds for the small cyclic molecule oxiranecarbonitrile (C3H3NO), which has been suggested as a precursor of important prebiotic molecules. We have determined upper limits to the column density and fractional abundance for the observed sources and find that, typically, the fractional abundance by number relative to molecular hydrogen of C3H3NO is less than a few times 10(exp -10). This limit is one to two orders of magnitude less than the measured abundance of such similarly complex species as CH3CH2CN and HCOOCH3 in well-studied hot cores. A number of astrochemical discoveries were made, including the first detection of the species CH3CH2CN in the massive star-forming clouds G34.3+0.2 and W51M and the first astronomical detections of some eight rotational transitions of CH3CH2CN, CH3CCH, and HCOOCH3. In addition, we found 8 emission lines in the 89 GHz region and 18 in the 102 GHz region which we were unable to assign.

Author

Interstellar Matter; Molecular Clouds; Molecular Gases; Emission Spectra; Hydrogen

19980033150 Wisconsin Univ., Dept. of Physics, Madison, WI USA
Determining the Composition of the Vela Pulsar's Jet ***Final Report***
Ogelman, Hakki, Wisconsin Univ., USA; Mar. 11, 1997; 2p; In English
Contract(s)/Grant(s): NAG5-2557
Report No.(s): NASA/CR-97-207475; NAS 1.26:207475; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The pulsar jet is significant in explaining how the Vela pulsar's rotational energy is transported outward to the rest of the SNR, since direct radiation from the pulsar only accounts for a small percentage of the total power. Our previous ROSAT observations presented the first evidence that the pulsar is driving a narrow, collimated, and remarkably symmetrical jet into the SNR (Markwardt, C. and Oegelman, H., 1995, Nature, 375, p. 40) which we interpret to be from a 'cocoon' of hot gas surrounding the jet itself. We obtained an ASCA exposure of the jet in order to determine whether the spectrum is thermal or power-law continuum. The jet cocoon is detected with ASCA at approximately 2-3 x 10(exp -3) ct/s. The X-ray spectrum of the jet is remarkably similar to the surrounding supernova remnant spectrum and extends to X-ray energies of at least 7 keV, with a total flux of approximately 2 x 10(exp -13) erg/s sq cm sq arcmin. The only strong emission line is from He-like Neon at approx. 0.9 keV; otherwise the spectrum is quite smooth. The spectrum cannot be fit by any one standard plasma emission model, so we used models with two-components. The lower energy component is thermal and has a temperature of 0.29 +/- 0.03 keV; the higher energy portion can either be fit by a thermal component of temperature approx. 4 keV or a power law with photon index approx. 2.0. If the observed spectrum is of a 'traditional' jet cocoon, then we estimate the speed of the jet to be at least 800 km/s, depending on the angle of inclination of the jet axis to our line of sight. The mechanical power driving the jet is greater than or equal to 10(exp 36) erg/s which is comparable to the pulsar's spin-down luminosity of 7 x 10(exp 36) erg/s. and the mass flow rate at the head is greater than or equal to 10(exp -6) solar radius/yr. We conclude that the jet must be entraining material all along its length in order to generate such a large mass flow rate.
Derived from text
Gas Jets; Pulsars; Constellations; Emission Spectra; Plasma Radiation

19980033174 NASA Ames Research Center, Moffett Field, CA USA
Organic Compounds Produced by Photolysis of Realistic Interstellar and Cometary Ice Analogs Containing Methanol
Bernstein, Max P., NASA Ames Research Center, USA; Sandford, Scott A., NASA Ames Research Center, USA; Allamandola, Louis J., NASA Ames Research Center, USA; Chang, Sherwood, NASA Ames Research Center, USA; Scharberg, Maureen A., San Jose State Univ., USA; The Astrophysical Journal; Nov. 20, 1995; Volume 454, pp. 327-344; In English
Contract(s)/Grant(s): RTOP 452-33-93-03; RTOP 185-52-12-04
Report No.(s): NASA/CR-95-207217; NAS 1.26:207217; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The InfraRed (IR) spectra of UltraViolet (UV) and thermally processed, methanol-containing interstellar / cometary ice analogs at temperatures from 12 to 300 K are presented. Infrared spectroscopy, H-1 and C-13 Nuclear Magnetic Resonance (NMR) spectroscopy, and gas chromatography-mass spectrometry indicate that CO (carbon monoxide), CO2 (carbon dioxide), CH4 (methane), HCO (the formyl radical), H2CO (formaldehyde), CH3CH2OH (ethanol), HC([double bond]O)NH2 (formamide), CH3C([double bond]O)NH2 (acetamide), and R[single bond]C[triple bond]N (nitriles) are formed. In addition, the organic materials remaining after photolyzed ice analogs have been warmed to room temperature contain (in rough order of decreasing abundance), (1) hexamethylenetetramine (HMT, C6H12N4), (2) ethers, alcohols, and compounds related to PolyOxyMethylene (POM, ([single bond]CH2O[single bond](sub n)), and (3) ketones (R[single bond]C([double bond]O)[single bond]R') and amides (H2NC([double bond]O)[single bond]R). Most of the carbon in these residues is thought to come from the methanol in the original ice. Deuterium and C-13 isotopic labeling demonstrates that methanol is definitely the source of carbon in HMT. High concentrations of HMT in interstellar and cometary ices could have important astrophysical consequences. The ultraviolet photolysis of HMT frozen in H2O ice readily produces the 'XCN' band observed in the spectra of protostellar objects and laboratory ices, as well as other nitriles. Thus, HMT may be a precursor of XCN and a source of CN in comets and the interstellar medium. Also, HMT is known to hydrolyze under acidic conditions to yield ammonia, formaldehyde, and amino acids. Thus, HMT may be a significant source of prebiogenic compounds on asteroidal parent bodies. A potential mechanism for the radiative formation of HMT in cosmic ices is outlined.
Author
Organic Compounds; Photolysis; Interstellar Matter; Comets; Ice; Methane; Methyl Alcohol

19980033338 Observatorio Astronomico Nacional, Facultad de Ciencias, Bogota, Colombia
Hydrodynamics and Structure of Astrophysics ***Hidrodinamica en Estructuras Astrofisicas***
Higuera, Mario A., Observatorio Astronomico Nacional, Colombia; Columbia Academy of Exact Sciences, Physical and Natural;

Nov. 1995; ISSN 0370-3908; Volume 19, No. 75, pp. 641-650; In Spanish; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The dynamics and stability analysis into the normal modes of a slablike thermal structure constituted by a plasma with solar abundances, cooled and heated at rates approx. rho(sup 2)T(sup upsilon), and rho(sup alpha) T(sup b)(ergs/cc cm s) respectively, is carried out. The initial steady gas pressure through the structure is assumed to be a constant. A complete analytical study for the trivial solution (thermal equilibrium) is made; the corresponding characteristic equation, their roots and two armonics are calculated, from which three instability criteria are obtained regardless the bounding surfaces be rigid or free. Five kind of heating mechanisms which are operative in different thermal structures of interest in astrophysics are considered.

Author

Hydrodynamics; Stability Tests; Models; Thermal Reactors; Plasmas (Physics)

19980035143 California Inst. of Tech., Caltech Submillimeter Observatory, Pasadena, CA USA

Deuterated Water in Comet C/1996 B2 (Hyakutake) and its Implications for the Origin of Comets

Bockelee-Morvan, D., Observatoire de Paris-Meudon, France; Gautier, D., Observatoire de Paris-Meudon, France; Lis, D. C., California Inst. of Tech., USA; Young, K., California Inst. of Tech., USA; Keene, J., California Inst. of Tech., USA; Phillips, T. G., California Inst. of Tech., USA; Owen, T., Hawaii Univ., USA; Crovisier, J., Observatoire de Paris-Meudon, France; Goldsmith, P. F., Cornell Univ., USA; Bergin, E. A., Harvard-Smithsonian Center for Astrophysics, USA; Despois, D., Bordeaux 2 Univ., France; Wootten, A., National Radio Astronomy Observatory, USA; 1998; 26p; In English

Contract(s)/Grant(s): URA-1757; URA-264; NSF AST-93-13929

Report No.(s): NASA/CR-1998-207518; NAS 1.26:207518; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The close approach to the Earth of comet C/1996 B2 (Hyakutake) in March 1996 allowed searches for minor volatile species outgassing from the nucleus. We report the detection of deuterated water (HDO) through its 1(sub 01)-0(sub 00) rotational transition at 464.925 GHz using the Caltech Submillimeter Observatory. We also present negative results of a sensitive research for the J(5-4) line of deuterated hydrogen cyanide (DCN) at 362.046 GHz. Simultaneous observations of two rotational lines of methanol together with HDO in the same spectrum allow us to determine the average gas temperature within the telescope beam to be 69 +/- 10 K. We are thus able to constrain the excitation conditions in the inner coma and determine reliably the HDO production rate as (1.20 +/- 0.28) x 10(exp 26)/s on March 23-24, 1996. Available IR, UV and radio measurements lead to a water production rate of (2.1 +/- 0.5) x 10(exp 29)/s at the time of our HDO observations. The resulting D/H ratio in cometary water is thus (29 +/- 10) x 10(exp -5) in good agreement with the values of (30.8(sub - 5.3, sup +3.8) (Balsiger et al. 1995) and (31.6 +/- 3.4) x 10(exp -5) (Eberhardt et al. 1995) determined in comet P/Halley from in situ ion mass spectra. The inferred 3 a upper limit for the D/H ratio in HCN is 1%. Deuterium abundance is a key parameter for studying the origin and the early evolution of the Solar System and of its individual bodies. Our HDO measurement confirms that, in cometary water, deuterium is enriched by a factor of at least 10 relative to the protosolar ratio, namely the D/H ratio in H2 in the primitive Solar Nebula which formed from the collapse of the protosolar cloud. This indicates that cometary water has preserved a major part of the high D/H ratio acquired in this protosolar cloud through ion-molecule isotopic exchanges or grain-surface reactions and was not re-equilibrated with H2 in the Solar Nebula. Scenarios of formation of comets consistent with these results are discussed.

Author

Deuterium Compounds; Water; Comets; Hydrocyanic Acid; Hydrogen; Ions; Mass Spectra; Molecules; Planetary Nebulae

19980035768 Texas Univ., Dept. of Astronomy, Austin, TX USA

Boron Abundances in A and B-type Stars *Final Report*

Lambert, David L., Texas Univ., USA; Oct. 28, 1997; 4p; In English

Contract(s)/Grant(s): NAG5-2484

Report No.(s): NASA/CR-97-112574; NAS 1.26:112574; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Boron abundances in A- and B-type stars may be a successful way to track evolutionary effects in these hot stars. The light elements - Li, Be, and B - are tracers of exposure to temperatures more moderate than those in which the H-burning CN-cycle operates. Thus, any exposure of surface stellar layers to deeper layers will affect these light element abundances. Li and Be are used in this role in investigations of evolutionary processes in cool stars, but are not observable in hotter stars. An investigation of boron, however, is possible through the B II 1362 A resonance line. We have gathered high resolution spectra from the IUE database of A- and B-type stars near 10 solar mass for which nitrogen abundances have been determined. The B II 1362 A line is blended throughout; the temperature range of this program, requiring spectrum syntheses to recover the boron abundances. For no star could we synthesize the 1362 A region using the meteoritic/solar boron abundance of log e (B) = 2.88; a lower boron abundance was necessary which may reflect evolutionary effects (e.g., mass loss or mixing near the main-sequence), the natal composition of the star forming regions, or a systematic error in the analyses (e.g., non-LTE effects). Regardless of the initial boron

abundance, and despite the possibility of non-LTE effects, it seems clear that boron is severely depleted in some stars. It may be that the nitrogen and boron abundances are anticorrelated, as would be expected from mixing between the H-burning and outer stellar layers. If, as we suspect, a residue of boron is present in the A-type supergiants, we may exclude a scenario in which mixing occurs continuously between the surface and the deep layers operating the CN-cycle. Further exploitation of the B II 1362 A line as an indicator of the evolutionary status of A- and B-type stars will require a larger stellar sample to be observed with higher signal-to-noise as attainable with the Hubble Space Telescope.
Author
A Stars; Boron; Abundance; B Stars; Ultraviolet Spectra

19980036935 National Inst. for Fusion Science, Nagoya, Japan
Baroclinic Vortex Generation by a Comet Shoemaker-Levy 9 Impact
Matsunaga, E., Tokyo Inst. of Tech., Japan; Tajima, M., Tokyo Inst. of Tech., Japan; Sep. 1997; ISSN 0915-633X; 26p; In English; Original contains color illustrations
Report No.(s): NIFS-509; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Impact of Shoemaker-Levy 9 caused various changes on Jupiter. One of them is the comet impact sites left on the surface of Jupiter. These impact sites were very stable and long-lived, which is a mystery worthy for detailed investigation. One hypothesis that is most probable one is to attribute these stable structures to vortex. Then a question arises when the vortex is generated. This paper shows that quite a large vortex can be generated by baroclinic mechanism which is caused by non-parallel density and pressure gradients during the break-up of the comet in Jovian atmosphere. The size of the vorticity thus generated is consistent with the size of comet impact sites under Kelvin's circulation theorem.
Author
Baroclinity; Vortex Generators; Cometary Collisions; Shoemaker-Levy 9 Comet

19980036998 Toledo Univ., Dept. of Physics and Astronomy, OH USA
Relative Band Oscillator Strengths for Carbon Monoxide: Alpha (1)Pi-Chi (1)Sigma(+) Transitions
Federman, S. R., Toledo Univ., USA; Menningen, K. L., Wisconsin Univ., USA; Lee, Wei, Toledo Univ., USA; Stoll, J. B., Wisconsin Univ., USA; The Astrophysical Journal; Mar. 01, 1997; Volume 477, No. 1, pp. L61-L64; In English
Contract(s)/Grant(s): NAGw-3840; NSF DMR-92-12658
Report No.(s): NASA/CR-97-207263; NAS 1.26:207263; Copyright Waived (NASA); Avail: CASI; A01, Hardcopy; A01, Microfiche

Band oscillator strengths for CO transitions between the electronic states A (l)Pi and X(1)Sigma(+) were measured via absorption with a synchrotron radiation source. When referenced to the well-characterized (5,0) band oscillator strength, our relative values for the (7,0) to (11,0) bands are most consistent with the recent experiments of Chan et al. and the theoretical predictions of Kirby & Cooper. Since the results from various laboratory techniques and theory now agree, analyses of interstellar CO based on absorption from A-X bands are no longer hindered by uncertainties in oscillator strength.
Author
Oscillator Strengths; Energy Bands; Carbon Monoxide

91
LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

19980027711 Lunar and Planetary Inst., Houston, TX USA
Re-Analysis of the Solar Phase Curves of the Icy Galilean Satellites
Domingue, Deborah, Lunar and Planetary Inst., USA; Verbiscer, Anne, Cornell Univ., USA; ICARUS: Article No. IS975730; 1997; ISSN 0019-1035; Volume 128, pp. 49-74; In English
Contract(s)/Grant(s): NASw-3591
Report No.(s): NASA/CR-97-207396; NAS 1.26:207396; LPI-Contrib-920; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Re-analysis of the solar phase curves of the icy Galilean satellites demonstrates that the quantitative results are dependent on the single particle scattering function incorporated into the photometric model; however, the qualitative properties are independent. The results presented here show that the general physical characteristics predicted by a Hapke model (B. Hapke, 1986, Icarus

67, 264-280) incorporating a two parameter double Henyey-Greenstein scattering function are similar to the predictions given by the same model incorporating a three parameter double Henyey-Greenstein scattering function as long as the data set being modeled has adequate coverage in phase angle. Conflicting results occur when the large phase angle coverage is inadequate. Analysis of the role of isotropic versus anisotropic multiple scattering shows that for surfaces as bright as Europa the two models predict very similar results over phase angles covered by the data. Differences arise only at those phase angles for which there are no data. The single particle scattering behavior between the leading and trailing hemispheres of Europa and Ganymede is commensurate with magnetospheric alterations of their surfaces. Ion bombardment will produce more forward scattering single scattering functions due to annealing of potential scattering centers within regolith particles (N. J. Sack et al., 1992, Icarus 100, 534-540). Both leading and trailing hemispheres of Europa are consistent with a high porosity model and commensurate with a frost surface. There are no strong differences in predicted porosity between the two hemispheres of Callisto, both are consistent with model porosities midway between that deduced for Europa and the Moon. Surface roughness model estimates predict that surface roughness increases with satellite distance from Jupiter, with lunar surface roughness values falling midway between those measured for Ganymede and Callisto. There is no obvious variation in predicted surface roughness with hemisphere for any of the Galilean satellites.
Author
Galilean Satellites; Solar Eclipses; Photometry; Models; Icy Satellites

