Scientific and Technical Aerospace Reports

STAR

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National Aeronautics and Space Administration
Langley Research Center

Scientific and Technical Information Program Office

NASA STI Program ... in Profile

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Introduction

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STAR includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
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- Domestic and foreign dissertations and theses

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NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the CASI TRS – the publicly available contents of the NASA STI Database.

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National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at http://www.ntis.gov.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** (FDLP) to ensure access by the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal Depository Libraries http://www.access.gpo.gov/su_docs.

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

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

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Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20020089468 NASA, USA
Innovation and the Development of Flight
Launius, Roger D., Editor, NASA, USA; [1999]; In English
Report No.(s): LC-98-48723; ISBN 0-89096-876-4; Copyright; Avail: Issuing Activity

Innovation and the Development of Flight, a first strike at the "new aviation history," represents a significant transformation of the field by relating the subject to larger issues of society, politics, and culture, taking a more sophisticated view of the technology than few historians have previously attempted. This volume moves beyond a focus on the artifact to emphasize the broader role of the airplane and, more importantly, the entire technological system. This suggests that many unanswered questions are present in the development of modern aviation and that inquisitive historians seek to know the relationships of technological systems to the human mind. Some of the subjects discussed are early aeronautical innovation and government patronage; the evolution of relationships among airports, cities, and industry; the relationship of engine development to the entire aviation industry; the Department of Commerce's influence on light plane development; pressure in the Air Force for the development of jet engines; and lessons of the National Aerospace Plane Program. Aviation historians and historians of technology will find Innovation and the Development of Flight a valuable examination of aeronautical innovation providing foundations for continued explorations of this field.
Derived from text
Aeronautical Engineering; Technology Utilization; Aircraft Engines; Aircraft Industry; Civil Aviation

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety; and 85 Technology Utilization and Surface Transportation.

20020087795 Federal Aviation Administration, Office of Aerospace Medicine, Washington, DC USA
Risk Perception and Risk Tolerance in Aircraft Pilots ***Final Report***
Hunter, D. R.; Sep. 2002; 30p; In English
Report No.(s): PB2003-100818; DOT/FAA/AM-2/17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Poor pilot decision-making has been identified as a factor in a large percentage of fatal aviation accidents. Risk perception and risk tolerance are two factors that can significantly impact pilot decision-making. Inaccurate risk perception can lead pilots to ignore or misinterpret external cues that demand immediate and effective decisions to avoid hazards. High risk tolerance can lead pilots to choose courses of action that unnecessarily expose them to hazards and increased likelihood of accident. Risk perception and risk tolerance are related and often confounded constructs. This study sought to separate these two constructs and to develop and evaluate measures that could be used to compare individual pilots on the constructs. A large sample of pilots visiting

a government web site completed two risk perception, and three risk tolerance measures. They also completed a short scale assessing their involvement in hazardous aviation events and provided demographic information. Analysis of the data showed that the five new measures demonstrated acceptable internal consistency. The measures of risk perception were only mildly related to risk tolerance, suggesting that these are separate constructs. As hypothesized, pilot perception of risk was negatively related to risk tolerance. In addition, risk perception demonstrated a small, but significant, correlation with self-reported involvement in hazardous aviation events. However, contrary to expectations, risk tolerance was not significantly related to hazardous events. The results suggest that it is differences in cognitive skills required for accurate risk perception that place pilots are greater likelihood of accident involvement, rather than differences in underlying personality traits related to risk tolerance. The implications of the findings are discussed, along with limitations on the generalizability of the results, and suggestions for future research to improve the measurement scales are given.
NTIS
Aircraft Pilots; Aircraft Accidents

20020087801 Hughes Technical Center, Fire Safety Section, Atlantic City International Airport, NJ USA
Development of a Minimum Performance Standard for Hean-Held Fire Extinguishers as a Replacement for Halon 1211 on Civilian Transport Category Aircraft ***Final Report***
Webster, H.; Aug. 2002; 52p; In English
Report No.(s): PB2003-100453; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The purpose of this standard is to provide a method to evaluate the performance of replacement hand-held fire extinguishers for Halon 1211 required on transport category aircraft. Currently, regulations require that Halon 1211, or equivalent, hand-held fire extinguishers be carried in the passenger cabin of transport aircraft. The regulation states that the type and quantity of agent, if other than Halon 1211, must be appropriate for the kind of fires likely to occur where used.
NTIS
Fire Extinguishers; Passenger Aircraft; Flame Retardants; Standards

20020087830 Naval Air Warfare Center, China Lake, CA USA
Engine Debris Fuselage Penetration Testing Phase 2 ***Final Report***
Lundin, S. J.; Sep. 2002; In English
Report No.(s): PB2003-100819; NAWCWD-418300D; No Copyright; Avail: CASI; C01, CD-ROM
During October and November 2000 the Naval Air Warfare Center, China Lake conducted a series of simulated uncontained engine failure structural impact tests. A large 12-inch gas gun was used to launch turbojet engine fan blade segments into a narrow-body commercial aircraft fuselage. The impacts were documented and analyzed with high-speed photography. Impact velocities, presented areas, and residual velocities were calculated. These data were then compared to analytic results predicted by the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) penetration equations. The results are presented in this report.
NTIS
Damage Assessment; Debris; Gas Turbines; Aircraft Accidents; Fuselages

20020089501 Army Safety Center, Fort Rucker, AL USA
FLIGHTFAX: Army Aviation Risk-Management Information. Volume 30, Number 9
Sep. 2002; 20p; In English; Original contains color images
Report No.(s): AD-A406773; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Executing our missions in support a of Operation Enduring Freedom requires a high state of readiness that, in turn, makes it even more imperative that we not allow accidents to degrade our ability to accomplish those missions. Every day we expose our soldiers to hazards in uncertain and complex operational and training environments. Increased mission optempo, leader inexperience, constant changes with personnel resource issues in terms of time, equipment, etc., are all present. None of these elements alone is the inherent cause of accidents. However, when left uncontrolled, seemingly low-risk hazards can collectively raise risk to an unacceptable level. The cumulative effect of these risks may create) breakdowns in leadership, discipline, training, and standards, which in turn can quickly set the accident chain of events in motion. In fact, an analysis of Class A accidents reveals that breakdowns in discipline, leadership, training, and standards were the main contributing causes of these accidents. Data also supports that, in many cases, the accident didn't just happen on the day of the helicopter crash or the tank rollover. Sometimes

the sequence of events that culminated in the accident started days, weeks, and even months before-and not always at the accident unit level.
DTIC
Aircraft Accidents; Information Management; Hazards; Education

20020089518 Department of Defense, Office of the Assistant Inspector General for Audit, Arlington, VA USA
Information Technology: Information Resource Management at the Army Aviation and Missile Command
Oct. 03, 2002; 36p; In English
Report No.(s): AD-A406706; OAIG-AUD-D-2003-002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Chief Information Officers and others who manage information technology resources within DoD should read this report because the issues identified may be applicable across DoD. This audit was initiated in response to a Hotline allegation that the Army Aviation and Missile Command (the Command) was not properly managing information resources at the Redstone Arsenal, Huntsville, Alabama. The Command develops, acquires, fields, and sustains aviation and missile systems for Army battlefield systems and provides support services to more than 40 tenants co-located at the Redstone Arsenal and the surrounding area. For FY 2001, the Command budget at the Redstone Arsenal exceeded $7.1 billion, and identified costs for information technology were estimated to be as much as $ 126 million.
DTIC
Information Systems; Military Aviation; Armed Forces (USA); Accounting; Missile Systems

20020089539 Air Force Occupational Measurement Center, Occupational Analysis Program, Randolph AFB, TX USA
Occupational Survey Report. AFSC 4M0X1 Aerospace Physiology
Beer, Larry; May 2002; 50p; In English; Original contains color images
Report No.(s): AD-A406845; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The overview for this document includes work performed, survey background, survey sample characteristics, job structure, career ladder progression, first-enlistment analysis, job satisfaction analysis, predictive retention analysis, and summary of results.
DTIC
Aerospace Medicine; Surveys; Armed Forces; Occupation

20020089547 Army Command and General Staff Coll., Fort Leavenworth, KS USA
The USA Navy's Ability to Counter the Diesel and Nuclear Submarine Threat With Long-Range Antisubmarine Warfare Aircraft
Jorgensen, Jason T.; May 31, 2002; 119p; In English; Original contains color images
Report No.(s): AD-A406874; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The threat of the Soviet Union and Communism to the USA diminished with the end of the Cold War in the early l990s. Instead, the asymmetric threat of terrorism has spread throughout the world and become a grave danger to Amen can citizens at home and abroad. Throughout these changes in global landscape, the US Navy has adapted and given new emphasis to a variety of missions during these times of fiscal challenge. However, one of the most dangerous weapons of the Cold War, the submarine, still exists and is being proliferated widely today. Once the primary ASW aircraft used in the prosecution of submarines, the P-3C Orion, has added new equipment to perform its added warfare missions. Thus, the central focus of the thesis: Does the US Navy have the airborne capability to defend itself from current as well as projected submarine threats? The thesis will examine the relevancy of ASW today and determine whether current and future submarines pose a threat to US, its interests as well as its military. The final analysis involves an evaluation of P-3C Orion's capability to detect adversary submarines in the contemporary as well as future operating environment.
DTIC
Antisubmarine Warfare; Antisubmarine Warfare Aircraft; USA

20020089849 Army Engineer Research and Development Center, Cold Regions Research and Engineering Lab., Hanover, NH USA
Wide-Area Ice Detection Using Time Domain Reflectometry
Yankielun, Norbert E.; Ryerson, Charles C.; Jones, Sarah L.; Oct. 2002; 37p; In English; Original contains color images
Report No.(s): AD-A406828; ERDC/CRREL-TR-02-15; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Ice accretion on the wings of fixed-wing aircraft and on the rotors of rotor-wing aircraft can have disastrous results. The ice that forms on a wing structure especially along the leading edge modifies the wing aerodynamics resulting in decreased lift. In

the extreme this can lead to stall and loss of control of the aircraft and potentially a crash. Ice building up elsewhere on the wing rotor or airframe can add weight to the aircraft. Several techniques and flight protocols have been developed and are widely used to prevent aircraft from becoming ice covered both in flight and on the ground.
DTIC
Ice Formation; Reflectometers; Aircraft Accidents; Aircraft Control

20020089852 Alphatech, Inc., Burlington, MA USA
Agile Control of Military Operations Joint Force Air Component Commander (JFACC) ***Final Report, Aug. 1999-Oct. 2001***
Logan, D. A.; Wohletz, J. M.; Castanon, D. A.; Burry, M. L.; Bank, B.; Aug. 2002; 113p; In English; Original contains color images
Contract(s)/Grant(s): F30602-99-C-0203; ARPA ORDER-J107; Proj-J107
Report No.(s): AD-A406819; ALPHATECH-TR-1048; AFRL-IF-RS-TR-2002-178; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This research focused on the problem of providing military commanders with real-time, optimal control of military air-to-ground operations for a 24-hour segment of a Joint Air Operations (JAO) campaign. In particular, we focused on developing control algorithms that anticipate possible air-to-ground mission modifications due to uncertain future events, thereby generating missions that can be readily adapted in the presence of contingencies. The primary benefit of this technology is agile and stable control of distributed and dynamic military operations conducted in inherently uncertain, hostile, and rapidly changing environments. The control methodology developed combines Approximate Dynamic Programming (ADP) and statistical hybrid state modeling techniques. Accordingly, a novel hybrid, multi-rate control architecture that tailors the control strategy for different battlespace situations was developed. For this JAO problem, a key concern was the scalability of the control methodology to larger scenarios. As a result, we investigated a broad spectrum of ADP control strategies. The solution quality and computation performance of these algorithms was tested and verified in a JAO simulator. It was shown through experimentation that the ADP strategies were able to produce operationally consistent control strategies that anticipated likely contingencies and positioned assets for opportunities of recourse in near real-time.
DTIC
Military Operations; Statistical Analysis; Adaptive Control

20020090113 Air Command and Staff Coll., Maxwell AFB, AL USA
Civilian Contract Air Refueling: Innovative or Insane?
Camerer, Mark D.; Apr. 2001; 38p; In English; Original contains color images
Report No.(s): AD-A407112; AU/ACSC/035/2001-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over the last 10 years Air Mobility Command's KC-135s have been plagued by deteriorating performance which is causing shortfalls in current air refueling capability. Air Mobility Command is now forecasting the retirement of KC-135s to begin in FY2013. There is no plan to address air refueling capability shortfalls in the near-ten percent. Additionally, there are some problems inherent to the assumptions Air Mobility Command planners are making about the replacement for the KC-135, dubbed KC-X. This research paper accomplishes three tasks. First, it addresses the importance of air refueling to national security. This is accomplished by demonstrating air refueling's contribution to America's ability to rapidly project and employ power on a global scale. Secondly, this paper presents an explanation of current and forecast air refueling shortfalls. These shortfalls are presented in conjunction with Air Mobility Command's long-ten percent plan to address these shortfalls and the weaknesses of Air Mobility Command's plans. Finally, this paper presents a unique solution to the current air refueling shortfalls civilian contract air refueling.
DTIC
Air to Air Refueling; Military Operations; C-135 Aircraft; Civil Aviation

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

20020087796 Federal Aviation Administration, Washington, DC USA
Evaluation of Triple Independent Instrument Landing System Approaches to Runways Spaced 4,000 Ft and 5,300 Ft

Apart Using A Precision Runway Monitor System

Magyarits, S. M.; Ozmore, R. E.; May 2002; 66p; In English

Report No.(s): PB2003-100902; DOT/FAA/CT-TN02/16; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Multiple Parallel Approach Program (MPAP) performed a real-time simulation to evaluate simultaneous Instrument Landing System approaches to three parallel runways spaced 4,000 ft and 5,300 ft apart. Air traffic controllers monitored traffic using a simulated Precision Runway Monitor (PRM) system, which consisted of Final Monitor Aid displays and a simulated radar update rate of 1.0 second. The MPAP test team introduced aircraft blunders to test the air traffic control system ability to maintain adequate separation between aircraft on final approaches during critical situations using the proposed runway configuration. The MPAP Technical Work Group (TWG) developed four criteria to evaluate the study: (1) the number of Test Criterion Violations relative to the total number of at-risk, non-responding blunders, and relative to a predetermined target level of safety of no more than one fatal accident per 25,000,000 approaches; (2) the frequency of No Transgression Zone entries and nuisance breakouts; (3) an evaluation of controller communications workload; and (4) an operational assessment from MPAP TWG members and participating controller and pilot technical observers. The results of the simulation passed all of the test criteria. The MPAP TWG therefore recommended the 4,000 and 5,300-ft triple approach procedure for approval in the operational environment, given similar controller and pilot training, when the PRM system is used.

NTIS

Runways; Landing Aids; Flight Management Systems; Air Traffic Control

20020089994 Naval Postgraduate School, Monterey, CA USA

Enhancing the Situational Awareness of Airfield Local Controllers

Mowery, Samuel P.; Sep. 2002; 87p; In English; Original contains color images

Report No.(s): AD-A407034; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In recent years, a number of near midair collisions has shed light on the increased likelihood of mishaps that are partly attributable to traffic density. In air traffic control operations, situational awareness of a local controller at an airfield such as Marine Corps Air Station Camp Pendleton, California, is critical to prevention of catastrophic midair collisions, Spatialized audio technology has the potential to reduce or eliminate temporary losses of situational awareness. Spatialized audio technology allows auditory icons to be presented at perceptual locations external to the head at a complete range of elevation and azimuth locations relative to the listener. This thesis investigates the use of these spatialized auditory icons to determine if they could be effectively implemented in air traffic control type tasks to benefit local controllers, The research was conducted in the Advanced Auditory Displays Laboratory at NPS. A scenario to exemplify typical airfield operations at Camp Pendleton was written using java-based computer code. A virtual tower environment was created with a head mounted video display, inertial head tracker, and a spatialized audio server. Results indicated that subjects of the experiment responded more rapidly and accurately using spatialized audio,

DTIC

Auditory Signals; Auditory Perception; Air Traffic Control; Air Navigation; Situational Awareness

20020090101 Naval Postgraduate School, Monterey, CA USA

Differential Solutions Using Long-Range Dual-Frequency GPS Correction Data

Lindy, Fred L.; Sep. 2002; 101p; In English; Original contains color images

Report No.(s): AD-A407080; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Military applications of space-based navigation systems have led to important enhancements to our fighting capability and are being applied to many phases of operations. The Global Positioning System (GPS) is a key factor for making this a reality. GPS provides accurate position, velocity and time information. Stand-alone GPS receivers may not provide the requisite accuracy to fulfill mission requirements. This thesis focused on the accuracy and relevance of applying dual-frequency GPS correction data to compute differential GPS (DGPS) solutions, Analysis was performed to assess the viability of using correction data from reference receivers at extended ranges, 2000- 3000 km away, to perform after-the-fact positioning by analyzing stand-alone GPS accuracy versus dual-frequency corrected techniques. This could be extended to real- time operations. The differentially-corrected technique produced more accurate results than stand- alone GPS at all ranges. The stand-alone GPS horizontal root mean square (RMS) accuracy was 5.9 meters while the differentially- corrected RMS accuracy was under 1.5 meters to 2000 kilometers and under 3.0 meters to 3200 kilometers. The process has applicability in determining GPS solutions for long-range military uses. It is possible to use U.S. or Allied GPS assets at long distances from areas of operations to prosecute targets of high interest.

DTIC

Data Bases; Global Positioning System; Differential Equations; Military Technology; Navigation

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20020087668 Swedish Defence Research Establishment, Aeronautics Div., Stockholm Sweden
Mechanically Fastened Joints: Critical Testing of Single Overlap Joints
Starikov, R.; Mar. 2002; 64p; In English
Report No.(s): PB2003-100483; FOI-R-0441-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The structural integrity of critical aircraft metal structures, which include bolted joints, has to be validated according to the certification requirements. The objective of the present work is to improve the understanding of the static and fatigue behavior of single overlap aluminium bolted joints. Three joints were loaded in static with three different pre-tensions in the bolts. Strain gauges were used to measure strain distributions between the bolt rows and calculate secondary bending at different joint locations. Two instrumented bolts were employed to measure their axial and shear response during loading. An optical measurement method, Digital Speckle Photography (DSP), was applied to measure bolt movement at different fastener locations. The load transfer between the bolt rows was calculated using the measured strain distribution.
NTIS
Bolted Joints; Aircraft; Fatigue Tests; Fretting; Aluminum

20020087800 SRI International Corp., Menlo Park, CA USA
Improved Barriers to Turbine Engine Fragments: Interim Report IV ***Interim Report***
Shockey, D. A.; Erlich, D. C.; Simons, J. W.; Shin, H. S.; Jun. 2002; 70p; In English
Report No.(s): PB2003-100452; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Over the years, several civil aircraft accidents with catastrophic consequences have occurred when fragments from in-flight engine failures damaged critical aircraft components. to reduce the probability of catastrophic consequences in future failures, the Federal Aviation Administration (FAA) established the Aircraft Catastrophic Failure Prevention Research (ACFPR) Program to develop and apply advanced technologies and methods for assessing, preventing, or mitigating the effect of such failures. In support of the ACFPR objective, SRI International is conducting research aimed at developing lightweight barrier systems for turbine engine fragments. This is a report of the progress made during calendar year 2000.
NTIS
Turbine Engines; Commercial Aircraft

20020088658 Quebec Univ., Anti-Icing Materials International Lab., Chicoutimi, Quebec Canada
Outdoor Testing of Type 1 Fluids in Snow ***Final Report***
Beisswenger, A.; Gagne, N.; Laforte, J. L.; Sep. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-100901; No Copyright; Avail: National Technical Information Service (NTIS)

Outdoor testing of five SAE Type I ground aircraft deicing fluids were conducted for natural snow in Chicoutimi, Quebec, Canada, between January and March 2002. These tests were performed using aluminum boxes which were shown to be thermodynamically equivalent to a wing leading edge coated with fluid. For these tests, the boxes were coated with 0.5 L of Type I fluid heated to 60DGC and applied to the test surface by means of a specially made spreader. The objective of this investigation was to conduct outdoor testing and determine the anti-icing endurance times of five Type I deicing fluids under natural snowfall conditions on wing thermodynamic equivalent boxes. Testing was performed on five fluids, three of which were diluted to a 10 deg buffer with the outside air temperature, according to dilution charts provided by the manufacturer, the other two were premixed fluids and were tested as received, without further dilution. Tests were performed during 18 natural snow events. Most of them occurred at temperatures between -3.5 C and -15.0 C producing fine snow with stellar and spatial dendrite crystal types in the less than 1 mm size range. The results showed that, given the scatter of results under natural conditions, all five fluids had relatively similar endurance times; the greatest difference of 40% being observed between fluids with the longest and shortest times, with the same intensity. The prediluted fluids had, in general, longer times by about 20%, as compared to the fluids tested at a 10 deg buffer with the outside air temperature. Results were compared to those obtained at the APS Aviation site, where events occurred at warmer temperatures, which led to longer endurance times. However, when the temperature differences are taken into

consideration, the times are comparable. The data at both sites generated the following holdover times for various temperature ranges: above 0 C 11 to 18 minutes; 0 C to -3 C 6 to 11 minutes; -3 C to -10 C 4 to 7 minutes; below -10 C 2 to 4 minutes.
NTIS
Deicing; Aircraft Icing; Field Tests