19980029722 Washington Univ., Dept. of Earth and Planetary Sciences, Saint Louis, MO USA
Some things we can infer about the Moon from the Composition of the Apollo 16 Regolith
Korotev, Randy L., Washington Univ., USA; Meteoritics and Planetary Science; 1997; Volume 32, pp. 447-478; In English
Contract(s)/Grant(s): NAGw-3343
Report No.(s): NASA/CR-97-207234; NAS 1.26:207234; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Characteristics of the regolith of Cayley plains as sampled at the Apollo 16 lunar landing site are reviewed and new compositional data are presented for samples of less than 1 mm fines ('soils') and 1-2 mm regolith particles. As a means of determining which of the many primary (igneous) and secondary (crystalline breccias) lithologic components that have been identified in the soil are volumetrically important and providing an estimate of their relative abundances, more than 3 x 10(exp 6) combinations of components representing nearly every lithology that has been observed in the Apollo 16 regolith were systematically tested to determine which combinations best account for the composition of the soils. Conclusions drawn from the modeling include the following. At the site, mature soil from the Cayley plains consists of 64.5% +/- 2.7% components representing 'prebasin' materials: anorthosites, feldspathic breccias, and a small amount (2.6% +/- 1.5% of total soil) of nonmare, mafic plutonic rocks, mostly gabbronorites. On average, these components are highly feldspathic, with average concentrations of 3l-32% Al2O3 and 2-3% FeO and a molar Mg/(Mg+Fe) ratio of O.68. The remaining 36% of the regolith is syn- and postbasin material: 28.8% +/- 2.4% mafic impact-melt breccias (MIMBS, i.e., 'LKFM' and 'VHA basalts') created at the time of basin formation, 6.0% +/- 1.4% mare-derived material (impact and volcanic glass, crystalline basalt) with an average TiO2 concentration of 2.4%, and 1% postbasin meteoritic material. The MIMBs are the principal (80-90%) carrier of incompatible trace elements (rare earths, Th, etc.) and the carrier of about one-half of the siderophile elements and elements associated with mafic mineral phases (Fe, Mg, Mn, Cr, Sc). Most (71 %) of the Fe in the present regolith derives from syn- and postbasin sources (MIMBS, mare-derived material, and meteorites). Thus, although the bulk composition of the Apollo 16 regolith is nominally that of noritic anorthosite, the noritic part (the MIMBs) and anorthositic parts (the prebasin components) are largely unrelated.
Author
Moon; Apollo 16 Flight; Regolith; Data Acquisition; Composition (Property); Lithology

19980032164 Lunar and Planetary Inst., Houston, TX USA
Mars 2005 Sample Return Workshop
Gulick, V. C., Editor, Lunar and Planetary Inst., USA; Mars 2005 Sample Return Workshop; 1997; 105p; In English; Mars 2005 Sample Return Workshop, 25-27 Mar. 1996, Houston, TX, USA; Sponsored by NASA Washington, USA; Also announced as 19980032165 through 19980032178
Contract(s)/Grant(s): NASw-4574
Report No.(s): NASA-CR-205525; NAS 1.26:205525; LPI/TR-97-01; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Convened at the request of Dr. Jurgen Rahe of the NASA Office of Space Science, the purpose of this workshop was to reexamine the science issues that will determine how an optimum sample return mission would be carried out in 2005 given the new context that has emerged for Mars exploration since the last such workshop was held (in 1987). The results and summary of discus-

sion that took place at the meeting are contained in this volume. The community was invited to participate in the preparation of the final written report by browsing through the agenda and reading the text and viewgraphs provided by workshop participants and submitting comments for that section.
Author
Mars Exploration; Mars Sample Return Missions; Conferences

19980032165 Lunar and Planetary Inst., Houston, TX USA
Human Exploration and Development of Space and the Mars Sample Return Mission
Duke, Michael B., Lunar and Planetary Inst., USA; Mars 2005 Sample Return Workshop; 1997, pp. 6-10; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Human Exploration and Development of Space is one of NASA's five strategic enterprises, which comprise the major thrusts of the U.S. space program. This enterprise includes all NASA programs that involve human space flight, including the space shuttle, International Space Station, and future exploration programs beyond low Earth orbit. The management of HEDS is currently shared by the Office of Space Flight and the Office of Life and Microgravity Science and Applications, but also incorporates significant contributions from the Office of Space Science and the Office of Access and Space Technology. In other words, essentially all parts of NASA are involved in the Human Exploration and Development of Space. As a new strategic enterprise, HEDS has completed its first Strategic Plan. This can be downloaded from the Internet at http:// www.osf.hq.nasa.gov/heds/hedsplan.html. For the first time, NASA enunciates, in HEDS, the goal to "Explore and Settle the Solar System." Within this strategy are two specific objectives of importance to Mars exploration. The first is: "Characterize solar system bodies, including the Moon, Mars and asteroids, to enable planning for human activities." Another calls for "Demonstrate technologies required to use extra terrestrial resources." Another major objective calls for NASA to "Establish a human presence on the Moon, in the Martian system, and elsewhere in the inner solar system." The strategies within this emphasize the development and demonstration of technologies to support humans and to undertake human exploration missions at drastically lowered cost. This strategic approach provides the basis for consideration of the linkages between robotic missions and the initial human exploration of Mars. In 1993-1994, a review and development of a human exploration of Mars reference mission was undertaken by an intercenter group. This report is nearing publication and should be available soon as a NASA SP. The reference mission established a number of desirable features of a human Mars exploration program, including long-duration surface operation and extended surface exploration mobility, supported by a robust surface infrastructure that utilizes in situ resources for life support and propulsion. A buildup of infrastructure over four mars launch opportunities was envisioned, which allowed local to regional exploration for science, and addressed of the critical questions regarding the feasibility of permanent habitation of Mars. The contributors to the reference mission report believed that the program outlined could be undertaken (three human landings, each lasting 1.5 years on the martian surface) for about the cost of the Apollo program adjusted for inflation. One purpose of this reference mission was to provide a basis for understanding the importance of various technology developments and improvements that could be undertaken between now and the time a human exploration program can be initiated. This serves as well as a means of identifying technology demonstrations and information gathering that can be done by robotic missions in advance of the human missions. In particular, a Mars Sample Return Mission can contribute particularly to (1) gathering environmental and sample data, which includes dust composition and size distribution, surface dust and surface environment reactivity, as well as generally gathering ground truth through which the large bank of Mars remote sensing data can be calibrated; (2) demonstrating and verifying the extraction of useful resources from the martian atmosphere, the high power applications required to do that, and the system control that will be necessary for long-lived operations; (3) test and verify sample collection and packaging using teleoperated rovers, preserving and packaging samples and back-contamination control; and (4) demonstrating an end-to-end round-trip mission to Mars that could include aerocapture, precision landing surface operations, including remote checkout of the Mars Ascent Vehicle from Earth, fueling with ISRU, Mars launch, Mars orbital rendezvous/dock, and return trajectory management. The Human Exploration and Development of Space is linked inevitably to the robotic missions such as the Mars Sample Return Mission, which provides both fundamental data as well as a demonstration testbed for important technologies.
CASI
Mars Sample Return Missions; Mars Exploration; NASA Space Programs

19980032166 Hawaii Univ., Inst. for Astronomy, Honolulu, HI USA
Atmospheric Samples
Owen, Tobias, Hawaii Univ., USA; Mars 2005 Sample Return Workshop; 1997, pp. 11-14; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

It will be impossible to reconstruct the origin and early history of the martian atmosphere without a detailed knowledge of the present composition, including isotope ratios of the various elements. This knowledge must be extended to gases trapped in

rocks, adsorbed on soils and condensed as ices. Only in this way can we determine the importance of various escape processes and identify current volatile reservoirs. The study of the martian atmosphere has greater significance than simply learning more about the atmosphere itself. We need to know the early history of the atmosphere in order to understand the early history of water on the planet and the associated probabilities for the origin and early evolution of life. The discovery of a trace constituent such as methane, which is far from chemical equilibrium in the present martian atmosphere, would be a clue that life might actually exist on Mars today. Because Mars is relatively inactive geologically, it preserves a record of the first billion years that is almost completely missing on Earth. We can therefore hope to use the study of the martian atmosphere to help us understand the early history of all inner planet atmospheres. As an example of how that can be done, I can offer an outline of a model Akiva Bar-Nun and I have developed for bringing in volatiles with icy planetesimals. One aspect of our argument that is worth noting here is the importance of many martian samples. We use noble gases from the SNC meteorites to support the idea that inner planet atmospheres may be a mixture of volatiles brought in by rocks and those contributed by icy planetesimals. lf we had only the Chassigny meteorite, we would never have seen this connection. We can certainly make further progress in understanding the martian atmosphere by means of remote investigations from Earth and by additional measurements of SNC meteorites. However, these investigations cannot substitute for direct analyses of a sample of martian atmosphere that has been brought to Earth in an undisturbed state, accompanied by suitable samples of soils, rocks, and ices. We can only achieve the necessary accuracies for stable isotope abundance determinations in suitably equipped terrestrial laboratories. These atmospheric samples should therefore be an essential component of any sample return program.
Author
Mars Atmosphere; Mars (Planet); Mars Exploration; Air Sampling; Biological Evolution

19980032167 California Univ., San Diego, Dept. of Chemistry, La Jolla, CA USA
An Exobiological Strategy for Mars Exploration
Kerridge, John F., California Univ., San Diego, USA; Mars 2005 Sample Return Workshop; 1997, pp. 15-19; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

In 1994, a writing group was convened by Dr. Michael A. Meyer, Discipline Scientist for Exobiology at NASA HQ, and charged with the task of formulating a strategy for the exobiological exploration of Mars. This group reviewed the state of knowledge about Mars as a planetary environment, defined the major exobiological goals that could be addressed by exploration of Mars, showed how achievement of those goals would require a sequence of robotic missions culminating in return of a martian sample to Earth, summarized the status of planned missions to Mars in this country and elsewhere, discussed the key role of site selection in achieving exobiological goals, and made a series of recommendations, including several regarding development of technology for future missions. Because of the key role envisaged for sample return in exobiological exploration, and the fundamental scientific importance of resolving the question of whether life ever arose on Mars, it seemed appropriate to include a summary of the group's findings in the report of the Mars Sample Return Science Workshop.
Derived from text
Mars Sample Return Missions; Exobiology; Mars Exploration; NASA Space Programs

19980032168 NASA Ames Research Center, Moffett Field, CA USA
Optimization of 2005 Sample Return for Mars Exopaleontology
Farmer, Jack D., NASA Ames Research Center, USA; Mars 2005 Sample Return Workshop; 1997, pp. 20-25; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

If we wish to retain the search for past/present life as an objective in the program, exobiological milestones need to be addressed at each opportunity. At this stage of Mars exploration, these milestones are complimentary to those of other disciplines. Achieving the goals of the exobiological community will require a long-term view of the problem and a phased plan of exploration. Decision trees are a realistic way to assess present needs and to benefit from future missions. Timely progress in achieving milestones identified will ensure we are moving ahead at each opportunity in meeting what the Agency (and public!) regards as an essential part of the program. It is clear that life-related issues must be handled carefully as they are presented to NASA and the public not to create an imbalance, or more importantly, misunderstanding about where we are in the exploration plan.
Derived from text
Exobiology; Site Selection; Mars Sample Return Missions; Mars Surface Samples; Mars Exploration

19980032169 Scripps Institution of Oceanography, San Diego, CA USA
Detection of Amino Acids on Mars
Bada, Jeffrey L., Scripps Institution of Oceanography, USA; Mars 2005 Sample Return Workshop; 1997, pp. 26-29; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The unambiguous detection of amino acids on Mars would be of pivotal importance in the understanding of the processes involved in the origin of life. Homochirality would be the best indicator of whether any detected martian amino acids were biotic or abiotic in origin. Several possible methods could be used for in situ amino acid analyses on Mars, but capillary electrophoresis would likely be the most suitable because it can be easily miniaturized and has small reagent and power requirements. Returned samples could be analyzed by any method then in routine laboratory use, but terrestrial contamination could interfere with the detection of trace levels of endogenous martian amino acids.
Author
Biological Evolution; Amino Acids; Mars (Planet); Mars Sample Return Missions

19980032170 NASA Ames Research Center, Moffett Field, CA USA
Searching for Biogeochemical Cycles on Mars
DesMarais, David J., NASA Ames Research Center, USA; Mars 2005 Sample Return Workshop; 1997, pp. 30-33; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The search for life on Mars clearly benefits from a rigorous, yet broad, definition of life that compels us to consider all possible lines of evidence for a martian biosphere. Recent studies in microbial ecology illustrate that the classic definition of life should be expanded beyond the traditional definition of a living cell. The traditional defining characteristics of life are threefold. First, life is capable of metabolism, that is, it performs chemical reactions that utilize energy and also synthesize its cellular constituents. Second, life is capable of self-replication. Third, life can evolve in order to adapt to environmental changes. An expanded, ecological definition of life also recognizes that life is a community of organisms that must interact with their nonliving environment through processes called biogeochemical cycles. This regenerative processing maintains, in an aqueous conditions, a dependable supply of nutrients and energy for growth. In turn, life can significantly affect those processes that control the exchange of materials between the atmosphere, ocean, and upper crust. Because metabolic processes interact directly with the environment, they can alter their surroundings and thus leave behind evidence of life. For example, organic matter is produced from single-carbon-atom precursors for the biosynthesis of cellular constituents. This leads to a reservoir of reduced carbon in sediments that, in turn, can affect the oxidation state of the atmosphere. The harvesting of chemical energy for metabolism often employs oxidation-reduction reactions that can alter the chemistry and oxidation state of the redox-sensitive elements carbon, sulfur, nitrogen, iron, and manganese. Have there ever been biogeochemical cycles on Mars? Certain key planetary processes can offer clues. Active volcanism provides reduced chemical species that biota can use for organic synthesis. Volcanic carbon dioxide and methane can serve as greenhouse gases. Thus the persistence of volcanism on Mars may well have influenced the persistence of a martian biosphere. The geologic processing of the crust can affect the availability of nutrients and also control the deposition of minerals that could have served as a medium for the preservation of fossil information. Finally, the activity of liquid water is crucial to life. Was there ever an Earth-like hydrologic cycle with rainfall? Has aqueous activity instead been restricted principally to hydrothermal activity below the surface? to what extent did the inorganic chemistry driven by sunlight and hydrothermal activity influence organic chemistry (prebiotic chemical evolution)? This paper addresses these and other key questions.
Derived from text
Extraterrestrial Life; Mars (Planet); Biogeochemistry; Hydrological Cycle; Microbiology; Exobiology; Mars Sample Return Missions; Mars Surface Samples; Mars Volcanoes

19980032171 Geological Survey, Menlo Park, CA USA
Sample Return and Climate
Carr, Michael H., Geological Survey, USA; Mars 2005 Sample Return Workshop; 1997, pp. 34-42; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Understanding the climate history of Mars is essential for unraveling the geologic history of the planet and assessing its potential for biologic evolution. Suspicion that climates in the past have at times been very different from those that presently prevail is based largely on surface morphology, particularly the presence of the seemingly water-worn valley networks. The climate history is, however, very uncertain because of ambiguities in both the geomorphic interpretations and the ages of the relevant features. Possibly the strongest evidence for climate change is the unambiguous change in erosion rates at the end of heavy bombardment. Many of the uncertainties could be resolved with returned samples. Samples of the atmosphere, the regolith, and the rock record would all contribute. The discussion of this paper focuses on these samples
Derived from text
Mars Sample Return Missions; Mars (Planet); Climate Change; Mars Atmosphere; Mars Surface Samples; Planetary Geology; Mars Environment; Regolith; Rocks

19980032172 NASA Ames Research Center, Moffett Field, CA USA

The Status of Mars Climate Change Modeling

Haberle, Robert M., NASA Ames Research Center, USA; Mars 2005 Sample Return Workshop; 1997, pp. 43-48; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Researchers have reviewed the evidence that the climate of Mars has changed throughout its history. In this paper, the discussion focuses on where we stand in terms of modeling these climate changes. For convenience, three distinct types of climate regimes are considered: very early in the planet's history (more than 3.5 Ga), when warm wet conditions are thought to have prevailed; the bulk of the planet's history (3.5-1 Ga), during which episodic ocean formation has been suggested; and relatively recently in the planet's history (less than 1 Ga), when orbitally induced climate change is thought to have occurred.

Derived from text

Climate Change; Mars Environment; Mars (Planet); Mars Sample Return Missions; Environment Models; Planetary Evolution; Oceans

19980032173 Colorado Univ., Lab. for Atmospheric and Space Physics, Boulder, CO USA

Science Goals for a Returned Sample of the Martian Atmosphere

Jakosky, Bruce M., Colorado Univ., USA; Mars 2005 Sample Return Workshop; 1997, pp. 50-52; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Return sample of the Martian atmosphere is reviewed. Topics discussed include: Isotope ratios in present-day martian atmosphere (C, H, N, O, noble gases); C-14 abundance in atmosphere; Properties of airborne dust; Detection of stable minor species; Detection of reactive minor species; What about water; and Polar ice.