20020089440 Dayton Univ. Research Inst., Research Inst., OH USA
Automated Corrosion Detection Program ***Final Report, 7 Apr. 1997-6 Oct. 2001***
Hoppe, Wally; Pierce, Jennifer; Scott, Ollie; Oct. 2001; 117p; In English; Original contains color images
Contract(s)/Grant(s): F09603-95-D-0175; Proj-3153
Report No.(s): AD-A406600; UDR-TR-2002-00083; AFRL-ML-WP-TR-2001-4162; No Copyright; Avail: CASI; A06, Hardcopy

An evaluation of several hidden corrosion-detection technologies was performed using a probability of detection (POD) method for percent material loss that is similar to well -established crack detection assessment methods. Several other tasks were performed, with overall goal of contribution to aging aircraft maintainability improvement. Automation concepts were studied and tested for improved speed and accuracy. Nondestructive Evaluation (NDE) requirements were surveyed within the industry for issues and needs pertaining to damage detection and repair. Concepts for new corrosion management maintenance philosophies were studied in terms of data fusion and reproducibility. Advancements were made to a high-temperature sensor design for Air Force application. A facility was established to support Air Force inspection advancements on KC-135 aircraft. A quantitative evaluation method was developed for hidden corrosion detection capability that lends itself to automation and data fusion concepts explored for improved corrosion management maintenance philosophies.
DTIC
Corrosion Tests; Detection; Automatic Control; Aging (Materials); Mechanical Properties

20020089542 Army Command and General Staff Coll., Fort Leavenworth, KS USA
The Effectiveness of the A-10 on the Battlefield of 2010
Hansen, Ralph S.; May 2002; 109p; In English
Report No.(s): AD-A406850; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study examines the ability of the upgraded A-10 to effectively support the Army's interim force in the year 2010. The A-10A Thunderbolt II is the first and only USAF aircraft specifically designed to provide close air support to friendly ground forces. Designed in the 1960s to provide inexpensive close air support during the Cold War, the A-10 is now programmed to remain in service until 2028. to counter inevitable obsolescence, the PE modification will add data link, targeting pod, and smart weapon capabilities to the A-10 beginning in 2005. The U.S. Army is transitioning to a lighter, more strategically agile force to respond more quickly to global challenges. The vanguard of this transformation is the Interim Brigade Combat Team, a highly mobile, technologically advanced maneuver force. Without many of the traditional fire support assets of heavier forces, these new units will depend heavily on joint fires while responding to the full spectrum of military operations. With the proposed modifications, the A-10 will possess the capabilities required to successfully integrate into the future battle space and support advanced ground forces, while still retaining its original visual and close-in support capabilities.
DTIC
A-10 Aircraft; Armed Forces; Upgrading; Effectiveness

20020089556 Air Command and Staff Coll., Maxwell AFB, AL USA
Identifying and Mitigating the Risks of Cockpit Automation
Olson, Wesley A.; Jun. 2001; 44p; In English
Report No.(s): AD-A406899; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cockpit automation has delivered many promised benefits, such as improved system safety and efficiency; however, at the same time it has imposed system costs that are often manifest in the forms of mode confusion, errors of omission, and automation surprises. An understanding of the nature of these costs as well as associated influencing factors is necessary to design adequately the future automated systems that will be required for Air Mobility Command aircraft to operate in the future air traffic environment. This paper reviews and synthesizes human factors research on the costs of cockpit automation. These results are interpreted by modeling the automated cockpit as a supervisory control system in which the pilot works with, but is not replaced by, automated systems. From this viewpoint, pilot roles in the automated cockpit provide new opportunities for error in instructing, monitoring, and intervening in automated systems behavior. These opportunities for error are exacerbated by the limited machine coordination capabilities, limits on human coordination capabilities, and properties of machine systems that place new attention and knowledge demands on the human operator. In order to mitigate the risks posed by these known opportunities for error and

associated influencing factors, a system of defenses in depth is required involving integrated innovations in design, procedures, and training. The issues raised in this paper are not specific to transport aircraft or the broader aviation domain but apply to all current and future highly automated military systems.
DTIC
Automation; Cockpits; Human Factors Engineering

20020089565 NASA Langley Research Center, Hampton, VA USA
Device and Method for Reducing Aircraft Noise
Streett, Craig L., Inventor, NASA Langley Research Center, USA; Lin, John C., Inventor, NASA Langley Research Center, USA; Oct. 29, 2002; 8p; In English; Provisional US-Patent-Appl-SN-125563, filed 22 Mar. 1999
Patent Info.: Filed 22 Mar. 2000; NASA-Case-LAR-15856-1; US-Patent-6,471,157; US-Patent-Appl-SN-533282; US-Patent-Appl-SN-125563; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A noise abatement device that is positioned adjacent to a body. The noise abatement device generally includes tabs or cavities which thicken the shear layer created by fluid flow over, around, or near the body, by creating horseshoe-shaped vortices; this thickening of the shear layer reduces the strength of fluctuations in the flow which produce noise.
Official Gazette of the U.S. Patent and Trademark Office
Horseshoe Vortices; Aircraft Noise; Noise Reduction; Mechanical Devices

20020089895 Air War Coll., Maxwell AFB, AL USA
Death by a Thousand Cuts: Micro-Air Vehicles (MAV) in the Service of Air Force Missions
Huber, Arthur F., II.; Apr. 2001; 87p; In English; Original contains color images
Report No.(s): AD-A406943; AU/AWC/2000-12; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Technological progress in a number of areas to include aerodynamics, micro-electronics, sensors, micro-electromechanical systems (MEMS), micro-manufacturing, and more, is ushering in the possibility for the affordable development and acquisition of a new class of military systems known as micro-air vehicles (MAV) MAVs are a subset of uninhabited air vehicles (UAV) that are up two orders of magnitude smaller than the manned systems that permeate our contemporary life, Recent advances in miniaturization may make possible vehicles that can carry out important military missions that heretofore were beyond our reach or could only be attained at great risk or resource expenditure. These missions will be possible if MAVs can fulfill their potential to attain certain attributes to include: low cost, low weight, little to no logistical ”footprint, ” mission versatility, range, endurance, stealth, and precision. A review of the literature in this area indicates that the military potential of this emerging field remains on the ”technological push” side of the equation with little to no ”requirements pull” from the user community. Accordingly, concepts of operations deriving from the war fighting community - particularly the USA Air Force (USAF) - are sparse. At a higher level, the potential of micro-air vehicles opens up new possibilities in the formulation of military strategies that require investigation. This paper provides an outline of the contemporary technological dimension of MAVs and contemplates how they might be used to enhance Air Force operations.
DTIC
Man Machine Systems; Electromechanics; Microelectromechanical Systems; Death

20020089898 Air Command and Staff Coll., Maxwell AFB, AL USA
Electronic Combat Support for an Expeditionary Air Force: The Lessons of History
Rentfrow, James C.; Jun. 2001; 35p; In English; Original contains color images
Report No.(s): AD-A406921; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USA Air Force (USAF) currently faces a shortfall in the type and number of electronic combat (EC) aircraft capable of operating with an Aerospace Expeditionary Wing (AEW). This has a direct impact on the USAF’s global attack core competency and undermines the combat power of any deployed AEW. Why have EC assets been allowed to deteriorate to this state? The answer begins with people, who have a flawed understanding of the theory of airpower. Because the theory is not understood correctly, money is not dedicated to the needed technology. Because the technology isn’t developed or is lacking, that community if you will fails to get representation at the higher levels of leadership. This cycle of organizational behavior repeats itself over and over until acted upon by an outside force in this case the shoot- down of a US F-117 during the Kosovo action. This is not the first time that the USAF has been through this cycle of organizational behavior. The almost exact same scenario played out in the famous pursuit versus bombers debates of the l93Os. Pursuit lost out and thereby lost money, technology, and people in key leadership

positions. It was not until the horrific bomber losses of 1943 that leaders fully realized the mistake they had made. This paper explores the connection between the two stories, looks at the current state of EC, and offers some suggestions for the future.
DTIC
Electronic Aircraft; Bomber Aircraft; Support Systems; Fighter Aircraft; Combat

20020090003 Naval Postgraduate School, Monterey, CA USA
An Analysis of Fuel Efficiency as a Key Performance Parameter for Military Aircraft Acquisitions
Young, Laurence M.; Sep. 2002; 130p; In English; Original contains color images
Report No.(s): AD-A407010; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Acquisition Management System (AMS) of the Department of Defense (DoD) is established to ensure that the needs of the warfighter are fulfilled in the most cost-effective manner possible. The establishment of Key Performance% Parameters (KPPs) on Operational Requirements Documents (ORDs) ensures that critical measures of performance are continuously monitored as the identification of a military requirement becomes a fulfilled capability. Threshold values for KPPs identified during an acquisition determine the minimum acceptable level of performance. Failure to meet the threshold level of an individual KPP is grounds for program cancellation. The Chairman of the Joint Chiefs of Staff (CJCS) has mandated that all defense acquisition programs should be kept to a maximum of eight for any individual program. Due to the multi-faceted aspect of modem military aircraft acquisition programs, frequently there are numerous parameters of critical importance. For this reason, any repetition of measure between KPPs must be minimized. The decision of the Principal Deputy Undersecretary of Defense for Acquisition, Technology and Logistics (PUSD (AT&L)) to include fuel efficiency as a KPP on all future acquisitions is an unnecessary exercise for military aircraft. This thesis develops a model in which multiple aircraft are examined flying different mission profiles carrying different weapon payloads. Strong relationships between factors such as combat radius, payload and on station endurance versus fuel efficiency are demonstrated by regression analysis of the model output. Consequently, any measures of fuel efficiency as a KPP is shown to be redundant. Furthermore, the methodology developed in this thesis may have further uses for the development of logistics planning factors for present and future military aircraft applications.
DTIC
Fuel Systems; Defense Program; Management Systems; Combat; Cost Effectiveness

20020090109 Air Command and Staff Coll., Maxwell AFB, AL USA
Past UAV Program Failures and Implications for Current UAV Programs
Carlson, Barak J.; Apr. 2001; 44p; In English; Original contains color images
Report No.(s): AD-A407103; AU/ACSC/037/2001-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There has been an increasing interest in the use of Unmanned Aerial Vehicles (UAVs) among the US armed services over the past 20 years. However, despite over four billion dollars in investment, the services have cancelled numerous development programs and achieved only marginal success with the fielded systems. This research will examine recent Department of Defense (DoD) UAV development efforts and identify common causes for the repeated failure of DoD UAV programs to become operationally robust. Two ongoing UAV development efforts, the RQ-4A Global Hawk UAV Advanced Concept Technology Demonstrator (ACTD) program and the X-45 Unmanned Combat Air Vehicle (UCAV) Advanced Technology Demonstrator (ATD) program, will then be examined for evidence that we are incorporating these lessons learned into our current programs.
DTIC
Pilotless Aircraft; Defense Program; Technology Utilization; System Failures

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.

20020087938 NASA Marshall Space Flight Center, Huntsville, AL USA
An End-to-End Test of A Simulated Nuclear Electric Propulsion System
VanDyke, Melissa, NASA Marshall Space Flight Center, USA; Hrbud, Ivana, Engineering Research and Consulting, Inc., USA; Goddfellow, Keith, Jet Propulsion Lab., California Inst. of Tech., USA; [2002]; 21p; In English; 38th AIAA Joint Propulsion Conference, 7-10 Jul. 2002, Indianapolis, IN, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint

owner in the copyright

The Safe Affordable Fission Engine (SAFE) test series addresses Phase I Space Fission Systems issues in it particular non-nuclear testing and system integration issues leading to the testing and non-nuclear demonstration of a 400-kW fully integrated flight unit. The first part of the SAFE 30 test series demonstrated operation of the simulated nuclear core and heat pipe system. Experimental data acquired in a number of different test scenarios will validate existing computational models, demonstrated system flexibility (fast start-ups, multiple start-ups/shut downs), simulate predictable failure modes and operating environments. The objective of the second part is to demonstrate an integrated propulsion system consisting of a core, conversion system and a thruster where the system converts thermal heat into jet power. This end-to-end system demonstration sets a precedent for ground testing of nuclear electric propulsion systems. The paper describes the SAFE 30 end-to-end system demonstration and its subsystems.

Author

Propulsion System Performance; Performance Tests; Nuclear Electric Propulsion; Simulation; End-to-End Data Systems

20020087940 NASA Marshall Space Flight Center, Huntsville, AL USA

Effects of Endwall Geometry and Stacking on Two-Stage Supersonic Turbine Performance

Dorney, Daniel J., NASA Marshall Space Flight Center, USA; Griffin, Lisa W., NASA Marshall Space Flight Center, USA; Huber, Frank W., Riverbend Design Services, USA; Sondak, Douglas L., Boston Univ., USA; [2002]; 19p; In English; 2002 AIAA Aerospace Sciences Meeting, Unknown; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Two methods are commonly used to control the secondary/separated flows (and associated losses) in supersonic turbines: endwall contouring and airfoil stacking. In the current investigation the flow path between the first-stage vanes and rotors, and the stacking of the first-stage vanes were varied in an effort to improve turbine performance. The geometric variations have been studied by performing a series of unsteady three-dimensional numerical simulations for the two-stage turbine.

Author

Supersonic Turbines; Two Stage Turbines; Vanes; Rotors; Performance; Flow Distribution; Rotor Dynamics

20020087945 NASA Glenn Research Center, Cleveland, OH USA

An Engine Research Program Focused on Low Pressure Turbine Aerodynamic Performance

Castner, Raymond, NASA Glenn Research Center, USA; Wyzykowski, John, Pratt and Whitney Aircraft of Canada Ltd., Canada; Chiapetta, Santo, Pratt and Whitney Aircraft of Canada Ltd., Canada; Adamczyk, John, NASA Glenn Research Center, USA; Whitlow, Woodrow, Jr., NASA Glenn Research Center, USA; [2002]; 6p; In English; ASME Turbo Expo 2002, 3-6 Jun. 2002, Amsterdam, Netherlands; Sponsored by American Society of Mechanical Engineers, USA

Contract(s)/Grant(s): RTOP 708-90-1A; SAA-3-7502-11

Report No.(s): GT-2002-30004; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

A comprehensive test program was performed in the Propulsion Systems Laboratory at the NASA Glenn Research Center, Cleveland Ohio using a highly instrumented Pratt and Whitney Canada PW 545 turbofan engine. A key objective of this program was the development of a high-altitude database on small, high-bypass ratio engine performance and operability. In particular, the program documents the impact of altitude (Reynolds Number) on the aero-performance of the low-pressure turbine (fan turbine). A second objective was to assess the ability of a state-of-the-art CFD code to predict the effect of Reynolds number on the efficiency of the low-pressure turbine. CFD simulation performed prior and after the engine tests will be presented and discussed. Key findings are the ability of a state-of-the art CFD code to accurately predict the impact of Reynolds Number on the efficiency and flow capacity of the low-pressure turbine. In addition the CFD simulations showed the turbulent intensity exiting the low-pressure turbine to be high (9%). The level is consistent with measurements taken within an engine.

Author

Turbofan Engines; Turbines; Computational Fluid Dynamics; Propulsion System Performance; Low Pressure

20020089504 Imperial Coll. Consultants Ltd., London, UK

Deflagration to Detonation Transition Processes in Pulsed Detonation Engines ***Final Report, 29 Aug. 2000-29 Aug 2001***

Lindstedt, R. P.; Aug. 03, 2002; 39p; In English; Original contains color images

Contract(s)/Grant(s): F61775-00-WE054

Report No.(s): AD-A406683; EOARD-SPC-00-4054; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of the work performed in the current contract is to assess the accuracy of potential modelling techniques applied to the formation of Deflagration to Detonation (DDT) kernels in mixtures of hydrocarbons with air. The application area is of direct

relevance to the transition to detonation in pulsed detonation engines featuring premixed gases. The latter technology is currently pursued at Wright Laboratories and the current evaluation is directly linked to this technology. Key aspects covered include guidance on suitable theoretical development directions and a preliminary investigation of optimal conditions for transition to detonation. The work is technically demanding and features several aspects that has not previously been accomplished. The main conclusions of the study are perhaps surprisingly positive. The work does show, for the first time, that the application of higher moment closures to model the initial onset of DDT is technically possible. Furthermore, the work illustrates that two physical limits on the chemical source term closure does in most cases bracket the experimental data. It is also shown that the transported PDF approach can be successfully applied to the modelling of premixed turbulent flames with scalar spaces of sufficient size to model auto-ignition type phenomena. It is also evident from the current work that the modelling of explosion kernels in pre-existing turbulence fields is very sensitive to both the details of the injection process and to the chemical source term closure. The present work does lay the foundations and also indicates the directions for further studies.
DTIC
Gas Mixtures; Combustion; Turbulence; Hydrocarbons; Detonation; Premixed Flames

08
AIRCRAFT STABILITY AND CONTROL

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

20020087944 NASA Glenn Research Center, Cleveland, OH USA
Nonlinear Analysis of Airfoil High-Intensity Gust Response Using a High-Order Prefactored Compact Code
Crivellini, A., Universita degli Studi, Italy; Golubev, V., Embry-Riddle Aeronautical Univ., USA; Mankbadi, R., Embry-Riddle Aeronautical Univ., USA; Scott, J. R., NASA Glenn Research Center, USA; Hixon, R., Toledo Univ., USA; Povinelli, L., NASA Glenn Research Center, USA; [2002]; 10p; In English; 8th AIAA/CEAS Aeroacoustics Conference and Exhibit, 17-19 Jun. 2002, Breckenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 708-90-33
Report No.(s): AIAA Paper 2002-2535; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The nonlinear response of symmetric and loaded airfoils to an impinging vortical gust is investigated in the parametric space of gust dimension, intensity, and frequency. The study, which was designed to investigate the validity limits for a linear analysis, is implemented by applying a nonlinear high-order prefactored compact code and comparing results with linear solutions from the GUST3D frequency-domain solver. Both the unsteady aerodynamic and acoustic gust responses are examined.
Author
Airfoils; Dynamic Response; Gusts; Nonlinearity; Aeroacoustics

09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

20020087934 NASA Ames Research Center, Moffett Field, CA USA
Airport Remote Tower Sensor Systems
Papasin, Richard, NASA Ames Research Center, USA; Gawdiak, Yuri, NASA Ames Research Center, USA; Maluf, David A., NASA Ames Research Center, USA; Leidich, Christopher, NASA Ames Research Center, USA; Tran, Peter B., QSS Group, Inc., USA; Jul. 13, 2001; 8p; In English; 2001 Aviation Safety Conference, 11-13 Sep. 2001, Seattle, WA, USA; Sponsored by Society of Automotive Engineers, Inc., USA
Report No.(s): SAE-2001-01-2651; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Remote Tower Sensor Systems (RTSS) are proof-of-concept prototypes being developed by NASA/Ames Research Center (NASA/ARC) with collaboration with the FAA (Federal Aviation Administration) and NOAA (National Oceanic Atmospheric Administration). RTSS began with the deployment of an Airport Approach Zone Camera System that includes real-time weather

observations at San Francisco International Airport. The goal of this research is to develop, deploy, and demonstrate remotely operated cameras and sensors at several major airport hubs and un-towered airports. RTSS can provide real-time weather observations of airport approach zone. RTSS will integrate and test airport sensor packages that will allow remote access to realtime airport conditions and aircraft status.
Author
Airport Towers; Real Time Operation; Remote Sensors; Weather; Airline Operations; Aircraft Safety; Data Integration

20020088665 NASA Ames Research Center, Computational Sciences Div., Moffett Field, CA USA
Secure Large-Scale Airport Simulations Using Distributed Computational Resources
McDermott, William J., NASA Ames Research Center, USA; Maluf, David A., NASA Ames Research Center, USA; Gawdiak, Yuri, NASA Ames Research Center, USA; Tran, Peter, QSS Group, Inc., USA; July 2001; 11p; In English; 2001 Aviation Safety Conference, 11-13 Sep. 2001, Seattle, WA, USA; Sponsored by Society of Automotive Engineers, Inc., USA
Contract(s)/Grant(s): RTOP 704-31-62
Report No.(s): SAE-2001-01-2650; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

To fully conduct research that will support the far-term concepts, technologies and methods required to improve the safety of Air Transportation a simulation environment of the requisite degree of fidelity must first be in place. The Virtual National Airspace Simulation (VNAS) will provide the underlying infrastructure necessary for such a simulation system. Aerospace-specific knowledge management services such as intelligent data-integration middleware will support the management of information associated with this complex and critically important operational environment. This simulation environment, in conjunction with a distributed network of supercomputers, and high-speed network connections to aircraft, and to Federal Aviation Administration (FAA), airline and other data-sources will provide the capability to continuously monitor and measure operational performance against expected performance. The VNAS will also provide the tools to use this performance baseline to obtain a perspective of what is happening today and of the potential impact of proposed changes before they are introduced into the system.
Author
Computerized Simulation; Airline Operations; Aircraft Safety; Air Traffic Control; Data Integration; Models; Information Systems; Computer Networks

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see categories 13 through 20. For extraterrestrial exploration, see 91 Lunar and Planetary Science and Exploration.