CASI

Mars Atmosphere; Mars Surface Samples; Chemical Analysis; Mars (Planet); Atmospheric Composition

19980032174 California Univ., Dept. of Earth and Space Science, Los Angeles, CA USA

Sample Return and Climate: Igneous Rocks and Impact Breccias

Leshin, Laurie, California Univ., USA; Mars 2005 Sample Return Workshop; 1997, pp. 53-56; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The major outstanding issue in studies of martian climate is whether or not Mars was warmer and/or wetter in its earliest history, i.e., during the Noachian, the time period when most of the valley networks were formed. In order to address the scientific questions associated with evolution from the early martian climate to that of today, we must proceed with two types of studies. First, it is critical to understand the distribution and composition (both molecular and isotopic) of the current martian volatile inventory. Specifically, detailed chemical and isotopic analysis of the current atmosphere and mineralogical, petrological, and chemical characterization of young martian rocks (such as, but not limited to, most of the SNC meteorites), as well as mapping of the current distribution of groundwater/ice (not accomplished by sample return missions) will lead to an understanding of the current product of Mars' early climate/volatile evolution. Second, and even more critical, are studies of ancient (Noachian) rocks that preserve a record of this ancient martian climate. Ancient sediments are obviously an immensely interesting target for a sample return effort, but Noachian igneous rocks and impact breccias would also give important insights into the earliest volatile history of Mars, and they are the focus of this discussion.

Derived from text

Igneous Rocks; Breccia; Mars Surface; Mars Environment

19980032175 NASA Johnson Space Center, Houston, TX USA

Martian Volatiles and Isotopic Signatures

Bogard, Donald D., NASA Johnson Space Center, USA; Mars 2005 Sample Return Workshop; 1997, pp. 57-63; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Data on martian volatiles gathered from Viking atmosphere measurements, modest groundbased spectra, shock-implanted atmospheric gases in martian (SNC) meteorites, trapped mantle gases in martian meteorites, and volatile-rich solid phases in martian meteorites, are presented. Atmospheric volatiles, surface volatiles, and isotopic chronologies are discussed, along with energetic particle interactions.

Derived from text

Mars Atmosphere; Mars Surface; SNC Meteorites

19980032176 Lamont-Doherty Geological Observatory, Palisades, NY USA

What the SNC Meteorite Tells Us About Mars

Longhi, J., Lamont-Doherty Geological Observatory, USA; Mars 2005 Sample Return Workshop; 1997, pp. 64-68; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

It is widely, though not universally, accepted that the SNC (shergottites-nakhlites-chassignites) meteorites come from Mars. These basaltic achondrites have traces of water-bearing minerals and magnetite, which indicates that their oxidation states are similar to terrestrial basalts, yet their oxygen isotope compositions show that they are definitely extraterrestrial. Belief in a martian origin is based on relatively young (less than 1.3 Ga) crystallization ages-such ”recent” igneous activity being likely only on a planet large enough to retain its heat-and on a distinct isotopic signature of the martian atmosphere in Ne and Ar gas trapped in an impact-melted glass in one of the shergottites. As with all basaltic rocks, the SNCs provide constraints on the composition, structure, and evolution of their parent body.

Derived from text

Mars Surface; SNC Meteorites; Mars Atmosphere

19980032177 Lunar and Planetary Inst., Houston, TX USA

The Surface Materials of Mars

Treiman, Allan H., Lunar and Planetary Inst., USA; Mars 2005 Sample Return Workshop; 1997, pp. 73-77; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The importance of considering the nature of the surface and near-surface materials of Mars for a Mars 2005 sample return mission planning is discussed.

Derived from text

Mars Surface; Dust; Mineralogy

19980032178 Tennessee Univ., Dept. of Geological Sciences, Knoxville, TN USA

A Conservative Strategy for Geological Sampling and Resource Utilization on Mars

McSween, Harry Y., Tennessee Univ., USA; Mars 2005 Sample Return Workshop; 1997, pp. 78-82; In English; Also announced as 19980032164; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

A Mars sample return mission in 2005 will be a challenging task, one so ambitious that realistic goals must be made clear at the outset of planning. To help define what is realistic, I will focus on several ”nuts-and-bolts” questions. What kind of geologic sample(s) should (can) we collect, and why? What information and tools are necessary for proper geologic sampling? How can a returned sample help us find and utilize resources, or alternatively, what resources might be used to effect a sample return mission?

Author

Sampling; Mars Surface Samples

19980033339 NASA Ames Research Center, Moffett Field, CA USA

Mercury

Gault, D. E., NASA Ames Research Center, USA; Burns, J. A., NASA Ames Research Center, USA; Cassen, P., NASA Ames Research Center, USA; Strom, R. G., Arizona Univ., USA; Annual Review Astronomy Astrophysics; 1977; Volume 15, pp. 97-126; In English

Report No.(s): NASA/TM-97-207393; NAS 1.15:207393; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Prior to the flight of the Mariner 10 spacecraft, Mercury was the least investigated and most poorly known terrestrial planet (Kuiper 1970, Devine 1972). Observational difficulties caused by its proximity to the Sun as viewed from Earth caused the planet to remain a small, vague disk exhibiting little surface contrast or details, an object for which only three major facts were known: 1. its bulk density is similar to that of Venus and Earth, much greater than that of Mars and the Moon; 2. its surface reflects electromagnetic radiation at all wavelengths in the same manner as the Moon (taking into account differences in their solar distances); and 3. its rotation period is in 2/3 resonance with its orbital period. Images obtained during the flyby by Mariner 10 on 29 March 1974 (and the two subsequent flybys on 21 September 1974 and 16 March 1975) revealed Mercury’s surface in detail equivalent to that available for the Moon during the early 1960’s from Earth-based telescopic views. Additionally, however, information was obtained on the planet’s mass and size, atmospheric composition and density, charged-particle environment, and infrared thermal radiation from the surface, and most significantly of all, the existence of a planetary magnetic field that is probably intrinsic to Mercury was established. In the following, this new information is summarized together with results from theoretical studies and ground-based observations. In the quantum jumps of knowledge that have been characteristic of ”space-age” exploration, the pre-

viously obscure body of Mercury has suddenly come into sharp focus. It is very likely a differentiated body, probably contains a large Earth-like iron-rich core, and displays a surface remarkably similar to that of the Moon, which suggests a similar evolutionary history.
Author
Mercury Surface; Planetary Magnetic Fields; Electromagnetic Radiation; Infrared Radiation

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

19980025565 Maryland Univ., Dept. of Astronomy, College Park, MD USA
Electron Densities in Solar Flare Loops, Chromospheric Evaporation Upflows, and Acceleration Sites
Aschwanden, Markus J., Maryland Univ., USA; Benz, Arnold O., Eidgenoessische Technische Hochschule, Switzerland; The Astrophysical Journal; May 10, 1996; Volume 480, No. 2, pp. 825-839; In English
Contract(s)/Grant(s): NAGw-4581; SNSF-2.046-6.56-.96
Report No.(s): NASA/CR-96-207164; NAS 1.26:207164; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

We compare electron densities measured at three different locations in solar flares: (1) in Soft X-Ray (SXR) loops, determined from SXR emission measures and loop diameters from Yohkoh Soft X-Ray Telescope maps (n(sub e, sup SXR) = (0.2-2.5) x 10(exp 11)/ cu cm); (2) in chromospheric evaporation upflows, inferred from plasma frequency cutoffs of decimetric radio bursts detected with the 0.1-3 GHz spectrometer Phoenix of ETH Zuerich (n(sub e, sup upflow) = (0.3-11) x 10(exp 10)/cu cm; and (3) in acceleration sites, inferred from the plasma frequency at the separatrix between upward-accelerated (type III bursts) and downward-accelerated (reverse-drift bursts) electron beams [n(sub e, sup acc) = (0.6-10) x 10(exp 9)/cu cm]. The comparison of these density measurements, obtained from 44 flare episodes (during 14 different flares), demonstrates the compatibility of flare plasma density diagnostics with SXR and radio methods. The density in the upflowing plasma is found to be somewhat lower than in the filled loops, having ratios in a range n(sub e, sup upflow)/n(sub e, sup SXR) = 0.02-1.3, and a factor of 3.6 higher behind the upflow front. The acceleration sites are found to have a much lower density than the SXR-bright flare loops, i.e., n(sub e, sup acc)/n(sub e, sup SXR) = 0.005- 0.13, and thus must be physically displaced from the SXR-bright flare loops. The scaling law between electron time-of-flight distances l' and loop half-lengths s, l'/s = 1.4 +/- 0.3, recently established by Aschwanden et al. suggests that the centroid of the acceleration region is located above the SXR-bright flare loop, as envisioned in cusp geometries (e.g., in magnetic reconnection models).
Author
Density Measurement; Electron Beams; Solar Flares; Chromosphere; Evaporation

19980033141 Kansas Univ. Center for Research, Inc., Lawrence, KS USA
Detailed Solar Activity and Ionization Event Records in Polar Ice Caps ***Final Report, 01 Oct. 1994 - 30 Sep. 1997***
Dreschhoff, Gisela A., Kansas Univ. Center for Research, Inc., USA; Zeller, Edward J., Kansas Univ. Center for Research, Inc., USA; Nov. 30, 1997; 41p; In English
Contract(s)/Grant(s): F49620-95-I-0003
Report No.(s): AD-A334829; AFRL-SR-BL-TR-98-0055; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Nitrate analyses were made of ice cores taken from high altitude sites on the Antarctic plateau and central Greenland. The 430 year nitrate record from the Greenland ice cap is believed to provide an estimate of the occurrence frequencies and number of major solar flares / solar proton events. The results include: (1) Observed historical white light flares can be expected to be associated with major solar proton events, (2) The SPE's recorded in the nitrate sequence are most likely large proton fluence events originating near the central meridian of the sun as viewed from the earth, (3) Large events occurred at the end of the 18th century, (4) Increased solar activity for several solar cycles preceding deep and prolonged solar minima, (5) Deep minima are recorded in both polar regions, (6) The nitrate record provides an almost complete history of ionospheric conditions in terms of individual ionization events as well as hemispheric or global effects via ionospheric-thermospheric coupling.
DTIC
Polar Caps; Polar Regions; Thermosphere; Solar Activity; Ionization; Ice

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see 52 Aerospace Medicine. For theory see 73 Nuclear and High-Energy Physics.

19980024372 NASA Washington, Washington, DC USA
Operational Aspects of Space Radiation
12th Man in Space Symposium: The Future of Humans in Space. Abstract Volume; 1997, pp. 321-328; In English; Also announced as 19980024339; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this session, Session FA4, the discussion focuses on the following topics: Solar Particle Events and the International Space Station; Radiation Environment on Mir and ISS Orbits During the Solar Cycle; New approach to Radiation Risk Assessment; An Industrial Method to Predict Major Solar Flares for a Better Protection of Human Beings in Space; Description of the Space Radiation Control System for the Russian Segment of ISS; Orbit Selection and Its Impact on Radiation Warning Architecture for a Human Mission to Mars; and Space Nuclear Power - Technology, Policy and Risk Considerations in Human Missions to Mars. CASI
Aerospace Environments; Radiation Effects; Mars Exploration; Solar Flares; Solar Corpuscular Radiation; Extraterrestrial Radiation; Aerospace Medicine; Radiation Damage; Radiation Protection

99
GENERAL

19980036984 Academia Sinica, Inst. of Physics, Taipei, Taiwan, Province of China
Institute of Physics, Academia Sinica, Volume 25 ***Annual Report***
Hu, C. K., Editor, Academia Sinica, Taiwan, Province of China; Hwang, I. S., Editor, Academia Sinica, Taiwan, Province of China; Lin, E. K., Editor, Academia Sinica, Taiwan, Province of China; To, K. W., Editor, Academia Sinica, Taiwan, Province of China; Yen, G. D., Editor, Academia Sinica, Taiwan, Province of China; Jul. 1997; 178p; In English
Report No.(s): PB98-111115; Copyright Waived; Avail: CASI; A09, Hardcopy; A02, Microfiche

The members of the authors' group are very active in conducting both basic and applied researches related to the physics of fluids. The basic research projects span the area of turbulence, two-dimensional flow, physics of soap film dynamics, sonoluminescence, phase transitions of complex fluid, fluid properties in porous medium and nonlinear oscillations problem. In applied researches, the authors are studying environmental fluid mechanics, mixing and diffusion of bouyant jets, numercial scheme for dilute gas-particle nozzle flow and modeling of atmospheric radiation related to remote sensing problems. Brief descriptions of these ongoing projects are given below.
NTIS
Two Dimensional Flow; Fluid Dynamics; Fluid Mechanics

Subject Term Index

A

A STARS, 167
ABILITIES, 118
ABSORPTION, 139, 151
ABSORPTION SPECTROSCOPY, 47
ABSORPTIVITY, 37
ABSTRACTS, 136
ABUNDANCE, 167
ACCEPTABILITY, 57
ACCURACY, 39
ACOUSTIC EMISSION, 19, 42
ACOUSTIC IMAGING, 81
ACOUSTIC PROPAGATION, 138
ACOUSTIC VELOCITY, 105
ACTIVE CONTROL, 3, 36
ACTUATORS, 15, 39, 143
ADAPTATION, 111, 116
ADAPTIVE OPTICS, 145
ADHESION, 49
ADHESION TESTS, 49
ADHESIVE BONDING, 26, 53
ADSORPTION, 145
ADVANCED VERY HIGH RESOLUTION RADIOMETER, 39, 89, 90
AEROACOUSTICS, 138
AEROBES, 42, 96
AERODYNAMIC CHARACTERISTICS, 16, 24, 34, 37
AERODYNAMIC HEATING, 80
AERODYNAMIC LOADS, 11
AERODYNAMIC NOISE, 138
AERODYNAMICS, 2
AEROELASTICITY, 14, 25
AEROSERVOELASTICITY, 23
AEROSOLS, 88
AEROSPACE ENGINEERING, 50
AEROSPACE ENVIRONMENTS, 99, 108, 109, 112, 113, 114, 117, 119, 175
AEROSPACE MEDICINE, 108, 109, 110, 112, 113, 114, 116, 117, 118, 119, 120, 139, 175
AEROSPACE PLANES, 38
AEROSPACE SYSTEMS, 1, 121
AEROTHERMODYNAMICS, 10, 80
AFTERGLOWS, 140
AGING (MATERIALS), 51
AGRICULTURE, 94
AIR FLOW, 26
AIR POLLUTION, 41, 92, 93, 95
AIR QUALITY, 92, 93, 95
AIR SAMPLING, 41, 170
AIR TRAFFIC CONTROL, 8, 35, 121, 158
AIR TRANSPORTATION, 8
AIR WATER INTERACTIONS, 93, 100, 105
AIRBORNE EQUIPMENT, 20
AIRCRAFT ACCIDENTS, 6
AIRCRAFT CONFIGURATIONS, 6
AIRCRAFT CONTROL, 24, 122
AIRCRAFT DESIGN, 13, 14, 26, 136
AIRCRAFT ENGINES, 21, 22, 26
AIRCRAFT GUIDANCE, 8
AIRCRAFT MAINTENANCE, 1
AIRCRAFT MANEUVERS, 12
AIRCRAFT MODELS, 10
AIRCRAFT NOISE, 3
AIRCRAFT PERFORMANCE, 8, 24
AIRCRAFT RELIABILITY, 15
AIRCRAFT SAFETY, 4, 5, 11
AIRCRAFT STRUCTURES, 13, 14, 15, 49
AIRFOILS, 2
AIRFRAMES, 1, 14, 15
AIRLINE OPERATIONS, 4, 5
AIRPORTS, 5, 8
ALGAE, 90
ALGORITHMS, 124, 128
ALTERNATIVES, 74
ALUMINUM, 37, 53, 140
ALUMINUM ALLOYS, 48, 53, 55, 88
AMINO ACIDS, 40, 171
AMORPHOUS MATERIALS, 44
AMPLIFICATION, 61, 82
AMPLITUDE DISTRIBUTION ANALYSIS, 153
ANALYTICAL CHEMISTRY, 56
ANGLE OF ATTACK, 3, 9, 25
ANHYDRIDES, 40
ANIMALS, 109
ANISOTROPY, 86, 147
ANNUAL VARIATIONS, 101, 138
ANODIZING, 47
ANOMALIES, 148, 149, 150, 151, 152
ANTENNA ARRAYS, 68, 76
ANTENNA DESIGN, 64, 67, 71
ANTENNA RADIATION PATTERNS, 67, 70, 71
ANTHROPOMETRY, 121
ANTIMONY, 47
ANTISKID DEVICES, 2
APERTURES, 71
APOLLO 16 FLIGHT, 168
APPLICATIONS PROGRAMS (COMPUTERS), 16, 65, 71
AQUIFERS, 90, 96
ARC JET ENGINES, 56
ARCHITECTURE (COMPUTERS), 123, 131
ARCTIC REGIONS, 100
ARMED FORCES (FOREIGN), 17
ARTIFICIAL SATELLITES, 28, 99
ASPECT RATIO, 39, 135
ASSEMBLIES, 84
ASTEROIDS, 29, 163
ASTRODYNAMICS, 7
ASTRONAUT PERFORMANCE, 113, 119
ASTRONAUT TRAINING, 119
ASTRONAUTS, 112, 139
ASTRONOMICAL PHOTOMETRY, 162
ASYNCHRONOUS TRANSFER MODE, 68, 130
ATMOSPHERIC BOUNDARY LAYER, 77, 104
ATMOSPHERIC CHEMISTRY, 3, 41, 92, 98
ATMOSPHERIC COMPOSITION, 94, 172
ATMOSPHERIC DIFFUSION, 77
ATMOSPHERIC MODELS, 24, 28, 41, 98, 103, 164
ATMOSPHERIC MOISTURE, 102
ATMOSPHERIC PHYSICS, 28, 92, 130, 160
ATMOSPHERIC REFRACTION, 59
ATMOSPHERIC SOUNDING, 102
ATMOSPHERIC TEMPERATURE, 89, 102
ATMOSPHERIC TURBULENCE, 24, 64
ATOMIC BEAMS, 141
ATOMIC ENERGY LEVELS, 153
ATOMIC PHYSICS, 151
ATOMS, 153, 155
ATTACK AIRCRAFT, 14, 16
ATTENUATION, 59, 61, 63, 66
ATTENUATION COEFFICIENTS, 139
ATTITUDE (INCLINATION), 7, 24, 59
ATTITUDE CONTROL, 39, 73
AUDITORY DEFECTS, 118
AUDITORY PERCEPTION, 118
AUTOMATIC PILOTS, 34
AUTONOMY, 7