20020088427 University of Southern California, Information Sciences Inst., Marina del Rey, CA USA
Teamwork Reasoning and Multi-Satellite Missions ***Annual Report, 1 Jul. 2001 - 30 Apr. 2002***
Marsella, Stacy C., University of Southern California, USA; [2002]; 39p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG2-1489; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA is rapidly moving towards the use of spatially distributed multiple satellites operating in near Earth orbit and Deep Space. Effective operation of such multi-satellite constellations raises many key research issues. In particular, the satellites will be required to cooperate with each other as a team that must achieve common objectives with a high degree of autonomy from ground based operations. The multi-agent research community has made considerable progress in investigating the challenges of realizing such teamwork. In this report, we discuss some of the teamwork issues that will be faced by multi-satellite operations. The basis of the discussion is a particular proposed mission, the Magnetospheric MultiScale mission to explore Earth's magnetosphere. We describe this mission and then consider how multi-agent technologies might be applied in the design and operation of these missions. We consider the potential benefits of these technologies as well as the research challenges that will be raised in applying them to NASA multi-satellite missions. We conclude with some recommendations for future work.
Author
Earth Magnetosphere; NASA Programs; Progress

20020088668 NASA Goddard Space Flight Center, Greenbelt, MD USA

Contingency Planning for the Microwave Anisotropy Probe Mission

Mesarch, Michael A., NASA Goddard Space Flight Center, USA; Rohrbaugh, David, AI Solutions, Inc., USA; Schiff, Conrad, AI Solutions, Inc., USA; [2002]; 9p; In English; AIAA/AAS Astrodynamics Specialist Conference, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The Microwave Anisotropy Probe (MAP) utilized a phasing loop/lunar encounter strategy to achieve a small amplitude Lissajous orbit about the Sun-Earth/Moon L2 libration point. The use of phasing loops was key in minimizing MAP's overall deltaV needs while also providing ample opportunities for contingency resolution. This paper will discuss the different contingencies and responses studied for MAP. These contingencies included accommodating excessive launch vehicle errors (beyond 3 sigma), splitting perigee maneuvers to achieve ground station coverage through the Deep Space Network (DSN), delaying the start of a perigee maneuver, aborting a perigee maneuver in the middle of execution, missing a perigee maneuver altogether, and missing the lunar encounter (crucial to achieving the final Lissajous orbit). It is determined that using a phasing loop approach permits many opportunities to correct for a majority of these contingencies.

Author

Orbital Maneuvers; Transfer Orbits; Space Probes; Trajectory Analysis; Trajectory Planning; Position Errors; Position (Location); Launch Vehicles

20020088670 Council on Competitiveness, Washington, DC USA

Opening Remarks

Goldin, Daniel S., Council on Competitiveness, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 19-24; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

What a wonderful day it is. We are taking the opportunity this morning to reflect on what it has meant since 1961 to he a spacefaring nation. We are also looking forward to the next forty years of human adventure in space and what it might bring us as a civilization. While the specifics of what will unfold during the first part of the twenty-first century are not certain-and that's the wonder of the space program-I can say with certainty that the possibilities are boundless. Accordingly, I am both excited about where we have been and where we are going. Alan Shepard, of Course, had become the first American to fly into space during a 15-minute suborbital flight on 5 May 1961, riding a Redstone booster in his Freedom 7 spacecraft. At the ceremony that followed, President Kennedy recognized the courage and sacrifice of all those involved in America's first human spaceflight. The President commented that Shepard's success as the first USA astronaut was an outstanding contribution to the advancement of human knowledge, space technology, and a demonstration of man's capabilities in suborbital flight. President Kennedy also juxtaposed the very public flight of Alan Shepard with the secrecy of our rival at the time, the Soviet Union: "I also want to pay cognizance to the fact that this flight was made out in the open with all the possibilities of failure, which have been damaging to our country's prestige. Because great risks were taken in that regard, it seems to me that we have some right to claim that this open society of ours, which risked much, gained much."

Derived from text

Aerospace Engineering; Astronauts; Risk; Space Programs

20020088671 American Enterprise Inst. for Public Policy Research, Washington, DC USA

Human Spaceflight and American Society: The Record So Far

Murray, Charles, American Enterprise Inst. for Public Policy Research, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 25-37; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

These remarks give me an excuse to revisit a world that Catherine Cox and I had a chance to live in vicariously from 1986 to 1989 when we were researching and writing about Project Apollo. As I thought about it, I realized that actually very few people in this audience have had a chance to live in that world, either vicariously or for real. For most people today, NASA's human spaceflight program is the Shuttle. The NASA you know is an extremely large bureaucracy. The Apollo you know is a historical event. So to kick off today's presentations, I want to be the "Voice of Christmas Past." If we want to think about what is possible for human spaceflight as part of America's future, it is essential to understand how NASA people understood "possible" during the Apollo era. It is also important to understand that the way NASA functioned during the Apollo Program was wildly different from the way NASA functions now. In fact-and I say this with all due respect to the current NASA team members who are doing fine work-the race to the Moon was not really a race against the Russians; it was a race to see if we could get to the Moon before

NASA became a bureaucracy, and we won. But the lessons of that experience should be ones that we still have at the front of our minds.
Derived from text
NASA Space Programs; Apollo Project; Histories; Human Performance

20020088672 National Science Foundation, USA
The Spaceflight Revolution Revisted
Bainbridge, William Sims, National Science Foundation, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 39-64; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

There are two models of the future of spaceflight, and there are two theories of how that future might be achieved. The first model of spaceflight assumes that we have already achieved most of what is worth achieving in space, whereas the second imagines it will be possible to build a truly interplanetary civilization in which most human beings live elsewhere than on Earth. The first theory holds that progress comes incrementally from the inexorable working of free markets and political systems, whereas the second believes that revolutionary transformations must sometimes be accomplished by social movements that transcend the ordinary institutions and motivations of mundane existence.
Derived from text
Space Flight; Motivation; Evolution (Development)

20020088673 Carnegie-Mellon Univ., Dept. of History, Pittsburgh, PA USA
Mutual Influences: USSR-US Interactions During the Space Race
Siddiqi, Asif A., Carnegie-Mellon Univ., USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 65-72; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

I would like to take a broader historical view of the space race and look at the relationship between the Soviet Union and the USA in the early years of the space race. Then I would like to add some thoughts on the writing of history and how we understand it. In the past ten years, our view of the space race has changed dramatically. Much of this has had to do with the fall of the Soviet Union and the subsequent availability of an unprecedented amount of information that has allowed us to rewrite that one side of the history of the space race. Previously, we only knew bits and pieces of what the Soviets did. Now we know not only what they did, but why they did certain things, which is an important aspect of writing history. Writing history is about making sense. It is about building patterns, about putting together pieces and making those pieces fit. It is not about chronologies. The writing of this new history indicates a fundamental maturity of our field and space history. We are now able to move from chronologies to making sense. One of the things that I want to talk about today is how we have understood the space race. Traditionally, we have viewed it in terms of action and reaction. One side reacted to the other and did certain things, and then the other side reacted to that. So there was this chain reaction of events. The new historical record suggests that's not so far from the truth, but perhaps we need a slightly more nuanced approach. I would like to touch on three very important milestones in the space race and reexamine those events in the light of new information-Sputnik, the flight of Yuri Gagarin in 1961, and the Moon race.
Derived from text
Chronology; Histories; Space Exploration; Space Flight

20020088675 George Washington Univ., Space Policy Inst., USA
What If? Paths Not Taken
Logsdon, John M., George Washington Univ., USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 81-90; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

I want to ask all of you to join me for a few minutes in a mental experiment. There is a certain sense of determinism as we review a period of history, like the forty years of U.S. human spaceflight. There is an implicit assumption that there were no alternatives to the way things happened. If you step back even half a step, you know that's not true; that along the way, history could have been very different if different choices had been made, if different events had happened, So I have arbitrarily picked a few situations in those forty years and invite you to ask along with me: "What If things had been different?" This notion of counterfactual history has some legitimacy. I have used it as a class assignment for my students in space policy, asking them to write about what might have occurred if different choices had been made. Dwayne Day, a former student and now a colleague, has suggested a whole symposium on counterfactual space history, and that might be an interesting thing to do someday. As I

looked into preparation for this talk, I discovered there is a body of literature on counterfactual history. And, not surprisingly in the Internet age, there are even Web sites devoted to the topic!
Derived from text
Space Flight; Space Law; Alternatives; Human Behavior; Human Tolerances

20020088676 Starcraft Enterprises, Los Angeles, CA USA
Apollo and Beyond
Aldrin, Buzz, Starcraft Enterprises, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 91-99; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

I got involved with spaceflight in a peculiar way. I graduated from West Point at a time when there was no Air Force Academy. I went in the Air Force at the time of the Korean War, and while there, I shot down a couple of MIGs. Years later, this led me to want to look at the extension of air travel into space. At MIT, I worked on intercepting other spacecraft. Based upon that education, I got into the space program, not by route of the test pilot school. I was involved in a more esoteric, egg-headed approach. I did help to train the people who were on the first rendezvous missions. I was slated initially on the backup crew for Gemini 10. That meant that I would skip two missions, and then I would fly on the prime crew with the next one. The only trouble was there was no Gemini 13. Because of a tragic aircraft accident that took the lives of the primary crew on Gemini 9, they had to make some crew adjustments. So Jim Lovell and I flew on Gemini 12. On that mission, I was able to take my SCUBA-diving expertise and training underwater for spacewalking and helped to teach some of the Navy people how to do spacewalks. Then, in the infinite wisdom of the Air Force, I was asked to command the test pilot school after I left NASA, even though I had never been through any test pilot training.
Derived from text
Air Transportation; Aircraft Accidents; Pilot Training; Space Flight

20020088681 Mars Society, Indian Hills, CO USA
Pushing Human Frontiers
Zubrin, Robert, Mars Society, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 137-147; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Dr. Tyson offered a very interesting set of ideas. I agree with some of the points he made and disagree with others. But I'm here to talk not about how we're going to mobilize the political or technological forces to get us into space, but rather why we need to do it. I'm going to start out with a quote by a very eminent historIan. Frederick Jackson Turner gave a presentation entitled "The Significance of the Frontier in American History" at the annual meeting of the American Historical Association. Incidentally, this was three years after the frontier was declared closed in the American census of 1890. He was looking backwards on 400 years of European presence in the Americas.
Derived from text
Histories; Mars Exploration

20020088682 Hickam (Homer), USA
About an Element of Human Greatness
Hickam, Homer, Hickam (Homer), USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 149-163; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

What a grand day that was when Alan Shepard climbed into his Mercury capsule attached to a Redstone rocket-the rocket which would ultimately grow into the greatest rocket ever built, the Saturn V Moon rocket. When I was a boy in Coalwood, WV, my greatest hero, besides my father and my mother, was Huntsville's Dr. Wernher von Braun. After Sputnik was launched in October 1957, the newspapers we received in our little coal camp were filled with stories of how American scientists and engineers were desperately working to catch up in the space race. It was as if the science fiction I had read all my life was coming true. Gradually, I became fascinated by the whole thing. I read every article I could find about the men who built rockets and launched them, and kept myself pinned to the television set for the latest on what they were doing. Dr. von Braun's name was mentioned often. At night before I went to steep, I thought about what he might be doing at that very moment and imagined that he was down at Huntsville or Cape Canaveral high on a gantry, lying on his back like Michelangelo, working with a wrench on the fuel lines of one of his rockets. I started to think about what an adventure it would be to work for him, helping him to build rockets and

launching them into space. For all I knew, a man with that much conviction might even form an expedition into space, like Lewis and Clark. Either way, I wanted to be part of his team.
Derived from text
Engineers; Expeditions; Human Beings; Scientists; Space Capsules

20020088684 NASA, Washington, DC USA
Future Visions for Scientific Human Exploration
Garvin, James, NASA, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 189-201; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Human exploration has always played a vital role within NASA, in spite of current perceptions that today it is adrift as a consequence of the resource challenges associated with construction and operation of the International Space Station (ISS). On the basis of the significance of human spaceflight within NASA's overall mission, periodic evaluation of its strategic position has been conducted by various groups, most recently exemplified by the recent Human Exploration and Development of Space Enterprise Strategic Plan. While such reports paint one potential future pathway, they are necessarily constrained by the ground rules and assumptions under which they are developed. An alternate approach, involving a small team of individuals selected as "brainstormers," has been ongoing within NASA for the past two years in an effort to capture a vision of a long-term future for human spaceflight not limited by nearer-term "point design" solutions. This paper describes the guiding principles and concepts developed by this team. It is not intended to represent an implementation plan, but rather one perspective on what could result as human beings extend their range of experience in spaceflight beyond today's beach-head of Low-Earth Orbit (LEO).
Derived from text
Human Beings; Space Exploration; Space Flight; Mars Exploration

20020088685 NASA Johnson Space Center, Houston, TX USA
Preparing for New Challenges
Shepherd, William M., NASA Johnson Space Center, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 203-216; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This conference brings back fond memories for me. I recall Alan Shepard being at the Naval Academy in spring 1971 after he walked on the Moon. That was a special moment for me because I have always been interested in aviation. My dad was a Navy flier in World War II. My grandfather flew biplanes in France in World War I. It had long been one of my ambitious to be a naval aviator, but I found out shortly before that day in 1971 that I didn't have the eyesight to be a pilot. So I ended up being a Navy diver, a SEAL. I was sitting there listening to Al Shepard talk about his adventures on the Moon, and I was thinking I probably would never have to worry about doing anything like that. How strange events have turned. I bring that up because I enjoy talking to kids and making education a very relevant part of space exploration. I think we often forget what impact exploration, technology, and human spaceflight have on the young kids of this country. A little more personal history: I served in the Navy for thirteen years, was selected in 1984 to go to Houston and to start training as an astronaut. I flew three times on the Shuttle. They were very interesting flights. The longest flight I had was ten days. Right after that, I was asked to go to Washington for two weeks and help as the Administration had changed in 1992. In early 1993, there was a complete review of the Space Station program. We were in the middle of trying to decide whether Space Station Freedom would continue as a program or be canceled or be transformed into something else. So I had a lot of time in Washington working on how we would convert Freedom into something that was more feasible.
Derived from text
Human Beings; Education; Space Exploration; Astronauts; Aircraft Pilots

20020089506 QinetiQ Ltd., London UK
TopSat Testing Different Ideas for SBS in ISTAR Laboratory
Brooks, Paul; Sep. 2001; 10p; In English; See Also ADM001419 for whole conference on CD-ROM. These papers are from the Harnessing Advanced Technology for C4ISTAR, The Annual Advanced Technology Conference (2d), held 25-27 September 2001 at The Great Malvern Theatre Complex
Report No.(s): AD-A406685; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

No abstract
Author
Space Missions; Performance Tests; Space Surveillance (Spaceborne)

20020089531 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
The New High Ground: An Analysis of Space-Based Systems in the Information Revolution'
Mitchell, Olivia S.; Sep. 23, 2002; 46p; In English
Report No.(s): AD-A406720; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Revolution in Military Affairs (RMA) was developed in 1989 by Andrew Marshall of the Office of Net Assessment in Washington. Based on Marshal Nikolai Ogarkov's doctrine of the Military-Technical Revolution, the RMA is defined as: A major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine, operations, and organizational concepts, fundamentally alters the character and conduct of military operations. Though no official definition exists, these requirements of technological innovation, new doctrine and operations concepts, and organizational change were used in the analysis of the 1991 Gulf War, resulting in the conclusion of the existence of a new RMA. Known as the Information Revolution, this RMA is centered on stealth technology, precision munitions, advanced sensors and increased communications, command, control, computer and intelligence (C4I). From these advancements, doctrinal development has taken place in both joint and service centered documents. These new doctrines have introduced the operational concepts of dominant maneuver, precision engagement, focused logistics and full-dimensional protection, culminating in the new core competency of full-spectrum dominance. Organizational changes to allow for the achievement of these new concepts consists of an increased focus on inter-service connectivity for joint operations and the mutation of the traditional military hierarchy into smaller, more mobile forces deployable for rapid reactions and tailored to the specific threat.
DTIC
Military Operations; Aerospace Systems

20020089997 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Determining if Space is an Applicable Component to Intelligence Preparation of the Battlefield for Ranger Operations When Facing Non-Nation-State Adversaries
Johnson, Michael B.; May 31, 2002; 79p; In English
Report No.(s): AD-A407030; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This study investigates whether or not space Intelligence Preparation of the Battlefield (IPB) applies to 75th Ranger regimental operations when facing non-nation-state adversaries. IPB includes a process in which military commanders and staff planners perform a systematic and continuous process of analyzing the threat and environment in a specific geographic area. Space IPB is the application of the fundamental principles of intelligence preparation of the battlefield to the subject area of space. The study identifies characteristics of space and its effects on Ranger and non-nation-state adversary systems. It identifies commercially available space-related resources for use by the Rangers or a non-nation-state adversary. The study then relates space IPB analysis to Ranger operations when facing non-nation-state adversaries by using two separate situational vignettes. Finally, the study assesses specific Ranger systems that necessitate inclusion in space IPB based on the functional relation to space and space effects. Finally, the study presents the utility in conducting thorough analysis of the subject area and concludes that space IPB applies to Ranger operations when facing non-nation-state adversaries.
DTIC
Military Operations; Intelligence; Aerospace Environments

20020090098 Air War Coll., Maxwell AFB, AL USA
Space-Based Global Strike: Understanding Strategic and Military Implications
Sills, Larry G.; Aug. 2001; 50p; In English; Original contains color images
Report No.(s): AD-A407068; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to examine the concept of prompt space-based global strikes. In order to contribute to the debate about its potential benefits and problems, this study addresses the effects of cultural mindsets and institutional preferences on decisions about future military strategy and forces. It examines how prompt precision strikes through space could provide an important set of options in future crises that are beyond the capabilities of current U,S military forces.
DTIC
Warfare; Military Operations; Strategy

20020090108 Air Command and Staff Coll., Maxwell AFB, AL USA
Sovereignty and Protective Zones in Space and the Appropriate Command and Control of Assets
Butler, Richard J.; Apr. 2001; 166p; In English
Report No.(s): AD-A407102; AU/ACSC/034/2001-04; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This paper examines two issues that are of vital importance to short and long term operations in space and the combat engagement of space borne assets. The first issue analyzed is the question of the establishment of sovereignty and protective zones for free passage in space. This paper will compare international law treaties and other historical analyses to current United States (US) war fighting doctrine on space and propose a USA Air Force (USAF) position on this issue. It will define and discuss the definition for two space protective zones. First and foremost, the immediate safety zone by the space object and secondly, the actual identification area around the object and its orbital track.
DTIC
Command and Control; Sovereignty; International Law; Warfare; Space Missions

20020090110 Air Command and Staff Coll., Maxwell AFB, AL USA
Lessons from Sea Launch
Cashin, Lina M.; Apr. 2001; 31p; In English
Report No.(s): AD-A407104; AU/ACSC/039/2001-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper looks at the problems with space launch and what the United States can do to improve it. Specifically, the paper presents the argument that military space launch is not changing with the times and there are innovative ideas in the commercial launch sector, particularly the Sea Launch Program, from which the USA can learn. Primarily, the USA needs to make spacelift more affordable, reliable, and responsive because providing robust spacelift, that meets these standards, will support the US national security and economy. The research methodology included analysis of existing literature, congressional records, and interviews.
DTIC
Spacecraft Launching; Sea Launching; Military Operations; Technology Utilization