AUXILIARY POWER SOURCES, 85
AVERAGE, 104
AVIONICS, 2, 19, 20

B

B STARS, 167
BACKWARD WAVES, 73
BALANCING, 13, 16, 21
BAND STRUCTURE OF SOLIDS, 46
BANDSTOP FILTERS, 146
BANDWIDTH, 63, 69, 130
BAROCLINIC WAVES, 138
BAROCLINITY, 167
BAYES THEOREM, 128, 154
BEAMS (RADIATION), 149, 153
BELL AIRCRAFT, 9
BENDING, 34
BENZENE, 96
BETA PARTICLES, 37
BIBLIOGRAPHIES, 4, 31, 44, 48, 49, 53, 75, 91, 123, 130
BINARY DATA, 19
BIOASTRONAUTICS, 112, 113, 117, 119
BIODEGRADATION, 42, 96
BIOFEEDBACK, 120
BIOGEOCHEMISTRY, 90, 171
BIOLOGICAL EFFECTS, 108, 109, 112, 113, 114, 117, 119
BIOLOGICAL EVOLUTION, 170, 171
BIOPOLYMERS, 155
BIRTH, 115
BLACK SEA, 107
BLADE-VORTEX INTERACTION, 3
BLOOD, 114
BONDED JOINTS, 47
BONE DEMINERALIZATION, 111
BONES, 111
BOOSTER ROCKET ENGINES, 32
BORON, 167
BOUNDARY CONDITIONS, 92
BOUNDARY INTEGRAL METHOD, 67
BOUNDARY VALUE PROBLEMS, 31
BOW WAVES, 100
BRAGG ANGLE, 139
BRAIN, 115
BRASSES, 74
BRECCIA, 172
BROADBAND, 63
BROADCASTING, 63, 65
BROMINE, 150
BROWN DWARF STARS, 163
BRYOPHYTES, 95
BUCKLING, 86
BUILDINGS, 63
BUOYANCY, 77
BUTTES, 95

C

C++ (PROGRAMMING LANGUAGE), 65
C-17 AIRCRAFT, 16
CABLES (ROPES), 84
CALCIUM METABOLISM, 111
CALIBRATING, 9, 39, 66, 163
CAMERAS, 30, 82, 144
CAPACITANCE, 74
CAPACITORS, 74
CARBON, 52
CARBON DIOXIDE, 51
CARBON ISOTOPES, 90
CARBON MONOXIDE, 88, 167
CARDIOVASCULAR SYSTEM, 95, 111, 120
CATALOGS (PUBLICATIONS), 28
CATALYSTS, 97
CCD CAMERAS, 54
CELL MEMBRANES (BIOLOGY), 117
CELLS (BIOLOGY), 117
CELLULOSE NITRATE, 96
CENTRAL PROCESSING UNITS, 158
CENTRIFUGING, 114
CERTIFICATION, 5, 8, 16, 17
CHANNEL CAPACITY, 127
CHARGE CARRIERS, 142
CHARGED PARTICLES, 139
CHARPY IMPACT TEST, 47
CHEMICAL ANALYSIS, 45, 51, 172
CHEMICAL COMPOSITION, 94
CHEMICAL ENGINEERING, 97
CHEMICAL EQUILIBRIUM, 93
CHEMICAL PROPERTIES, 45, 52
CHEMICAL PROPULSION, 56
CHEMICAL REACTIONS, 41, 46
CHEMISTRY, 53
CHROMOSPHERE, 174
CIRCADIAN RHYTHMS, 107
CIRCUIT BOARDS, 72
CIVIL AVIATION, 6, 35
CLAYS, 43
CLEANING, 53
CLIMATE CHANGE, 96, 97, 105, 171, 172
CLIMATE MODELS, 89
CLIMATOLOGY, 60, 89, 96, 101, 106
CLOUD COVER, 102, 103, 104
CLOUD PHYSICS, 103, 104
CLOUDS (METEOROLOGY), 103
CLUSTER ANALYSIS, 92
CLUTTER, 132
COASTAL ZONE COLOR SCANNER, 90
COATING, 41, 48
COATINGS, 48, 49
COCKPITS, 6, 120, 122
CODING, 61, 66
COGNITION, 116, 119
COLLECTION, 95
COLLISION AVOIDANCE, 122
COLUMNS (SUPPORTS), 42
COMBAT, 1, 13, 14
COMBUSTION, 46
COMBUSTION CHAMBERS, 81
COMBUSTION PHYSICS, 93
COMBUSTION PRODUCTS, 94
COMETARY COLLISIONS, 167
COMETS, 165, 166
COMMAND AND CONTROL, 67
COMMAND SERVICE MODULES, 70
COMMERCE, 130, 157, 159
COMMERCIAL AIRCRAFT, 4
COMMUNICATION EQUIPMENT, 73
COMMUNICATION NETWORKS, 67, 68
COMMUNICATION SATELLITES, 62, 63, 66
COMPLEX SYSTEMS, 27
COMPOSITE MATERIALS, 41, 42, 43, 52, 86
COMPOSITE STRUCTURES, 30, 42, 43, 86
COMPOSITE WRAPPING, 26
COMPOSITION (PROPERTY), 168
COMPUTATION, 154
COMPUTATIONAL FLUID DYNAMICS, 10, 12, 34, 46, 78, 79, 80, 81
COMPUTATIONAL GRIDS, 71, 78, 104
COMPUTER AIDED MANUFACTURING, 127
COMPUTER ASSISTED INSTRUCTION, 162
COMPUTER GRAPHICS, 58, 132
COMPUTER INFORMATION SECURITY, 161
COMPUTER NETWORKS, 130
COMPUTER PROGRAMMING, 129, 164
COMPUTER PROGRAMS, 11, 15, 27, 66, 73, 78, 106, 120, 126, 127, 129, 144, 150, 157, 159
COMPUTER SYSTEMS DESIGN, 123, 147
COMPUTER SYSTEMS PROGRAMS, 128, 147
COMPUTER TECHNIQUES, 27, 127
COMPUTER VISION, 132, 136

COMPUTERIZED SIMULATION, 2, 3, 10, 36, 71, 131, 144
COMPUTERS, 66
COMSAT PROGRAM, 61
CONCRETES, 87, 88, 96
CONDUCTIVITY, 90
CONDUCTORS, 50
CONFERENCES, 2, 76, 83, 108, 138, 148, 169
CONGRESSIONAL REPORTS, 5, 158
CONNECTORS, 84
CONSTELLATIONS, 165
CONSTRAINTS, 120
CONSTRUCTION, 38
CONTINENTS, 121
CONTINUUMS, 156
CONTROL EQUIPMENT, 12, 41
CONTROL SIMULATION, 121
CONTROL SYSTEMS DESIGN, 3, 87
CONTROL THEORY, 122
CONTROL UNITS (COMPUTERS), 129
CONTROLLABILITY, 12, 13, 23, 24
CONTROLLERS, 158
CONVECTION, 77, 103, 146
COPOLYMERS, 51
CORRECTION, 8
CORRELATION, 51
CORROSION PREVENTION, 48
CORROSION RESISTANCE, 49
CORROSION TESTS, 49
COSMIC RAYS, 98, 139, 156
COST EFFECTIVENESS, 123, 125
COST REDUCTION, 1, 14, 15, 19, 22, 26
COSTS, 13, 15, 18, 21, 26, 137, 158
COUPLINGS, 140
CRACK CLOSURE, 11
CRACK PROPAGATION, 11, 19, 49
CRACKS, 42
CREEP PROPERTIES, 149
CREW EXPERIMENT STATIONS, 32
CREWS, 120
CROSSOVERS, 39
CRYOGENIC TEMPERATURE, 42
CRYOGENICS, 140
CRYSTAL OPTICS, 145
CRYSTAL STRUCTURE, 50, 148, 150
CRYSTALLINITY, 44
CRYSTALLOGRAPHY, 148, 149, 151, 153, 154, 155
CRYSTALS, 152
CULTURE (SOCIAL SCIENCES), 116
CURING, 55
CYCLOTRONS, 142
CYLINDRICAL BODIES, 79

D

DAMAGE, 156
DAMAGE ASSESSMENT, 32
DATA ACQUISITION, 8, 11, 17, 20, 45, 61, 64, 85, 86, 103, 125, 151, 152, 155, 168
DATA BASE MANAGEMENT SYSTEMS, 16, 124
DATA BASES, 61, 64, 65, 95, 103, 117, 126, 129, 150, 157, 159, 160
DATA LINKS, 5, 61, 62, 127
DATA MANAGEMENT, 125, 128, 150
DATA PROCESSING, 17, 51, 115, 151, 161
DATA RETRIEVAL, 6, 160
DATA STRUCTURES, 78
DATA SYSTEMS, 31
DATA TRANSFER (COMPUTERS), 68
DATA TRANSMISSION, 63, 127, 159
DECISION MAKING, 119
DECISION SUPPORT SYSTEMS, 70, 159
DEEP SPACE, 29
DEFECTS, 34
DEFENSE PROGRAM, 126
DEFORMATION, 34, 54
DEGRADATION, 52
DELAMINATING, 42
DELTA CLIPPER, 31
DENSITY MEASUREMENT, 79, 174
DEPLOYMENT, 60
DESIGN, 4
DESIGN ANALYSIS, 10, 12, 14, 26, 28, 35, 71, 76, 87, 88, 126, 131, 149
DESIGN TO COST, 18, 36
DETECTION, 44
DEUTERIUM COMPOUNDS, 166
DIAMOND FILMS, 52
DIATOMIC MOLECULES, 98
DICHROISM, 139
DIELECTRIC PROPERTIES, 62
DIESEL FUELS, 56
DIFFRACTION, 149, 150, 151, 153
DIFFRACTION PATTERNS, 86, 149
DIGITAL DATA, 103, 124
DIGITAL SYSTEMS, 128, 129
DIGITAL TECHNIQUES, 73, 103
DIRECT BROADCAST SATELLITES, 65
DIRECT CURRENT, 74
DIRECTION FINDING, 9
DIRECTIONAL ANTENNAS, 62
DIRECTIONAL SOLIDIFICATION (CRYSTALS), 48
DISCONTINUITY, 99
DISPERSING, 150
DISPERSION, 77
DISPERSIONS, 148
DISPLACEMENT, 100
DISPLAY DEVICES, 9, 119, 122, 144
DISSOCIATION, 140
DISTANCE, 121
DISTRIBUTED PROCESSING, 125, 127
DOPED CRYSTALS, 140
DOWNLINKING, 66
DUALITY PRINCIPLE, 156
DUALITY THEOREM, 156
DUCTS, 67
DURABILITY, 21
DUST, 173
DYES, 145
DYNAMIC CONTROL, 145
DYNAMIC MODELS, 51
DYNAMIC RESPONSE, 78
DYNAMIC STRUCTURAL ANALYSIS, 50, 78, 155
DYNAMICAL SYSTEMS, 138

E

EARTH MAGNETOSPHERE, 51
EARTH OBSERVATIONS (FROM SPACE), 33
EARTH ORBITAL ENVIRONMENTS, 10
EARTH ORBITS, 31
EARTHQUAKES, 99
ECLIPSES, 65
ECOLOGY, 77
ECOSYSTEMS, 88
EDDY CURRENTS, 101
EDUCATION, 27, 119, 120, 130, 157
EIGENVALUES, 134
EL NINO, 96
ELASTIC WAVES, 78
ELECTRIC CONNECTORS, 84
ELECTRIC FIELDS, 51
ELECTRIC MOTOR VEHICLES, 85
ELECTRIC MOTORS, 74
ELECTRIC POTENTIAL, 145
ELECTRIC POWER SUPPLIES, 57
ELECTRIC POWER TRANSMISSION, 72
ELECTRICAL ENGINEERING, 63
ELECTRICAL INSULATION, 74
ELECTRICAL RESISTIVITY, 62
ELECTRO-OPTICS, 144
ELECTROCHEMISTRY, 47
ELECTRODEPOSITION, 47
ELECTRODES, 47
ELECTROMAGNETIC FIELDS, 35, 68

ELECTROMAGNETIC INTERACTIONS, 82
ELECTROMAGNETIC INTERFERENCE, 67, 70, 135
ELECTROMAGNETIC PROPERTIES, 156
ELECTROMAGNETIC RADIATION, 68, 174
ELECTRON BEAMS, 174
ELECTRON DENSITY (CONCENTRATION), 154
ELECTRON DIFFRACTION, 147
ELECTRON EMISSION, 141
ELECTRON PROBES, 140
ELECTRON STATES, 140
ELECTRON-ION RECOMBINATION, 140
ELECTRONIC CONTROL, 24
ELECTRONIC EQUIPMENT, 75
ELECTRONS, 140
ELECTROPOLISHING, 49
ELECTROSTATICS, 30
ELEVATION ANGLE, 59, 62, 64
ELLIPSOIDS, 162
ELLIPTICAL CYLINDERS, 12
ELLIPTICAL ORBITS, 29
EMBEDDING, 15
EMISSION, 85
EMISSION SPECTRA, 141, 164, 165
EMISSIVITY, 163
ENDEAVOUR (ORBITER), 32
ENERGY BANDS, 167
ENERGY CONVERSION EFFICIENCY, 54
ENERGY GAPS (SOLID STATE), 46
ENERGY LEVELS, 44
ENERGY SPECTRA, 156
ENERGY STORAGE, 91
ENERGY TECHNOLOGY, 57
ENERGY TRANSFER, 98
ENGINE CONTROL, 81, 85
ENGINE DESIGN, 21, 85
ENGINE NOISE, 22
ENGINE TESTS, 22
ENGINEERING TEST SATELLITES, 64, 73
ENTRAINMENT, 92
ENTROPY, 128
ENVIRONMENT EFFECTS, 68, 93
ENVIRONMENT MODELS, 92, 99, 107, 172
ENVIRONMENT PROTECTION, 93, 97, 100, 133
ENVIRONMENT SIMULATION, 121
ENVIRONMENT SIMULATORS, 38
ENVIRONMENTAL MONITORING, 64, 93, 139
ENVIRONMENTAL QUALITY, 97
EPITAXY, 147
EPOXY RESINS, 42
EQUATIONS OF MOTION, 31
ERROR ANALYSIS, 36
ERRORS, 39, 71
ESTIMATES, 41
ESTIMATING, 99, 158
ETHYLENE, 51
EUKARYOTES, 107
EULER EQUATIONS OF MOTION, 78
EUROPEAN SPACE AGENCY, 164
EUTECTICS, 48
EVALUATION, 25, 75, 131
EVAPORATION, 174
EXHAUST EMISSION, 95
EXHAUST FLOW SIMULATION, 26
EXHAUST GASES, 37, 95
EXHAUST NOZZLES, 26
EXOBIOLOGY, 108, 109, 170, 171
EXPERIMENTATION, 29, 65, 73, 75, 76, 152, 161
EXPERT SYSTEMS, 128
EXPLORATION, 121
EXTERNAL TANKS, 32, 34
EXTRACTION, 115
EXTRAPOLATION, 64
EXTRATERRESTRIAL LIFE, 171
EXTRATERRESTRIAL RADIATION, 109, 139, 175
EXTRAVEHICULAR ACTIVITY, 113, 119
EXTREME ULTRAVIOLET EXPLORER SATELLITE, 27
EXTREMELY HIGH FREQUENCIES, 58, 59, 60, 61, 65
EYE (ANATOMY), 116