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SPACE TRANSPORTATION AND SAFETY

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

20020087568 NASA Johnson Space Center, Houston, TX USA
STS-111 Post Flight Presentation
Jul. 12, 2002; In English; 17 min., 17 sec. playing time, in color, with narration
Report No.(s): JSC-1929; NONP-NASA-VT-2002139475; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS
The crews of STS-111 (Endeavour's crew: Ken Cockrell, Commander; Paul Lockhart, Pilot; Franklin Chang-Diaz, Mission Specialist (MS); Philippe Perrin, MS; International Space Station's (ISS) Expedition 4 crew: Yury Onufrienko, Commander; Daniel Bursch, Flight Engineer; Carl Walz, Flight Engineer; ISS Expedition 5 crew: Valery Korzun, Commander; Peggy Whitson, Flight Engineer; Sergei Treschev, Flight Engineer) narrate this video of highlights from the mission. It includes footage from each major portion of the mission: launch preparation, launch, entering orbit, opening payload bay doors, rendezvous of Endeavour with ISS, docking of the crafts and the meeting between Endeavour and Expedition 5 crews and the Expedition 4 crew, which Expedition 5 relieved. Docked operations include: crew transfer procedures, transfer of goods, EVA (extravehicular activity) prep, EVA performed by Chang-Diaz and Perrin which included installing a grapple fixture, mounting the Mobile Base System (MBS) to the Mobile Transporter (MT), and changing a joint on the station's Canadarm 2 robotic arm. The video ends with re-entry and landing of the shuttle.
CASI
Space Transportation System Flights; Spacecraft Docking; Postflight Analysis; Extravehicular Activity; Spacecrew Transfer

20020087582 NASA Johnson Space Center, Houston, TX USA
STS-109 Mission Highlights Resource Tape, Part 4 of 4, Flight Days 8 - 12
May 31, 2002; In English; 1 hr., 30 min. playing time, in color, with sound
Report No.(s): JSC-1916; NONP-NASA-VT-2002137577; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS
This video, Part 4 of 4, shows footage of crew activities from flight days 8 through 12 of STS-109. The crew included: Scott Altman, Commander; Duane Carey, Pilot; John Grunsfeld, Payload Commander; Nancy Currie, Richard Linnehan, James Newman, Michael Massimino, Mission Speicalists. The activities from other flights days can be seen on 'STS-109 Mission

Highlights Resource Tape' Part 1 of 4 (internal ID 2002139471), 'STS-109 Mission Highlights Resource Tape' Part 2 of 4 (internal ID 2002137664), and 'STS-109 Mission Highlights Resource Tape' Part 3 of 4 (internal ID 2002139476). The primary activity on flight day 8 was an EVA (extravehicular activity) by Grunsfeld and Linnehan to install a cryocooler and radiator for the NICMOS (Near Infrared Camera and Multi-Object Spectrometer) on the HST (Hubble Space Telescope). Before returning to Columbia's airlock, the astronauts, with a cloudy background, hold onto the orbiter and offer their thoughts on the significance of their mission, the HST, and spaceflight. Footage from flight day 9 includes the grappling, unbearthing, and deployment of the HST from Columbia, and the crew coordinating and videotaping Columbia's departure. Flight day 10 was a relatively inactive day, and flight day 11 includes a checkout of Columbia's aerodynamic surfaces. Columbia landed on flight day 12, which is covered by footage of the crew members speaking during reentry, and their night landing, primarily shown through the orbiter's head-up display. The video includes numerous views of the HST, as well as views of the the Galapagos Islands, Madagascar, and Southern Africa with parts of the Atlantic, Indian, and Pacific Oceans, and part of the coast of Chile. The pistol grip space tool is shown in use, and the crew answers two messages from the public, including a message to Massimino from the Fire Department of New York.
CASI
Columbia (Orbiter); Spacecrews; Hubble Space Telescope; Orbital Servicing; Spacecraft Instruments; Extravehicular Activity; Spacecraft Docking; Horizontal Spacecraft Landing

20020087583 NASA Johnson Space Center, Houston, TX USA
STS-109 Mission Highlights Resource Tape, Part 2 of 4, Flight Days 4 & 5
May 30, 2002; In English; 1 hr., 24 min., 50 sec. playing time, in color, with sound
Report No.(s): JSC-1916; NONP-NASA-VT-2002137664; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

This video, Part 2 of 4, shows the activities of the STS-109 crew (Scott Altman, Commander; Duane Carey, Pilot; John Grunsfeld, Payload Commander; Nancy Currie, James Newman, Richard Linnehan, Michael Massimino, Mission Specialists) during flight days 4 and 5. The activities from other flights days can be seen on 'STS-109 Mission Highlights Resource Tape' Part 1 of 4 (internal ID 2002139471), 'STS-109 Mission Highlights Resource Tape' Part 3 of 4 (internal ID 2002139476), and 'STS-109 Mission Highlights Resource Tape' Part 4 of 4 (internal ID 2002137577). The primary activities during these days were EVAs (extravehicular activities) to replace two solar arrays on the HST (Hubble Space Telescope). Footage from flight day 4 records an EVA by Grunsfeld and Linnehan, including their exit from Columbia's payload bay airlock, their stowing of the old HST starboard rigid array on the rigid array carrier in Columbia's payload bay, their attachment of the new array on HST, the installation of a new starboard diode box, and the unfolding of the new array. The pistol grip space tool used to fasten the old array in its new location is shown in use. The video also includes several shots of the HST with Earth in the background. On flight day 5 Newman and Massimino conduct an EVA to change the port side array and diode box on HST. This EVA is very similar to the one on flight day 4, and is covered similarly in the video. A hand operated ratchet is shown in use. In addition to a repeat of the previous tasks, the astronauts change HST's reaction wheel assembly, and because they are ahead of schedule, install installation and lubricate an instrument door on the telescope. The Earth views include a view of Egypt and Israel, with the Nile River, Red Sea, and Mediterranean Sea.
CASI
Spacecrews; Columbia (Orbiter); Hubble Space Telescope; Extravehicular Activity; Orbital Servicing; Solar Arrays; Payload Transfer

20020087584 NASA Johnson Space Center, Houston, TX USA
STS-109 Mission Highlights Resource Tape, Part 1 of 4, Flight Days 1 - 3
May 30, 2002; In English; 1 hr. playing time, in color, with sound
Report No.(s): JSC-1916; NONP-NASA-VT-2002139471; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

This video, Part 1 of 4, shows the activities of the STS-109 crew (Scott Altman, Commander; Duane Carey, Pilot; John Grunsfeld, Payload Commander; Nancy Currie, James Newman, Richard Linnehan, Michael Massimino, Mission Specialists) during flight days 1 through 3. The activities from other flight days can be seen on 'STS 109 Mission Highlights Resource Tape' Part 2 of 4 (internal ID 2002137664), 'STS 109 Mission Highlights Resource Tape' Part 3 of 4 (internal ID 2002139471), and 'STS-109 Mission Highlights Resource Tape' Part 4 of 4 (internal ID 2002137577). The main activity recorded during flight day 1 is the liftoff of Columbia. Attention is given to suit-up, boarding, and pre-flight procedures. The pre-launch crew meal has no sound. The crew members often wave to the camera before liftoff. The jettisoning of the solid rocket boosters is shown, and the External Tank is seen as it falls to Earth, moving over African dunes in the background. There are liftoff replays, including one

from inside the cockpit. The opening of the payload bay doors is seen from the rear of the shuttle's cockpit. The footage from flight day 2 shows the Flight Support System for bearthing the HST (Hubble Space Telescope). Crew preparations for the bearthing are shown. Flight day 3 shows the tracking of and approach to the HST by Columbia, including orbital maneuvers, the capture of the HST, and its lowering onto the Flight Support System. Many views of the HST are shown, including one which reveals an ocean and cloud background as the HST retracts a solar array.
CASI
Columbia (Orbiter); Hubble Space Telescope; Spacecrews; Liftoff (Launching); Orbital Rendezvous; Preflight Operations; Spacecraft Docking

20020087585 NASA Johnson Space Center, Houston, TX USA
STS-109 Mission Highlights Resource Tape, Part 3 of 4, Flight Days 6 & 7
May 30, 2002; In English; 58 min., 54 sec. playing time, in color, with sound
Report No.(s): JSC-1916; NONP-NASA-VT-2002139476; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

This video, Part 3 of 4, shows the activities of the STS-109 crew (Scott Altman, Commander; Duane Carey, Pilot; John Grunsfeld, Payload Commander; Nancy Currie, James Newman, Richard Linnehan, Michael Massimino, Mission Specialists) during flight days 6 and 7. The activities from other flight days can be seen on 'STS-109 Mission Highlights Resource Tape' Part 1 of 4 (internal ID 2002139471), 'STS-109 Mission Highlights Resource Tape' Part 2 of 4 (internal ID 2002137664), and 'STS-109 Mission Highlights Resource Tape' Part 4 of 4 (internal ID 2002137577). Flight day 6 features a very complicated EVA (extravehicular activity) to service the HST (Hubble Space Telescope). Astronauts Grunsfeld and Linnehan replace the HST's power control unit, disconnecting and reconnecting 36 tiny connectors. The procedure includes the HST's first ever power down. The cleanup of spilled water from the coollant system in Grunsfeld's suit is shown. The pistol grip tool, and two other space tools are also shown. On flight day 7, Newman and Massimino conduct an EVA. They replace the HST's FOC (Faint Object Camera) with the ACS (Advanced Camera for Surveys). The video ends with crew members playing in the shuttle's cabin with a model of the HST.
CASI
Columbia (Orbiter); Spacecrews; Hubble Space Telescope; Spacecraft Instruments; Payload Transfer; Orbital Servicing; Extravehicular Activity

20020087626 NASA Johnson Space Center, Houston, TX USA
STS-112 Flight Day 8 Highlights
Oct. 14, 2002; In English; 27 min. playing time, in color, with sound
Report No.(s): BRF-1435H; NONP-NASA-VT-2002146098; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this eighth day of the STS-112 mission, the crew members of Atlantis (Commander Jeff Ashby; Pilot Pam Melroy; Mission Specialists Sandy Magnus, Piers Sellers, Dave Wolf, and Fyodor Yurchikhin) are seen preparing for the mission's third extravehicular activity (EVA). Magnus is shown reviewing instructions for operation of the International Space Station's (ISS) robot arm. Wolf and Sellers are seen successfully attaching cable connections to the S1 truss during the EVA. Scenes shown include: the ISS's robot arm, the Crew Equipment Translation Aid (CETA) cart and the deployment of the central radiator panel of the S1 truss.
CASI
Astronauts; Integrated Truss Structure S1; Extravehicular Activity; Space Station Mobile Servicing System; Orbital Assembly; International Space Station