F

F-16 AIRCRAFT, 20
FABRICATION, 4, 85, 141, 144
FABRY-PEROT INTERFEROMETERS, 85
FADING, 60, 61, 62, 63, 66
FAN BLADES, 26
FAST FOURIER TRANSFORMATIONS, 66, 135
FAST NEUTRONS, 141
FASTENERS, 84
FATIGUE (MATERIALS), 11, 49
FATIGUE LIFE, 11
FATIGUE TESTS, 11
FAULT DETECTION, 75, 123
FAULT TOLERANCE, 123
FEASIBILITY, 8
FEEDBACK, 24, 74
FEEDBACK CONTROL, 36, 72
FERMIONS, 140
FERRITIC STAINLESS STEELS, 47
FETUSES, 115
FIBER COMPOSITES, 42, 43
FIBER OPTICS, 143
FIBERS, 114
FIELD OF VIEW, 121
FIGHTER AIRCRAFT, 1, 3, 12, 13, 14, 15, 18, 19, 22, 24, 121, 136
FILTRATION, 114
FINITE ELEMENT METHOD, 11, 35, 42, 69, 71, 79, 86, 105
FIRE PREVENTION, 57
FIRES, 88
FISHERIES, 94
FISHES, 53
FIXTURES, 26
FLAMES, 81
FLIGHT CHARACTERISTICS, 23, 24
FLIGHT CONTROL, 8, 12, 122
FLIGHT CREWS, 2, 121
FLIGHT PLANS, 6
FLIGHT SAFETY, 4, 5, 15
FLIGHT TEST INSTRUMENTS, 20, 22
FLIGHT TESTS, 2, 5, 7, 8, 9, 12, 14, 16, 17, 18, 19, 20, 24, 25, 26
FLOATING POINT ARITHMETIC, 78
FLOW CHARTS, 104
FLOW DISTRIBUTION, 10, 80
FLOW MEASUREMENT, 26
FLUID DYNAMICS, 175
FLUID FLOW, 80
FLUID MECHANICS, 80, 175
FLUORESCENCE, 75, 145
FLUTTER, 25
FLUX (RATE), 100
FLYWHEELS, 91
FOOTPRINTS, 59
FOREBODIES, 3
FORECASTING, 102
FOULING, 53
FOURIER ANALYSIS, 25
FOURIER TRANSFORMATION, 56
FRANCK-CONDON PRINCIPLE, 98
FREE FLOW, 37
FREEZING, 48
FREQUENCIES, 63, 64, 132
FREQUENCY CONTROL, 145
FREQUENCY DISTRIBUTION, 60
FREQUENCY DIVISION MULTIPLEXING, 69

FREQUENCY MEASUREMENT, 105
FRESH WATER, 90
FUEL CELLS, 57
FUEL FLOW, 81
FUEL PUMPS, 54
FUEL SPRAYS, 46
FUELS, 56
FULLERENES, 98
FUNCTIONAL DESIGN SPECIFICATIONS, 122
FURNACES, 30

G

GALACTIC COSMIC RAYS, 109
GALILEAN SATELLITES, 168
GAMMA RAYS, 37, 164
GAS EXCHANGE, 100
GAS JETS, 79, 165
GAS TURBINE ENGINES, 21, 22
GAS TURBINES, 21
GASEOUS DIFFUSION, 93
GASOLINE, 96
GEAR TEETH, 84
GEARS, 84
GENERAL AVIATION AIRCRAFT, 6
GENETIC ALGORITHMS, 87, 110
GEOCHEMISTRY, 90
GEOGRAPHIC INFORMATION SYSTEMS, 95
GEOLOGICAL FAULTS, 99
GEOMAGNETISM, 99
GEOMORPHOLOGY, 99
GEOPHYSICS, 99
GEOSYNCHRONOUS ORBITS, 35, 66
GLASS LASERS, 82
GLIDERS, 11
GLOBAL POSITIONING SYSTEM, 5, 6, 7, 72, 121
GLOBAL WARMING, 97
GOES 8, 103
GOLD ALLOYS, 141
GRAIN SIZE, 48, 124
GRAPHICAL USER INTERFACE, 128, 144
GRAPHITE-EPOXY COMPOSITES, 37
GRASSLANDS, 95
GRAVIMETRY, 98
GRAVITATION, 98
GRAVITATIONAL EFFECTS, 108, 109, 111, 112, 113, 114, 116, 117, 119
GRAVITATIONAL PHYSIOLOGY, 109, 112, 114, 117
GREENHOUSE EFFECT, 95, 96, 97
GRID GENERATION (MATHEMATICS), 135
GROUND BASED CONTROL, 13
GROUND RESONANCE, 140
GROUND SUPPORT SYSTEMS, 31
GROUND TESTS, 8, 75, 81
GROUND WATER, 89, 90
GROUP DYNAMICS, 159
GULFS, 98

H

HANDBOOKS, 63, 65
HARMONIC CONTROL, 3
HARMONIC GENERATIONS, 54
HEAD-UP DISPLAYS, 27
HEALTH, 110
HEAT OF FORMATION, 46
HEAT TRANSFER, 80
HEAVY ELEMENTS, 150
HELICOPTER CONTROL, 6, 16
HELICOPTERS, 3, 6, 10, 11, 12, 18, 137
HELIUM, 98
HELIUM ISOTOPES, 98
HELMET MOUNTED DISPLAYS, 16
HERMITIAN POLYNOMIAL, 134
HETEROGENEITY, 159
HEURISTIC METHODS, 110
HIERARCHIES, 128
HIGGS BOSONS, 140
HIGH ELECTRON MOBILITY TRANSISTORS, 76
HIGH ENERGY ELECTRONS, 147
HIGH FREQUENCIES, 61
HIGH POWER LASERS, 82
HIGH PRESSURE, 54, 81
HIGH RESOLUTION, 28, 153, 163
HIGH SPEED, 54
HIGH TEMPERATURE, 52
HIGH TEMPERATURE TESTS, 74
HOLES (MECHANICS), 86
HOLOGRAPHY, 154
HOT CORROSION, 44
HOT ISOSTATIC PRESSING, 47
HOT-WIRE ANEMOMETERS, 73
HUMAN FACTORS ENGINEERING, 6, 118, 119
HUMAN PERFORMANCE, 6, 112, 116, 120
HUMAN-COMPUTER INTERFACE, 119, 120
HYDRAULIC EQUIPMENT, 12, 40, 80
HYDROCARBONS, 41
HYDROCYANIC ACID, 166
HYDRODYNAMICS, 166
HYDROGEN, 51, 164, 166
HYDROGEN COMPOUNDS, 46
HYDROGRAPHY, 106
HYDROLOGICAL CYCLE, 171
HYDROXYL RADICALS, 41
HYPERSONIC FLIGHT, 1
HYPERSONIC FLOW, 80
HYPERSONIC INLETS, 12

I

ICE, 165, 174
ICE FORMATION, 32, 106
ICY SATELLITES, 168
IDENTIFYING, 41
IGNEOUS ROCKS, 172
IGNITION, 85
IMAGE ANALYSIS, 62, 132
IMAGE PROCESSING, 124, 136
IMAGERY, 103
IMAGES, 155
IMAGING TECHNIQUES, 35
IMPROVEMENT, 155
IN-FLIGHT MONITORING, 17, 18
INCOMPRESSIBLE FLOW, 81
INDIUM PHOSPHIDES, 46, 76
INDUSTRIAL MANAGEMENT, 97
INDUSTRIAL PLANTS, 121
INDUSTRIAL WASTES, 44, 97
INDUSTRIES, 18
INFLATABLE STRUCTURES, 35, 69
INFORMATION ADAPTIVE SYSTEM, 161
INFORMATION DISSEMINATION, 5
INFORMATION FLOW, 70
INFORMATION MANAGEMENT, 161
INFORMATION RETRIEVAL, 160
INFORMATION SYSTEMS, 124, 129, 159
INFORMATION TRANSFER, 124
INFRARED DETECTORS, 20, 141, 143
INFRARED RADIATION, 20, 89, 90, 163, 174
INFRARED SIGNATURES, 144
INFRARED SPECTRA, 163
INFRARED SPECTROSCOPY, 45, 56
INHOMOGENEITY, 78
INSPECTION, 15, 86
INSTRUMENT APPROACH, 8
INTEGRATED CIRCUITS, 76, 135
INTERCALATION, 37
INTERFEROMETERS, 39, 141
INTERFEROMETRY, 87, 141
INTERGRANULAR CORROSION, 55
INTERMETALLICS, 147
INTERNATIONAL COOPERATION, 38
INTERNATIONAL SPACE STATION, 38
INTERNETS, 124, 131

INTERPLANETARY DUST, 98
INTERSTELLAR MATTER, 164, 165
INTERSYMBOLIC INTERFERENCE, 69
INVENTIONS, 114, 115, 131, 143
INVENTORIES, 95
IODIDES, 145
ION PROBES, 163
IONIZATION, 174
IONIZING RADIATION, 37
IONS, 44, 99, 139, 166
IRON, 151
IRRADIATION, 109
ISOMORPHISM, 137
ISOTOPES, 163
ITERATION, 124, 153
ITERATIVE SOLUTION, 133

J

JAPANESE SPACE PROGRAM, 30, 38
JAS-39 AIRCRAFT, 136
JET ENGINES, 85

K

KINETIC ENERGY, 106
KUIPER AIRBORNE OBSERVATORY, 63

L

LAND MOBILE SATELLITE SERVICE, 62, 63
LANDING GEAR, 2, 10
LASER COOLING, 141
LASER RANGE FINDERS, 71, 144
LASER WEAPONS, 17
LASERS, 83, 145
LATERAL CONTROL, 6
LAUNCH DATES, 125
LAUNCH VEHICLES, 30, 31, 56
LAUNCHING, 31, 32, 60, 164
LEADERSHIP, 158
LEADING EDGE SLATS, 2
LEADING EDGES, 12
LEARNING, 110
LEAST SQUARES METHOD, 28
LECTURES, 157
LETHALITY, 19
LEVITATION, 30
LIBRARIES, 162
LIE GROUPS, 134
LIFE (DURABILITY), 125
LIFE CYCLE COSTS, 14
LIFE SCIENCES, 27, 108, 111
LIFE SUPPORT SYSTEMS, 108
LIGHT AMPLIFIERS, 82
LIGHT SCATTERING, 145
LINE OF SIGHT, 69
LINEAR SYSTEMS, 133, 135
LIQUID CHROMATOGRAPHY, 45
LIQUID CRYSTALS, 145
LIQUID OXYGEN, 34
LIQUID ROCKET PROPELLANTS, 56
LIQUID-VAPOR EQUILIBRIUM, 80
LIQUID-VAPOR INTERFACES, 80
LITHOLOGY, 168
LOCAL AREA NETWORKS, 68
LONG DURATION SPACE FLIGHT, 108, 111, 112, 113, 116, 117
LOSSES, 6, 21, 157
LOW COST, 30, 123
LOW EARTH ORBITS, 10, 36, 66
LOW TEMPERATURE ENVIRONMENTS, 95
LUBRICANTS, 54
LUMINAIRES, 75

M

MACROMOLECULES, 154, 155
MAGELLAN SPACECRAFT (NASA), 37
MAGNETIC COILS, 142
MAGNETIC FIELDS, 142, 146, 147
MAGNETIC FLUX, 147
MAGNETIC PROPERTIES, 147
MAGNETOHYDRODYNAMIC WAVES, 99
MAMMALS, 109
MAN MACHINE SYSTEMS, 5
MANAGEMENT METHODS, 19, 58
MANAGEMENT PLANNING, 19
MANEUVERS, 3
MANNED SPACE FLIGHT, 108, 112, 113, 114, 117, 119
MANNED SPACECRAFT, 38
MARINE ENVIRONMENTS, 43, 138
MARINE METEOROLOGY, 93, 104
MARINE TECHNOLOGY, 43
MARS (PLANET), 170, 171, 172
MARS ATMOSPHERE, 170, 171, 172, 173
MARS ENVIRONMENT, 171, 172
MARS EXPLORATION, 108, 169, 170, 175
MARS LANDING, 3
MARS SAMPLE RETURN MISSIONS, 169, 170, 171, 172
MARS SURFACE, 172, 173
MARS SURFACE SAMPLES, 170, 171, 172, 173
MARS VOLCANOES, 171
MASS FLOW, 79
MASS SPECTRA, 166
MASS SPECTROSCOPY, 142
MASSIVELY PARALLEL PROCESSORS, 139
MATHEMATICAL MODELS, 11, 62, 83, 92, 109, 124, 128, 140
MATRICES (MATHEMATICS), 36, 133, 134, 135, 137, 140
MATRIX MATERIALS, 55, 146
MATRIX METHODS, 36
MAXIMUM ENTROPY METHOD, 148, 154
MAXIMUM LIKELIHOOD ESTIMATES, 150
MEANDERS, 101
MEASUREMENT, 64
MEASURING INSTRUMENTS, 3
MECHANICAL DRIVES, 84
MECHANICAL ENGINEERING, 80
MECHANICAL PROPERTIES, 40, 51
MEDITERRANEAN SEA, 107
MEMBRANES, 43
MEMORY, 110
MEMORY (COMPUTERS), 129
MENTAL HEALTH, 117
MENTAL PERFORMANCE, 119, 158
MERCURY COMPOUNDS, 95
MERCURY SURFACE, 174
METABOLISM, 119
METAL BONDING, 47
METAL COMBUSTION, 44, 93
METAL FILMS, 52
METAL OXIDES, 55
METALS, 43, 93
METEOROLOGICAL PARAMETERS, 3, 60, 103
METEOROLOGICAL SATELLITES, 35, 164
METEOROLOGICAL SERVICES, 103
METHANE, 51, 163, 165
METHYL ALCOHOL, 165
METHYL COMPOUNDS, 40
MICROBIOLOGY, 113, 171
MICROGRAVITY, 32, 36, 48, 108, 109, 110, 111, 112, 113, 114, 116, 117, 119
MICROMECHANICS, 43
MICROORGANISMS, 163
MICROPHONES, 138
MICROPROCESSORS, 19
MICROPROGRAMMING, 129
MICROSTRIP ANTENNAS, 68, 71
MICROSTRUCTURE, 48
MICROWAVE ANTENNAS, 59
MICROWAVE CIRCUITS, 76

MICROWAVES, 85
MILITARY AIRCRAFT, 19, 137
MILITARY HELICOPTERS, 16
MILITARY OPERATIONS, 137
MILITARY TECHNOLOGY, 67
MINE DETECTORS, 110
MINERALOGY, 173
MIR SPACE STATION, 32, 33, 111
MIRRORS, 144
MISSILE CONTROL, 158
MISSILE DESIGN, 158
MISSION PLANNING, 2, 27, 99, 136
MISSISSIPPI RIVER (US), 89, 90
MIXING LAYERS (FLUIDS), 79
MOBILE COMMUNICATION SYSTEMS, 63, 69, 72
MODELS, 16, 25, 38, 51, 88, 125, 146, 166, 168
MODULARITY, 14
MODULATION, 54, 58
MODULATORS, 144
MOISTURE, 102
MOLECULAR BEAMS, 153
MOLECULAR BIOLOGY, 107, 138
MOLECULAR CLOUDS, 164
MOLECULAR DYNAMICS, 50, 139
MOLECULAR GASES, 164
MOLECULAR IONS, 140
MOLECULAR SPECTROSCOPY, 56, 160
MOLECULAR STRUCTURE, 139, 141, 153
MOLECULAR WEIGHT, 40, 142
MOLECULES, 46, 140, 154, 166
MOLTEN SALTS, 47
MONOPOLES, 67
MOON, 168
MOORING, 106
MORSE CODE, 118
MOTION SICKNESS, 120
MRCA AIRCRAFT, 20
MULTIDISCIPLINARY DESIGN OPTIMIZATION, 14
MULTIDISCIPLINARY RESEARCH, 49
MULTIMEDIA, 162
MULTIPATH TRANSMISSION, 9, 62, 69
MULTIPHASE FLOW, 26
MUSCLES, 113

N

NASA PROGRAMS, 64, 65, 66
NASA SPACE PROGRAMS, 169, 170
NAVIER-STOKES EQUATION, 10, 79, 80, 81
NAVIGATION, 7, 9, 72
NAVIGATION AIDS, 6, 8
NAVIGATION SATELLITES, 8
NEAR INFRARED RADIATION, 163
NEGATIVE IONS, 147
NERVOUS SYSTEM, 110
NEURAL NETS, 128
NEUROLOGY, 113
NEURONS, 115
NEUROPHYSIOLOGY, 117
NEUROSPORA, 107
NEUTRAL CURRENTS, 156
NEUTRON DIFFRACTION, 152
NEUTRON IRRADIATION, 141
NEUTRON SCATTERING, 152
NEUTRON STARS, 162, 164
NICKEL ALLOYS, 48, 49
NIGHT VISION, 27
NITROGEN, 46
NITROGEN OXIDES, 93
NOISE MEASUREMENT, 138
NONDESTRUCTIVE TESTS, 86
NONLINEAR OPTICS, 54, 75, 145
NONLINEARITY, 34, 124
NORMAL DENSITY FUNCTIONS, 154
NORTH ATLANTIC TREATY ORGANIZATION (NATO), 1, 118, 157
NOZZLE FLOW, 26
NUCLEAR CHEMISTRY, 115
NUCLEAR MAGNETIC RESONANCE, 41
NUCLEAR REACTIONS, 98
NUMERICAL ANALYSIS, 106, 135
NUTRIENTS, 94

O

OBJECT-ORIENTED PROGRAMMING, 125, 126, 127, 161
OCEAN CURRENTS, 106, 138
OCEAN DATA ACQUISITIONS SYSTEMS, 104
OCEAN DYNAMICS, 138
OCEAN MODELS, 89, 101, 107, 138
OCEAN SURFACE, 105
OCEANOGRAPHY, 104, 138
OCEANS, 172
OCTAVES, 132
OLIGOMERS, 40
OPERATING COSTS, 14
OPERATORS (MATHEMATICS), 134
OPTICAL COMMUNICATION, 64
OPTICAL DISKS, 162
OPTICAL FIBERS, 55
OPTICAL FILTERS, 143, 146
OPTICAL RADAR, 71
OPTICAL RELAY SYSTEMS, 143
OPTICAL THICKNESS, 88
OPTIMIZATION, 13, 71, 118, 124
OPTOELECTRONIC DEVICES, 75
ORBIT CALCULATION, 28
ORBITAL ELEMENTS, 28, 29
ORBITAL MANEUVERS, 33
ORBITAL RENDEZVOUS, 33
ORBITS, 65
ORGANIC COMPOUNDS, 165
ORGANIZATIONS, 126
ORGANOMETALLIC COMPOUNDS, 50
ORTHOSTATIC TOLERANCE, 110
OSCILLATIONS, 48
OSCILLATOR STRENGTHS, 167
OTOLITH ORGANS, 115
OXIDATION, 46, 93
OXYGEN, 44
OXYGEN PRODUCTION, 83
OXYGEN SUPPLY EQUIPMENT, 83
OZONE, 93

P

PAINT REMOVAL, 54
PANELS, 91
PARACHUTE DESCENT, 78
PARACHUTES, 4, 78
PARALLEL PROCESSING (COMPUTERS), 131, 139
PARAMETER IDENTIFICATION, 3
PARAMETERIZATION, 103, 104
PARTIAL DIFFERENTIAL EQUATIONS, 135
PARTICLE SIZE DISTRIBUTION, 44
PARTICULATES, 124
PATENT APPLICATIONS, 143
PATENTS, 82, 114
PATTERN RECOGNITION, 117, 136
PAYLOAD DELIVERY (STS), 33
PAYLOAD RETRIEVAL (STS), 33
PAYLOADS, 15, 60
PERCEPTUAL ERRORS, 118
PERFORATED PLATES, 86
PERFORMANCE TESTS, 4, 22, 87, 88, 123, 158
PERMEABILITY, 51
PERMEATING, 51
PETROLEUM PRODUCTS, 133
PHASE MATCHING, 54
PHASED ARRAYS, 76
PHOBOS, 28
PHOTOCHEMICAL REACTIONS, 93
PHOTOGRAMMETRY, 62
PHOTOGRAPHIC RECORDING, 32

PHOTOIONIZATION, 98
PHOTOLYSIS, 165
PHOTOMETRY, 168
PHYSIOCHEMISTRY, 43
PHYSIOLOGICAL EFFECTS, 108, 109, 110, 112, 113, 114, 117, 119
PHYSIOLOGICAL RESPONSES, 109, 111, 113, 117
PHYSIOLOGICAL TESTS, 110
PHYTOPLANKTON, 90
PILOT INDUCED OSCILLATION, 24
PILOT PERFORMANCE, 120
PILOTS, 120
PINHOLES, 147
PIXELS, 82
PLANAR STRUCTURES, 68
PLANETARY EVOLUTION, 172
PLANETARY GEOLOGY, 171
PLANETARY MAGNETIC FIELDS, 174
PLANETARY NEBULAE, 166
PLANETARY WAVES, 104
PLANING, 16
PLANTS (BOTANY), 95, 100, 109
PLASMA DENSITY, 146
PLASMA GENERATORS, 85
PLASMA JETS, 161
PLASMA RADIATION, 165
PLASMAS (PHYSICS), 73, 79, 140, 166
PLATFORMS, 36
PLUMES, 37, 77, 92, 103
PNEUMATICS, 40
POINT SOURCES, 92
POLAR CAPS, 174
POLAR REGIONS, 106, 174
POLLUTION CONTROL, 96, 97
POLYATOMIC MOLECULES, 140
POLYCHLORINATED BIPHENYLS, 42
POLYGONS, 144
POLYIMIDES, 40, 50
POLYMER CHEMISTRY, 50
POLYMER MATRIX COMPOSITES, 52
POLYMERIZATION, 41
POLYMERS, 53
POSITION (LOCATION), 95
POSITION ERRORS, 9
POSTFLIGHT ANALYSIS, 32
POWDER (PARTICLES), 97
POWER AMPLIFIERS, 76
PRECIPITATION, 43
PRECIPITATION (METEOROLOGY), 102
PRECISION, 9
PREDICTION ANALYSIS TECHNIQUES, 65
PREFLIGHT ANALYSIS, 32
PREPROCESSING, 58
PRESSURE DISTRIBUTION, 54
PRESSURE GRADIENTS, 54
PRESSURE MEASUREMENT, 54
PRESSURE PULSES, 56
PRESTRESSING, 87, 88
PRINTED CIRCUITS, 72
PROBABILITY THEORY, 60, 66, 150
PRODUCT DEVELOPMENT, 19, 57, 74, 126, 131, 161
PRODUCTION MANAGEMENT, 97
PROGRAM VERIFICATION (COMPUTERS), 27
PROGRAMMING LANGUAGES, 126, 128
PROJECT MANAGEMENT, 18
PROPULSION, 22, 57
PROPULSION SYSTEM PERFORMANCE, 15
PROTECTIVE COATINGS, 52, 55
PROTEINS, 141, 153
PROTOCOL (COMPUTERS), 56, 66
PROTOTYPES, 26
PROVING, 9, 125
PROXIMITY, 131
PSYCHOLOGICAL EFFECTS, 116, 117
PSYCHOPHYSIOLOGY, 113, 118
PULMONARY FUNCTIONS, 111
PULSARS, 164, 165
PULSE DURATION, 82
PULSED LASERS, 71

Q

Q FACTORS, 25
QUALIFICATIONS, 158
QUALITATIVE ANALYSIS, 24
QUALITY CONTROL, 4
QUANTUM ELECTRONICS, 83
QUANTUM THEORY, 156
QUANTUM WIRES, 142

R

RADAR ATTENUATION, 60
RADAR CLUTTER MAPS, 70
RADAR DATA, 60, 101
RADAR TRACKING, 28
RADIATION ABSORPTION, 37
RADIATION BELTS, 99
RADIATION DAMAGE, 109, 175
RADIATION EFFECTS, 75, 109, 139, 175
RADIATION MEASUREMENT, 139
RADIATION PROTECTION, 175
RADIATION SHIELDING, 37
RADIATION SOURCES, 142
RADICALS, 140
RADIO COMMUNICATION, 69, 72
RADIO FREQUENCIES, 68, 69, 115
RADIO RECEIVERS, 67, 70
RADIO SIGNALS, 65, 66
RADIO TRANSMISSION, 58, 105
RADIO WAVES, 58, 64, 105
RADIOACTIVE ISOTOPES, 94
RADIOMETERS, 58, 60
RAIN, 59, 60, 61, 66
RANDOM ACCESS MEMORY, 123
RANDOM VARIABLES, 66, 135
RANGEFINDING, 144
RARE GASES, 140
RATES (PER TIME), 130
RATS, 109
REACTION KINETICS, 45, 98
REAL TIME OPERATION, 15, 19, 127, 164
RECEPTION DIVERSITY, 61
RECOMBINATION COEFFICIENT, 140
RECTANGULAR PLATES, 12, 86
RECTANGULAR WAVEGUIDES, 35, 69
REENTRY VEHICLES, 55
REFERENCE STARS, 163
REFINING, 103
REFRACTIVITY, 55
REGOLITH, 168, 171
REGRESSION ANALYSIS, 50
REGULATIONS, 159
REINFORCEMENT (STRUCTURES), 88
RELIABILITY, 1, 21, 77, 123
REMOTE SENSING, 88, 90, 104
REMOTE SENSORS, 104
RENDEZVOUS TRAJECTORIES, 31
REPLACING, 158
RESEARCH AIRCRAFT, 20, 75
RESEARCH AND DEVELOPMENT, 55, 118, 122, 136
RESEARCH FACILITIES, 112, 163
RESONANCE, 29
RESONANT FREQUENCIES, 11
RESOURCES MANAGEMENT, 89
REUSABLE LAUNCH VEHICLES, 36
REVISIONS, 96
REYNOLDS AVERAGING, 80, 81
RIGGING, 26
RING CURRENTS, 99
ROADS, 6
ROBOTICS, 133
ROBOTS, 132
ROBUSTNESS (MATHEMATICS), 65
ROCKET ENGINE CONTROL, 40
ROCKS, 171

ROLL, 24
ROTATION, 132
RUNWAYS, 5

S

SAFETY FACTORS, 6
SAFETY MANAGEMENT, 57
SAMPLING, 173
SATELLITE ANTENNAS, 67
SATELLITE COMMUNICATION, 10, 58, 60, 62, 64, 65, 72
SATELLITE IMAGERY, 101
SATELLITE NETWORKS, 10, 61, 62
SATELLITE ORBITS, 29
SATELLITE SOUNDING, 89, 90
SATELLITE-BORNE INSTRUMENTS, 130
SATELLITES, 28
SCANNERS, 81, 144
SCANNING, 118
SCANNING ELECTRON MICROSCOPY, 44, 47
SCANNING TUNNELING MICROSCOPY, 147
SCATTERING, 139, 155
SCATTERING AMPLITUDE, 148
SCHEDULING, 27, 69
SEA ICE, 98, 106
SELF TESTS, 75
SEMICONDUCTOR DEVICES, 53, 76
SEMICONDUCTOR LASERS, 83
SEMICONDUCTORS (MATERIALS), 147
SENSORIMOTOR PERFORMANCE, 117
SENSORS, 81
SENSORY PERCEPTION, 15
SERVICE LIFE, 1, 22
SEX FACTOR, 116
SHADOWGRAPH PHOTOGRAPHY, 81
SHAPE FUNCTIONS, 67
SHAPES, 12
SHEAR FLOW, 46
SHEAR LAYERS, 79
SHEAR STRENGTH, 42
SHELLFISH, 53
SHIPS, 57
SHOCK TESTS, 74
SHOCK WAVE INTERACTION, 100
SHOCK WAVES, 78, 100
SHOEMAKER-LEVY 9 COMET, 167
SHORELINES, 105
SHORT WAVE RADIO TRANSMISSION, 39
SICKNESSES, 120
SIGNAL PROCESSING, 70, 73, 105, 128
SIGNAL TO NOISE RATIOS, 54
SILICON COMPOUNDS, 141
SIMULATION, 13, 16, 50, 80
SIMULATORS, 122
SINGLE CRYSTALS, 151
SINGULAR INTEGRAL EQUATIONS, 67
SITE SELECTION, 170
SIZE DISTRIBUTION, 124
SMART STRUCTURES, 3, 15
SNC METEORITES, 172, 173
SOFTWARE DEVELOPMENT TOOLS, 16
SOFTWARE ENGINEERING, 124, 126, 127, 129, 164
SOL-GEL PROCESSES, 43
SOLAR ACTIVITY, 28, 174
SOLAR ARRAYS, 91
SOLAR CELLS, 57
SOLAR CORPUSCULAR RADIATION, 139, 175
SOLAR ECLIPSES, 168
SOLAR FLARES, 174, 175
SOLAR ORBITS, 29
SOLID PROPELLANT ROCKET ENGINES, 33
SOLIDS, 41
SOUND DETECTING AND RANGING, 81
SOUND FIELDS, 67
SOUTHERN OSCILLATION, 96
SPACE COMMUNICATION, 60
SPACE DEBRIS, 32
SPACE FLIGHT, 32, 33, 38
SPACE LABORATORIES, 112
SPACE MISSIONS, 32, 108, 112, 113
SPACE PROCESSING, 30
SPACE PROGRAMS, 38, 65
SPACE PSYCHOLOGY, 117, 119
SPACE RENDEZVOUS, 32
SPACE SHUTTLE BOOSTERS, 32
SPACE SHUTTLE MISSIONS, 32, 33
SPACE SHUTTLE ORBITERS, 33
SPACE SHUTTLE PAYLOADS, 33
SPACE SHUTTLES, 32, 34
SPACE SURVEILLANCE (SPACE-BORNE), 103
SPACE TRANSPORTATION SYSTEM, 32, 33
SPACE TRANSPORTATION SYSTEM FLIGHTS, 32, 33
SPACEBORNE EXPERIMENTS, 27, 58, 84, 111, 112
SPACECRAFT COMMUNICATION, 65
SPACECRAFT DOCKING, 32, 33
SPACECRAFT ENVIRONMENTS, 108, 109, 110, 111, 116
SPACECRAFT GUIDANCE, 29
SPACECRAFT LAUNCHING, 31, 32
SPACECRAFT MODULES, 30, 74
SPACECRAFT MOTION, 3
SPACECRAFT STRUCTURES, 30
SPACECREWS, 32, 33
SPECTRAL EMISSION, 163
SPECTRAL ENERGY DISTRIBUTION, 163
SPECTRAL SIGNATURES, 132
SPEECH RECOGNITION, 69, 128
SPHERES, 145
SPREAD SPECTRUM TRANSMISSION, 67, 69, 70
STABILITY TESTS, 166
STABILIZATION, 66
STANDARD MODEL (PARTICLE PHYSICS), 140, 156
STANDARDIZATION, 160
STANDARDS, 84
STARTING, 56
STATE VECTORS, 28
STATIC PRESSURE, 54
STATISTICAL ANALYSIS, 60, 64, 92
STATISTICAL DECISION THEORY, 127
STATISTICS, 61
STEREOSCOPIC VISION, 82
STORAGE TANKS, 133
STRETCHING, 147
STRUCTURAL ANALYSIS, 36, 86, 158
STRUCTURAL DESIGN, 3, 10, 36, 52, 78, 87, 91
STRUCTURAL FAILURE, 86
STRUCTURAL STABILITY, 39
STUDENTS, 157
SULFUR HEXAFLUORIDE, 74
SUPERCONDUCTORS (MATERIALS), 74
SUPERHIGH FREQUENCIES, 59, 60, 61
SUPERLATTICES, 142
SUPERPLASTICITY, 48
SUPERSONIC JET FLOW, 79
SUPERSONIC TRANSPORTS, 23
SUPPORT SYSTEMS, 66
SURFACE CRACKS, 52
SURFACE NAVIGATION, 132
SURFACE TEMPERATURE, 80, 163
SURFACE TREATMENT, 49
SURFACE WATER, 90, 93
SURVEYS, 98
SWITCHES, 74
SYMMETRY, 156

SYNAPSES, 115
SYNCHROTRONS, 149
SYNTHESIS (CHEMISTRY), 43
SYSTEM EFFECTIVENESS, 13, 15, 120
SYSTEMATIC ERRORS, 152
SYSTEMS ENGINEERING, 65, 85
SYSTEMS INTEGRATION, 5
SYSTEMS SIMULATION, 121

T

T SHAPE, 87
TABLES (DATA), 58
TAKEOFF, 14
TALKING, 162
TAPE RECORDERS, 162
TARGET ACQUISITION, 20
TARGET RECOGNITION, 132
TARGETS, 17
TAXONOMY, 45, 125
TDR SATELLITES, 64
TECHNOLOGIES, 16, 52, 82, 131, 143, 153, 155
TECHNOLOGY TRANSFER, 150, 160
TECHNOLOGY UTILIZATION, 17, 45, 84
TELECOMMUNICATION, 10, 65, 67
TELECONFERENCING, 121
TELEMEDICINE, 110, 131
TELEMETRY, 16
TELEOPERATORS, 121
TEMPERATURE, 141
TEMPERATURE DEPENDENCE, 54
TEMPERATURE EFFECTS, 34, 102
TEMPERATURE MEASUREMENT, 90
TEMPERATURE PROFILES, 102
TENSILE PROPERTIES, 47
TENSILE TESTS, 47
TENSORS, 156
TERRAIN FOLLOWING, 132
TEST FACILITIES, 2
TEXTILES, 86
THALLIUM COMPOUNDS, 46
THERMAL ANALYSIS, 45
THERMAL BUCKLING, 86
THERMAL CONTROL COATINGS, 44
THERMAL CYCLING TESTS, 91
THERMAL DIFFUSION, 52
THERMAL PROTECTION, 10, 32, 55
THERMAL REACTORS, 166
THERMOCHEMISTRY, 44
THERMODYNAMICS, 156
THERMOSETTING RESINS, 55
THERMOSPHERE, 174
THICKNESS, 141
THIN FILMS, 53, 54
THREE DIMENSIONAL FLOW, 78
THREE DIMENSIONAL MODELS, 12, 132, 153
THRESHOLDS (PERCEPTION), 88
THRUST REVERSAL, 37
THRUST VECTOR CONTROL, 18
THUNDERSTORMS, 101
TIME FUNCTIONS, 52
TIME LAG, 74, 142
TOKAMAK DEVICES, 47, 146, 147
TOPPING CYCLE ENGINES, 21
TORQUE, 84
TOWED BODIES, 106
TOWING, 106
TOXICITY, 53, 93
TRACKING NETWORKS, 157
TRADEOFFS, 13
TRAFFIC, 127
TRAINING DEVICES, 27, 162
TRAJECTORY OPTIMIZATION, 23
TRANSATMOSPHERIC VEHICLES, 36
TRANSFER FUNCTIONS, 23, 87
TRANSISTOR LOGIC, 54
TRANSMISSIONS (MACHINE ELEMENTS), 84
TRANSPORT AIRCRAFT, 23, 24
TRANSPORT PROPERTIES, 53
TRENDS, 97, 136
TRITIUM, 146
TROPICAL REGIONS, 60, 93
TROPOSPHERE, 93, 94, 103
TUBES, 42
TUNABLE FILTERS, 143
TUNGSTEN ALLOYS, 88
TURBINE PUMPS, 54
TURBOJET ENGINES, 26
TURBULENCE, 73, 79
TURBULENCE MODELS, 24
TURBULENT FLOW, 37, 77
TWO DIMENSIONAL FLOW, 175
TWO PHASE FLOW, 46

U

ULTRAHIGH FREQUENCIES, 62
ULTRAHIGH VACUUM, 147
ULTRASONICS, 86
ULTRAVIOLET SPECTRA, 167
UNIVERSITIES, 130
UNSTEADY AERODYNAMICS, 25
UNSTRUCTURED GRIDS (MATHEMATICS), 78, 79, 135
UPLINKING, 72
UPPER ATMOSPHERE, 102
USER MANUALS (COMPUTER PROGRAMS), 58, 160
USER REQUIREMENTS, 20

V

V-22 AIRCRAFT, 19
V/STOL AIRCRAFT, 14
VANADATES, 44
VARIABILITY, 152
VELOCITY, 88
VERTICAL LANDING, 14
VERY HIGH FREQUENCIES, 9
VESTA ASTEROID, 163
VESTIBULAR NYSTAGMUS, 116
VESTIBULES, 115
VIABILITY, 63, 141
VIBRATION DAMPING, 36
VIBRATION ISOLATORS, 84
VIBRATION MODE, 11
VIBRATION TESTS, 11, 74
VIDEO COMMUNICATION, 121
VIRTUAL REALITY, 38, 121
VISCOELASTICITY, 156
VISIBILITY, 64
VISUAL CONTROL, 9
VISUAL PERCEPTION, 119
VISUAL STIMULI, 113
VOLATILITY, 93
VOLTAGE CONVERTERS (DC TO DC), 72
VORTEX GENERATORS, 167
VORTICES, 3, 46, 78, 89, 101
VORTICITY, 78, 79
VSAT (NETWORK), 60

W

WARFARE, 13, 110, 132
WASTE MANAGEMENT, 97
WASTE TREATMENT, 44
WASTE WATER, 44, 96
WATER, 102, 166
WATER FLOW, 90, 107
WATER MANAGEMENT, 89, 94
WATER QUALITY, 96
WATER RESOURCES, 89, 90
WATER VAPOR, 102, 163
WATER WAVES, 107
WAVE PROPAGATION, 58, 105
WAVE ROTORS, 21
WAVEGUIDE ANTENNAS, 35, 69
WAVELENGTHS, 149, 150, 151, 152
WAVELET ANALYSIS, 23
WEAPON SYSTEMS, 126
WEATHER, 61, 66

WEATHER FORECASTING, 103
WEIGHT REDUCTION, 10
WEIGHTLESSNESS, 111, 113, 114, 115, 116
WEIGHTLESSNESS SIMULATION, 109, 110
WELDING, 84
WIND EFFECTS, 106
WIND SHEAR, 106
WIND TUNNEL TESTS, 10, 34, 55
WIND TUNNELS, 26
WIND VELOCITY, 100
WINGS, 11
WORDS (LANGUAGE), 69, 128
WORKLOADS (PSYCHOPHYSIOLOGY), 120, 121
WORLD WIDE WEB, 65, 70, 124, 130
WOVEN COMPOSITES, 86

X

X RAY DIFFRACTION, 45, 139
X RAYS, 37, 154, 162
X-31 AIRCRAFT, 18, 25
X-34 REUSABLE LAUNCH VEHICLE, 10

Y

YANG-MILLS THEORY, 156

Personal Author Index

A

Abbe, Brian, 63
Abdel-Tawab, Khaled, 156
Adamovsky, Grigory, 81
Adelman, Leonard, 118
Agan, Martin, 63
Aggarwal, Ishwar D., 143
Aggarwal, Suresh K., 46
Aikawa, Hiroshi, 131
Akimoti, Toshio, 34
Akturan, Riza, 62
Allamandola, Louis J., 165
Allard, Richard A., 106
Allott, R., 81
Altiparmakov, D. V., 142
Ambagtsheer, A. F., 162
Amiri, Khalil, 130
Anderson, A. H., 128
Anderson, B. E., 94
Anderson, J. C., 128
Andino, J. M., 40
Angkasa, Krisjani, 65
Angkasa, Krisjani S., 65
Angood, S., 81
Aoyagi, Tetsuo, 147
Araki, Kenichi, 72
Ardema, Mark D., 23
Armando, Patrick, 1
Arrhenius, G., 164
Artun, Omer B., 115
Aschwanden, Markus J., 174
Ashton, A. W., 148
Atkin, G., 132
Aune, Robert M., 102
Avello, C. Garcia, 7
Awa, Yuji, 29
Axeirad, Penina, 7
Azambuja, R., 79
Azinheira, J. R. C., 7

B

Bada, Jeffrey L., 98, 170
Badger, M. L., 161
Bailey, Elizabeth K., 125
Bailey, S., 148
Baillie, Stewart, 9
Bair, Scott, 54
Baker, Emanuel R., 125
Banks, Sheila, 128
Barker, Howard W., 104
Barzanti, L., 81
Baskir, J., 97
Bass, James N., 99
Bateman, J. E., 141
Bates, D., 81
Bauder, A., 164
Bauer, Robert, 65
Bazdenkov, Sergey, 146
Beaver, John, 59
Becker, Luann, 98
Beckwith, C., 81
Beery, Dwight B., 37
Behre, Charles P., 7
Bell, K. W., 141
Bell, L. D., 140
Bellero, Lucio, 22
Ben-Arie, Jezekiel, 132
Benfield, M. P., 84
Benney, Richard J., 78
Benton, Jesse C., 68
Benz, Arnold O., 174
Bergin, E. A., 166
Berkh, O., 54
Bernstein, Max P., 165
Beveridge, J. R., 30
Bhavnani, Krishin H., 99
Bianconi, Patricia A., 43
Biazar, A., 91
Biou, Valerie, 149
Birks, M., 81
Birman, M. S., 134
Blais, Brian S., 117
Blake, D. R., 93, 94
Blanchard, Robert C., 2
Bockelee-Morvan, D., 166
Bodnevas, A., 54
Bogard, Donald D., 172
Bonds, Timothy, 35
Bondyopadhyay, Probir K., 68
Booth, G., 79, 81, 145
Borden, R. C., 95
Bordes, Jose, 140
Bosworth, John T., 25
Boumsellek, Said, 44
Boyce, W., 29
Bradshaw, J. D., 93, 94
Bradwell, N., 81
Brady, Pamalee A., 87
Braun, Robert D., 2
Bregman, Jesse, 162
Brenner, Marty, 23, 25
Bricogne, G., 150, 154
Bridel, G., 136
Bridgewater, L. Grant, 158
Bringi, V. N., 59
Brooks, C. J., 5
Brooks, Thomas F., 3, 138
Broome, M. J., 158
Brown, A. D., 20
Brown, Arik, 71
Brown, C. W., 90
Brummitt, P., 81
Bryant, Wayne H., 5
Buch, Eric J., 101
Bulluck, J. W., 45
Bunch, Jennifer R. Terry, 37
Burge, S. R., 141
Burns, J. A., 173
Butcher, Paul, 18
Butzmuehlen, Carsten, 8
Byun, D., 92

C

Callahan, John, 125
Campbell, Mark E., 36
Campion, R. P., 50
Canody, Cheryl, 15
Capshaw, William K., 85
Carmel, Y., 73
Carr, Michael H., 171
Carter, Emily A., 139
Carter, Jason W., 110
Casper, Ann M., 74
Cassen, P., 173
Castagnos, Patrick, 17
Castner, Raymond S., 26
Caux, L. A., 137
Cella, James, 53
Celmins, Aivars, 132
Cestero, Francisco J., 37
Chalasani, Prasad, 127
Chan, Hong-Mo, 140, 156
Chan, K., 68
Chance, K. V., 164
Chang, Fay W., 130
Chang, Sherwood, 165
Charles, P. A., 162
Chaumette, Daniel, 1
Chellappa, Rama, 70

Chen, Wilfred, 41
Cherry, Mark C., 14
Chester, Mark V., 83
Ching, J., 91
Chioma, Vincent J., 28
Christian, Matthew, 118
Christopher, Sundar A., 88
Christophorou, L. G., 73
Chutjian, Ara, 44
Clapp, Lee W., 96
Cleveland, R. F., 68
Clift, Vaughan L., 114
Clinton, Thomas W., 74
Coates, D., 81
Coats, C., 92
Cohen, Martin, 162
Cohen, P. I., 147
Cohn, R., 92
Coleman, Michael G., 126
Collier, J., 81
Collins, J., 94
Collins, Mona J., 106
Collins, Timothy J., 34
Coney, Thom A., 66
Connors, Vickie S., 88
Conrad, Jeffrey G., 105
Cook, Joseph S., Jr., 84
Cooper, Gene R., 78
Cooper, Leon N., 115, 117
Coppins, Richard J., 125
Corej, Thomas A., 20
Corio, L., 92
Cowings, Patricia S., 120
Cox, Brian J., 82, 144
Coyle, John M., 126
Crane, Robert K., 58, 61
Crawley, Edward F., 36, 38, 86
Cristian, Flaviu, 125
Croll, John B., 8
Crouch, James A. M., 105
Crovisier, J., 166
Crowe, C. Robert, 15
Cunningham, Ronan A., 52
Curran, Francis M., 56

D

Dacey, John W., 100
Dagdigian, Paul J., 140
DAgostino, P. A., 141
Dai, Y., 141
Damerell, A. R., 81
Damouth, D., 6
Danson, C. N., 78, 81, 145
Darzi, Michael, 104
Dateo, Christopher E., 46
Dauter, Zbigniew, 153
Davarian, Faramaz, 62
Davidson, Michelle L., 37
Davies, G., 148
Davis, Joel L., 109
Davis, R. W., 136
Dayde, MicheL J., 133
Dayde, Michel J., 133
Decamps, Jerome P., 133
Decker, Curtis L., 87
deLaFortelle, E., 150
Delaney, R. G., 137
DelBalzo, Donald R., 106
DeMalleray, E., 7
Dennis, R., 92
Dentamaro, Anthony V., 98
Der, Sandor, 70
DeRieux, W., 96
DeRosa, G., 43
Deshpande, M. D., 35, 68
DesMarais, David J., 171
Despois, D., 166
Destarac, Guy, 17
Dibb, J. E., 94
Dicken, J. E., 164
Dickman, J. David, 114
Dieroff, M., 8
DiIorio, D., 107
Ding, Yujie J., 75
Dissanayake, Asoka, 60, 61
Dixon, Maurice, 159
Dixon, Peter G., 25
Doarn, Charles R., 131
Dobler, K., 8
Docherty, M. J., 97
Dogliatti, Francesco, 22
Domingue, Deborah, 167
Dow, B., 59
Dreschhoff, Gisela A., 174
Dublenko, A. Lawrence, 2
Duke, Michael B., 169
Dupont, Pierre, 127

E

Eckhardt, Dave E., Jr., 5
Eder, B., 92
Edwards, C. B., 81
Edwards, D., 81
Efremov, Alexander, 22
Einea, Amin, 87
Eisman, Mel, 35
Ellrod, Gary P., 102
Ellwood, J., 81
Eloy, M., 79
Erm, Lincoln P., 73
Ershov, Elksei, 84
Eschenmoser, A., 164
Evans, Philip R., 151
Ewald, C. A., 129
Exley, P., 81

F

Fan, S.-M., 93
Faridani, Jacqueline, 140
Farmer, Jack D., 170
Favreau, J. P., 159
Federman, S. R., 167
Feldhake, Glenn, 66
Fell, Julie H., 61
Ferraro, Ralph, 101
Ferreira, L. F. Vieira, 145
Fiedler, Fred E., 158
Figueira, G., 79
Finch, Roger S., 16
Fleming, J., 6
Flintoff, P. S., 81
Fodor, G. E., 56
Fonseca, A. A., 7
Forbes, James A., 125
Forgan, B. W., 39
Forstner, H. J. L., 40
Fourme, R., 152
Frackiewicz, A., 81
Franke, John M., 81
Fraser, Timothy J., 161
Frew, Nelson M., 100
Friehmelt, Holger, 18
Fujiwara, Susumu, 50
Fung, Francis, 122
Furukawa, Masao, 80
Futamata, Ryosuke, 80

G

Gahagan, Shane G., 54
Gaier, James R., 37
Gamache, Robert R., 160
Gardner, Lee S., 17
Gault, D. E., 173
Gautier, D., 166
Geary, J. C., 164
Gebhardt, Heidi L., 67
Ghalib, Ali, 124
Gibson, Garth A., 130

Gillani, N. V., 91
Gillespie, James B., 145
Girolami, Claudio, 22
Glover, Ian D., 150
Gmelin, Bernd, 3
Gnoffo, Peter A., 80
Gobat, Jason I., 106
Gobioff, Howard, 130
Godowitch, J., 91
Goin, R. T., 95
Golde, Michael F., 139
Goldhirsh, Julius, 61, 62
Goldsmith, P. F., 166
Golshan, Nassar, 58, 66
Gonzalez, Daniel, 35
Gornik, Erich, 142
Gotoh, Yoshifumi, 29
Gougousi, Theodosia, 139
Gould, Nicholas I. M., 123, 133
Green, D. S., 73
Green, P., 6
Greene, E., 42
Gregory, G. L., 93, 94
Greiner, T. J., 97
Griffin, R., 41
Grody, Norman C., 101
Grosch, C. E., 79
Grosenbaugh, Mark A., 106
Gualtieri, James, 118
Guetter, Richard, 18
Guidry, Rene, 71
Gulick, V. C., 168

H

Haakensen, Erik Edward, 123
Haberle, Robert M., 172
Hahn, Klaus-Uwe, 24
Hahn, Steven E., 30
Hale, Todd B., 70
Hamburg, S. P., 97
Hamill, Sean, 159
Hancock, J. R., 141
Handschub, Robert F., 84
Hanson, Ronald J., 72
Hansson, Othar, 27
Hardebeck, Wendie, 37
Harrington, Robert A., 128
Harris, N., 97
Hartman, Mary L., 56
Hashimoto, Hidekazu, 38
Hatano, Toshihisa, 47
Hauvette, Jacquesa, 21
Hayashi, Takumi, 146
Hayes, Will, 129
Hazzard, Mark, 18
Head-Gordon, Teresa L., 141
Healy, Alice F., 118
Heikes, B. G., 93, 94
Hein, Carl A., 99
Heintsch, Thomas, 24
Helliwell, John R., 148
Helmken, Henry F., 60
Henbest, K., 145
Henning, Rudy, 60
Hergenrother, Paul M., 40
Hermes, Douglas Joseph, 71
Herr, Michael, 18
Hess, Ronald A., 24
Hewett, Marle D., 15
Hickman, J. R., Jr., 118
Hidekuma, S., 161
Higuera, Mario A., 165
Hoelzer, Kerstin, 152
Hoenlinger, H. G., 13
Hoffmann, J. P., 90
Hollestelle, P. M. N., 20
Holzhausen, Klaus Peter, 121
Honda, Atsushi, 147
Horan, Stephen, 61, 63
Hozumi, Kohichi, 34
Hryciw, Roman D., 124
Hu, C. K., 175
Hudson, Mary K., 99
Hughes, Michael C., 17
Hui, Kenneth, 9
Humphreys, William M., Jr., 138
Hunter, D., 6
Hunter, William W., Jr., 138
Huntington, H. P., 100
Hutcheson, Donald W., 125
Hutin, P. M., 13
Hutzler, S. A., 56
Hwang, I. S., 175
Hydro, Norsk, 51

I

Iacovazzi, Robert, 103
Ichihara, Kiyoshi, 134
Ikegami, Tetsuhi, 72
Immarigeon, J-P., 14
Intrator, N., 117
Ippolito, Louis J., 61, 64
Irvine, W. M., 164
Irwin, J., 150
Islamgaliev, R. K., 48
Israeli, D., 17

J

Jacob, D. J., 93
Jaeger, Bradley E., 58
Jaeger, J., 97
Jakosky, Bruce M., 172
Jamsek, Damir, 122
Jeganathan, Muthu, 64
Jensen, Brian J., 40
Jha, Somesh, 127
Johansson, K., 134, 135
Johns, William E., 25
Johnsen, Rainer, 139
Johnson, Karen, 118
Johnson, Keith R., 143
Johnson, Mark B., 74
Johnson, Terry L., 36
Johnson, Troy D., 38
Jonas, Jiri, 49
Jones, Denise R., 5
Jones, Robert L., 44
Joshi, Tulasi, 125
Jungkamp, T. P. W., 41
Junichiro, Shimizu, 37

K

Kaariainen, Jussi, 98
Kahn, R., 152
Kain, Robert M., 49
Kalmus, John R., 159
Kaminaga, Atsushi, 146
Kantak, Anil V., 65
Kao, C. M., 95
Kardo-Sysoev, Alexei, 76
Karl, T. R., 97
Karniadakis, George E., 79
Kashimoto, Masami, 72
Katnik, Gregory N., 31
Katsurahara, Tadashi, 34
Katz, S., 6
Kaushik, Dinesh K., 78
Kavak, Adnan, 62
Kawai, Mikito, 147
Keene, J., 166
Kempel, Leo, 71
Kerridge, John F., 170
Kersting, R., 142
Keyes, David E., 78
Kharadly, M. M. Z., 59
Khoroshkin, S., 134
Kida, Shigeo, 146
Kikuchi, Mitsuru, 146
Kim, Byung J., 96
Kim, Quirin, 18

Kinney, Todd M., 124
Kital, Tatsuya, 146
Kitauchi, Hideaki, 146
Kleb,William H., 80
Kleindienst, T. E., 41
Klemm, K. I., 94
Klich, Donna V., 88
Klijn, J. M., 20
Ko, William L., 86
Kojima, M., 161
Kolata, William G., 137
Konno, Akira, 39
Koolstra, H. J., 20
Korotev, Randy L., 168
Kosan, Keith J., 20, 121
Koul, A. K., 14
Krishnamurthy, S., 45
Kuiper, H., 162
Kulkarni, S. R., 163
Kume, Etsuo, 131
Kurasawa, Toshimasa, 47
Kurita, Gen-ichi, 146
Kuriyama, Masaaki, 147
Kuroda, Toshimasa, 47
Kuwashima, Saburo, 57

L

Lachenmaier, Ralph, 19
Lagally, Max G., 53
Lakota, Barbara Anne, 66
Lambert, David L., 166
Lamzin, Victor S., 154
Landrum, D. B., 84
Langley, A. J., 12
Langmack, Dennis J., 83
Laptev, A., 134
Lathan, Corinna E., 131
Lawson, R. E., 76, 77
Lawson, Seth W., 115
Lazovic, M., 142
Le, Anh Tuan, 35
LeDuc, S., 92
Lee, Jaehee, 9
Lee, Timothy J., 46
Lee, Wei, 167
Lemanski, Michael J., 68
Lerner, F., 117
Lesh, Jim, 64
Leshin, Laurie, 172
Li, Larry C., 82, 144
Lichvar, Robert, 95
Lin, E. K., 175
Lin, Hsin-Piao, 62
Lin, K. T., 61
Lin, Kuan-Ting, 60
Linak, W. P., 93
Lind, Rick, 23, 25
Lindquist, Timothy E., 124
Lintern, A. L., 141
Lipkin, Robert, 95
Lis, D. C., 166
Litvin, Faydor L., 84
Loewen, Edward D., 69
Logan, J. A., 93
Loh, Anne, 11
Lomakina, O. V., 142
Longhi, J., 173
Lopes, T. J., 90
Loros, Jennifer J., 107
Lovesey, Stephen, 139
Lowe, Steven J., 160
Lucidi, Stefano, 123
Luckner, Robert, 24
Lunin, V., 155
Lunn, Robert H., 69
Lynch, J., 92

M

Macagno, E., 79
MacLean, William J., 2
Main, Peter, 153
Makinen, Jaakko, 98
Malkin, M., 97
Man, Kim Fung, 44
Manhart, Paul K., 144
Manuilov, V. M., 137
Marsh, A. S., 141
Marsh, Delbert K., II, 6
Masaki, Kei, 146
Mason, J., 96
Masters, Brett P., 86
Matsunaga, E., 167
Matsuyama, Yuji, 131
Matthews, K., 163
Mauzerall, D. L., 93
Mayer, Charles E., 58
Maynard, Nelson C., 51
McCarthy, James M., 83
McCaugherty, Dan, 125
McCool, Chris, 71
McDaniel, Richard G., 126
McErlean, Donald P., 14
McFarland, M., 97
McIntyre, David H., 141
McKay, K., 13
McKeegan, Kevin D., 163
McLelland, Scott, 76
McManus, Hugh L., 52
McMillin, Larry, 102
McNeil, William J., 99
McSween, Harry Y., 173
Meadows, Kristine R., 138
Means, D. L., 68
Medioni, G., 132
Menningen, K. L., 167
Menzel, W. Paul, 103
Merrill J. T., 94
Miller, James G., 85
Miller, K. A., 96
Miller, Russ, 153
Mirmiran, A., 42
Mishchenko, A. S., 137
Mitchell, D. P., 84
Mitchell, John A., 47
Mitchell, R. M., 39
Miya, Naoyuki, 146
Mohan, Sunil, 27
Moloney, J., 83
Montgomery, Raymond C., 12
Moody, Paul E., 83
Moon, J. M., 30
Moorhouse, David J., 3, 26
Morgan, G. J., 50
Morgan, Matthew E., 45
Morin, Gilbert A., 76
Morino, Yoshiki, 55
Morrison, Wayne G., 161
Moss, James N., 2
Motta, Brian, 101
Mueller, F., 164
Mulkey, F. J., 97
Murakami, Keiji, 29
Murray, Barbara, 95
Murtagh, B. J., 11
Muscettola, Nicola, 27
Musiani, Bert, 61
Muthsam, Erfried W., 24
Myers, Brad A., 126

N

Nagami, Masayuki, 146
Nagao, Ryuji, 39
Nagaoka, Miyuki, 74
Nagashima, Keisuke, 146
Nagle, David F., 130
Nakai, Muneaki, 74
Nakajima, T., 163
Nakanishi, H., 161
Nanson, K. M., 16

Naoumov, Alexandre, 145
Neal, Ralph D., 125
Neal, Ralph D., 125
Neely, D., 78
Nelson, James P., III, 102
Nemeth, Michael P., 34
Nevatia, R., 132
Newman, Dava J., 131
Nguti, Don, 150
Nicolet, Eric, 22
Nikolaev, Valeri, 82
Nolf, Scott, 88
Normanton, T. H., 120
Norton, William J., 16
Novak, J., 92

O

OBrien, D. M., 39
Oda, Masahiro, 47
Odum, J. R., 40
Oelker, Hans-Christoph, 24
Ofengeim, D., 77
Ogelman, Hakki, 165
Ohishi, M., 164
Ohnstein, Thomas, 143
Oliveira, A. S., 145
Olson, William A., 100
Olthoff, J. K., 73
Ong, Tiong P., 52
Oohara, Hiroshi, 147
Oppenheimer, B. R., 163
Orii, Shigeo, 131
Ota, Toshiro, 131
Ovenden, C. R., 120
Over, James W., 129
Owen, T., 166
Owen, Tobias, 169

P

Pagano, Robert J., 144
Painter, Darcy S., 17
Pampalone, Michael R., 11
Park, James K., 96
Pastore, Richard, 118
Patching, C. Alan, 11
Paul, Don, 126
Paul, Donald B., 26
Pell, Barney, 27
Pendleton, E. W., 13
Pendleton, J. D., 145
Perrakis, Anastassis, 154
Peterson, Mark R., 150
Petkac, Michael J., 161
Petraroli, E., 17
Pfaudler, Jakov, 140
Philippe, Jean J., 3
Phillips, James, 23
Phillips, Joel R., 135
Phillips, T. G., 166
Philpot, Mike, 21
Plakosh, Daniel, 127
Podesta, G. P., 90
Podjarny, A., 155
Podner, Daniel J., 85
Polze, Andreas, 127
Poreda, Robert J., 98
Posey, Pamela G., 106
Povitsky, A., 77
Powell, Harold R., 151
Preller, Ruth H., 106
Price, K., 132
Price, Robert C., 18
Prieur, Jean, 3
Pritchett, Amy, 122
Provost, Lionel R., 141
Purdom, James F. W., 103
Puster, Richard L., 81

R

Racine, Charles, 95
Ramin, M., 152
Ramsay, R. B., 16
Ratwani, Mohan M., 14
Rauch, C., 142
Read, Brian J., 159
Read, William J., 9
Redman, Brian, 70
Regel, Liya L., 47
Resendes, D., 78
Rice, Jane K., 43
Riley, Christopher J., 10
Robinette, Kathleen M., 121
Robinson, Edward C., 99
Roderick, David V., 69
Rodger, K. S., 15
Rodriguez, Leonard J., 143
Rogalsky, G., 54
Rogers, Stuart E., 80
Roma, Massimo, 123
Rosal, C. G., 95
Rosen, David L., 145
Rosenberg, Armand, 145
Rosenfeld, Ronald, 127
Ross, H. G., 136
Ross, Robert, 59
Rotel, M., 54
Roth, N., 92
Roush, Ted, 162
Rozelle, Daniel R., 26
Rubin, C. M., 99
Rucker, James, 65
Ruderman, Malvin, 164
Rushing, R. A., 45
Rzemien, E., 92

S

Sachs, G., 8
Sachse, G. W., 93, 94
Sahu, Jabaraj, 78
Sakamoto, Hiroshi, 72
Saleh, Moshen A., 87
Sandford, Scott A., 165
Sandholm, S. T., 94
Sandkovic, John M., 56
Sandreczki, T. C., 41
Sanghera, Jasbinder S., 143
Santos, Eugene, Jr., 128
Sasnett, S., 96
Sater, Janet M., 15
Sato, Tetsuya, 50, 146
Satorius, Edgar, 63
Schaafsma, David T., 143
Schaenzer, G., 8
Scharberg, Maureen A., 165
Scheffler, Daniel R., 88
Schempf, Hagen, 133
Schmidt, Karl, 133
Schroer, Klaus, 152
Scott, Michael A., 12
Sears, Gregory B., 31
Sebrechts, Marc M., 131
Seiner, John M., 79
Selegan, D. R., 136
Selvarathinam, Alex S., 42
Semple, W. G., 120
Sensburg, O., 12
Shade, P. J., 89
Shahbaz, T., 162
Shaw, G. A., 128
Sheldrick, George M., 153
Shepard, W., 152
Sherman, N. D., 162
Shimada, Sadanori, 29
Shimizu, Akira, 74
Shimoji, Haruhiko, 29
Shing, Yuh-Han, 52
Shipbaugh, Calvin, 35
Shipman, Floyd S., 5

Shipman, M. S., 76, 77
Shoop, Brian P., 10
Shouval, H., 117
Shouval, Harel Z., 115
Singh, H. B., 93, 94
Siquig, Richard A., 160
Sixma, Titia K., 154
Skira, Charles A., 21
Smart, M. K., 12
Smeltzer, Stanley S., III, 115
Smilowitz, Gary J., 67
Smith, Alphonso C., 85
Smith, Amy R., 138
Smith, Barry F., 78
Smith, D. F., 41
Smith, Ernest K., 64
Smith, Jane McKee, 106
Smith, Janet L., 149
Smith, Joseph G., Jr., 40
Smith, Kathryn A., 5
Smith, Reginald W., 47
Snyder, W. H., 76, 77
Solley, W. B., 90
Solomyak, M., 134
Sommers, Tagore, 133
Somoza, John R., 154
Southerland, M., 92
Spence, Harlan E., 130
Spill, E. J., 141
Splettstoesser, Wolf, 3
Sponder, Leopold, 19
Spurr, R. J. D., 164
St.Clair, Terry L., 25
Starnes, James H.,Jr., 34
Stegeman, G. I., 54
Steinman, Jeffrey S., 131
Stephenson, R., 141
Stocks, A. J., 20
Stoliker, Patrick C., 25
Stolin, A., 134
Stoll, J. B., 167
Stolz, Earl W., 121
Strasser, G., 142
Strom, R. G., 173
Stubbs, Malcom G., 76
Sugawara, Masayuki, 72
Sullivan, Kevin, 127
Surka, Derek M., 38
Svergun, D. I., 155
Swierstra, S., 7
Szebehely, V., 29
Szoeke, Abraham, 154
Szoeke, Hanna, 154

T

Tackett, Jeff, 71
Tadros, Maher K., 87
Tajima, M., 167
Takatsu, Hideyuki, 47
Talbot, R. W., 93, 94
Talmor, Dafna, 135
Tamagawa, Yasuhisa, 29
Tande, Gerald, 95
Terada, Teruhisa, 74
Thomas, Joseph M., 98
Thompson, A., 149
Thompson, R. S., 76
Thornton, D. C., 94
Thorstensen, J. R., 162
Titkova, I. V., 142
To, K. W., 175
Toint, Philippe L., 123
Tokmakian, Robin T., 88
Tolson, Robert H., 27, 36, 37
Tolstoy, V., 134
Tom, Caroline, 71
Tomlinson, B., 13
Toner, W. T., 81
Tong, Loretta, 64
Tonucci, Ronald J., 145
Torbet, M. J., 141
Tornes, John A., 141
Torrence, Geoffrey W., 63
Tourtoulon, Marc, 17
Toyoshima, Noboru, 146
Treiman, Allan H., 173
Triantafyllou, Michael S., 106
Tsenev, N. K., 48
Tsou, Sheung Tsun, 140, 156
Tsuchiya, Yoshikazu, 29
Tsukishima, Chihiro, 29
Tsukiyama, Hiroshi, 80
Turner, John, 120

U

Uecker, Ben, 161
Ueno, Kenji, 72
Unterrainer, K., 142
Urzhumtsev, A., 155
Ushigusa, Kenkichi, 146
Utashima, Masayoshi, 28
Utashima, Masayoshi,, 28

V

Valiev, R. Z., 48
Vance, Phillip W., 105
VanderMear, Chad A., 159
VanderVliet, Gery M., 18
Vanhooser, M. T., 84
vanRijt, Q. G. N., 162
Verbiscer, Anne, 167
Vodicka, Roger, 55
Vogel, Wolfhard J., 62, 63
Vorozhtsov, S. B., 142

W

Waibel, Alex, 69
Walcek, Chris J., 103
Walchli, Lawrence A., 3
Walker, James, 42
Walker, K. F., 11
Wallace, W., 14
Wallnau, Kurt C., 127
Walter, G., 92
Wang, Min, 88
Wang, Per Arne, 51
Wang, Xu-He, 58
Weaver, John, 101
Weber, Robert A., 133
Weckert, Edgar, 152
Weeks, Charles M., 153
Weeks, R., 13
Weil, J. C., 76, 77
Weinkauf, R. A., 89
Weinkauf, Ronald A., 89
Weiss, Isaac, 136
Weistroffer, H. Roland, 125
Weitsman, Y. J., 42
Welch, Ronald M., 88
Wells, Dennis L., 144
Weltsman, Y.J., 156
Weng, Fuzhong, 101
Westenhaver, David, 58, 66
Weston, Robert P., 12
Wheeler, Mark L., 67, 70
Whitman, Randall S., 129
Whitson, Peggy A., 114
Whitworth, T. M., 43
Wieland, Frederick P., 131
Wielicki, Bruce A., 104
Wikman, J., 57
Wilcox, William R., 47
Wiley, D., 12
Wilkin, Paul G., 27
Wilkins, Richard, 75
Wilkinson, F., 145
Williams, J. C., 21
Wills, Robert W., 5

Wilmoth, Richard G., 2
Wilson, Jack, 21
Wilson, K. S., 148
Wilson, Keith, 64
Wilson, Keith S., 154
Windhorst, Robert, 23
Witteborn, Fred C., 162
Wolter, John D., 26
Wood, William A., 80
Wooden, Diane, 162
Wootten, A., 166
Workman,Gary, 42
Worrall, D., 145
Wreggit, Steven S., 6
Wright, B. D., 158
Wu, Y. L., 91
Wurster, Kathryn E., 10
Wykes, K. M., 120

X

Xu, Guang-Han, 62

Y

Yamawaki, Koji, 72
Yao, Xiao-Tian Steve, 144
Yeager, Jessie C., 23
Yen, G. D., 175
Yoshinaka, Toshinari, 55
Yoshizawa, Kenji, 29
Young, Clarence P., Jr., 25
Young, J., 92
Young, K., 166
Young, Richard D., 34
Young, Steven D., 5
Youngs, Wiley J., 50
Yu, Yung H., 3
Yuce, H., 107
Yuzawa, Mari, 29

Z

Zahavi, J., 54
Zare, K., 29
Zeller, Edward J., 174
Zhan, Pu-Ming, 69
Zoby, E. Vincent, 10