20020087627 NASA Johnson Space Center, Houston, TX USA
STS-112 Flight Day 7 Highlights
Oct. 13, 2002; In English; 34 min. playing time, in color, with sound
Report No.(s): BRF-1435G; NONP-NASA-VT-2002139486; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

On this seventh day of STS-112 mission members of the crew (Commander Jeff Ashby; Pilot Pam Melroy; Mission Specialist Sandy Magnus, Piers Sellers, Dave Wolf, and Fyodor Yurchikhin) along with the Expedition Five crew (Commander Valery Korzun; Flight Engineer Peggy Whitson, and Sergei Treschev) are seen answering questions during the mission's press interview and photo opportunity. They answered various questions regarding the mission's objectives, the onboard science experiments,

the extravehicular activities (EVAs) and the effects of living in space. Shots of the test deployment of the S1 truss radiator and Canadarm rotor joint are also shown.
CASI
Astronauts; Extravehicular Activity; Integrated Truss Structure S1; Orbital Assembly; Space Station Mobile Servicing System; International Space Station

20020087628 NASA Johnson Space Center, Houston, TX USA
International Space Station Expedition 6 Crew Training Clip
2002; In English; 22 min. playing time, in color, with sound
Report No.(s): JSC-1935; NONP-NASA-VT-2002143585; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The crewmembers of Expedition Six consists of Commander Ken Bowersox, and Flight Engineers Donald Pettit, and Nikolai Budarin. The main goal for expedition six is to perform scientific research and international cooperation. The various areas of training shown include hands on review of The International Space Station Mockups, Neutral Buoyancy Laboratory Extravehicular Activity (EVA) training, and International Space Station Training. A photo session of the astronauts is also presented.
CASI
International Space Station; Space Flight Training; Expeditions; Extravehicular Activity

20020087629 NASA Johnson Space Center, Houston, TX USA
STS-112 Flight Day 2 Highlights
Oct. 08, 2002; In English; 8 min. playing time, in color, with sound
Report No.(s): BRF-1435B; NONP-NASA-VT-2002139460; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

On the second flight day of STS-112 (Commander Jeff Ashby, Pilot Pam Melroy and Mission Specialists Sandy Magnus, Piers Sellers, David Wolf and Fyodor Yurchikhin), video footage is shown of the Space Shuttle Atlantis's payload bay, which contains the International Space Station's (ISS) S1 (S-One) truss section, which will be installed on the ISS by Sellers and Wolf during EVAs (extravehicular activities) following Atlantis's docking with the station. Also shown, via a camera on the shuttle's robotic arm, are the three radiators that reside on the truss structure and will provide cooling capability for the entire station. During this flight day, Atlantis passes over Southern California, Nevada, Wyoming, South Dakota, and Minnesota in a track that will eventually bring it over Newfoundland and Labrador.
CASI
Integrated Truss Structure S1; Robot Arms; Space Shuttle Payloads; Atlantis (Orbiter)

20020087649 NASA Johnson Space Center, Houston, TX USA
STS-113 Crew Training Clip
Jan. 01, 2002; In English; 34 min., 2 sec. playing time, in color, with sound
Report No.(s): JSC-1934; NONP-NASA-VT-2002143591; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

The STS-113 crew consists of Commander Jim Weatherbee, Pilot Paul Lockhart, and Mission Specialists Michael Lopez-Alegria and John Herrington. The goal of the STS-113 mission is to deliver the Expedition Six crew to the International Space Station and return the Expedition Five crew to Earth. Also, the P1 Truss will be installed on the International Space Station. The STS-113 crew is shown getting suited for Pre-Launch Ingress and Egress. The Neutral Buoyancy Lab Extravehicular Activity training (NBL) (EVA), CETA Bolt Familiarization, and Photography TV instruction are also presented.
CASI
International Space Station; Space Transportation System; Trusses; Space Flight Training

20020087659 NASA Johnson Space Center, Houston, TX USA
STS-112 Flight Day 1 Highlights
Oct. 07, 2002; In English; 25 min. playing time, in color, with sound
Report No.(s): BRF-1435A; NONP-NASA-VT-2002139472; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On the first day of STS-112 the crew (Commander Jeff Ashby, Pilot Pam Melroy and Mission Specialists Sandy Magnus, Piers Sellers, David Wolf and Fyodor Yurchikhin) are shown preparing for launch at Kennedy Space Center, being transported

to the Space Shuttle Atlantis at its launch pad, and being seated in the Orbiter. During the launch, the External Tank (ET) camera, mounted to the top of Atlantis's ET and aimed downward) will provide never before seen footage of the shuttle during lift-off. Following the final countdown and liftoff, the ET camera provides footage as Atlantis quickly leaves the Earth behind, at speeds over 2,800 miles per hour. Following orbital insertion, the shuttle's payload bay doors are shown opening in footage provided by a payload bay camera. Sellers and Magnus narrate their thoughts during a replay of the initial launch sequence, shortly after entering orbit. Following the tape, they are shown in the crewcabin with the rest of the crew, and they each share brief thoughts.
CASI
Endeavour (Orbiter); Spacecraft Launching; Postlaunch Reports; Spacecrews

20020087660 NASA Johnson Space Center, Houston, TX USA
STS-112 Flight Day 3 Highlights
Oct. 09, 2002; In English; 20 min. playing time, in color, with sound
Report No.(s): BRF-1435C; NONP-NASA-VT-2002139458; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

During the third flight day of STS-112 (Commander Jeff Ashby, Pilot Pam Melroy and Mission Specialists Sandy Magnus, Piers Sellers, David Wolf and Fyodor Yurchikhin), the Space Shuttle Atlantis begins its final approach to the International Space Station (ISS) with which it will dock. The Chinese mainland is seen, at night, at a height of 242 statute miles. In one section of video from a camera onboard the ISS, Atlantis can be seen to be almost directly below the station, at a distance of several hundred feet. The orbiter's docking system is shown, as it is slowly guided by Ashby towards the forward docking port on the ISS's Destiny Laboratory Module and its forward docking port. Above the docking port, the S0 truss structure can be seen, to which the S1 truss structure in Atlantis' payload bay will be attached during this mission. Also seen are the Unity airlock and other modules. Following the completion of docking, in which an excellent shot of the docking system in hard dock is visible, the hatches between the two crafts are opened and the members of Atlantis are greeted by the very excited members of Expedition 5, who have been aboard the ISS for several months.
CASI
International Space Station; Spacecraft Docking; Atlantis (Orbiter); Orbital Rendezvous

20020087946 NASA Johnson Space Center, Houston, TX USA
STS-110 Flight Day 11 Highlights
Apr. 18, 2002; In English; 20 min., 1 sec. playing time, in color, with sound
Report No.(s): BRF-1433; NONP-NASA-VT-2002139463; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The STS-110 flight day eleven begins with a live television view from the cockpit of the Space Shuttle Atlantis. The crewmembers consist of Commander Michael Bloomfield, Pilot Stephen N. Frick, Mission Specialists Rex J. Walhheim, Ellen Ochoa, Lee M.E. Morin, Jerry L. Ross, and Steven L. Smith. The crewmembers answer questions about the Canadarm 2 and the mobile servicing system.
CASI
Space Shuttles; Atlantis (Orbiter); Space Flight; Canadian Space Program; Space Transportation System

20020087947 NASA Johnson Space Center, Houston, TX USA
STS-110 Flight Day 3 Highlights
Apr. 10, 2002; In English; 26 min. playing time, in color, with sound
Report No.(s): BRF-1433C; NONP-NASA-VT-2002140922; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The STS-110 Flight Day 3 begins with a view from the flight deck of The Space Shuttle Atlantis. Commander Mike Bloomfield performs engine firing from Atlantis to meet with the International Space Station. The hatch between Space Shuttle Atlantis and the International Space Station opens and Expedition Four Commander Yury Onufrienko greets STS-110 Commander Michael Bloomfield and Mission Specialist Ellen Ochoa as they enter the station. Also, much live animation of the Space Shuttle Atlantis is presented, as seen from a camera aboard the I.S.S.
CASI
International Space Station; Space Transportation System; Space Shuttles; Atlantis (Orbiter); Manned Space Flight

20020088677 Thiokol Propulsion, Brigham City, UT USA
Breaking in the Space Shuttle
Crippen, Robert L., Thiokol Propulsion, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight

Symposium; 2002, pp. 101-106; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

I like to look forward, but I am also a great student of history. I believe there are many lessons, both positive and negative, that we can learn by looking back. Quite often, we tend to forget some of those. I'd like to speak a little bit about the era in which I entered the astronaut corps. I joined NASA in kind of a weird way-in the time period when everybody going into space was a test pilot. I was attending the Air Force Test Pilot School, even though I'm a Navy guy. In that time period, they were going through and selecting astronauts from the test pilot class, and I put my hand up and said, "I'd like to join." It turned out that both NASA and the Department of Defense were selecting astronauts, and, somewhere in the selection process, I ended up having to make a choice. There were lots of folks on the NASA list, and there weren't many folks on the Department of Defense list, so I figured that was my best chance to fly. So I said, "Send me to DoD for something called the Manned Orbital Laboratory," or MOL for short.

Derived from text

Astronauts; Space Shuttles; Selection

20020088705 NASA Johnson Space Center, Houston, TX USA

STS-110 Flight Day 9 Highlights

Apr. 16, 2002; In English; 29 min., 8 sec. playing time, in color, with sound

Report No.(s): BRF-1433I; NONP-NASA-VT-2002140925; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The STS-110 ninth flight day begins with a live television view of the International Space Station's Quest Airlock. Astronauts Jerry Ross and Lee Morin are preparing for their forth spacewalk while Space Shuttle Atlantis is docked with the International Space Station. Jerry Ross and Lee Morin are breathing Oxygen inside of the Quest Airlock. Live footage of Jerry Ross at the tip of the Robotic Arm is shown. Jerry Ross and Lee Morin are entering the airlock module after the work on the S(0) Truss segment is finished.

CASI

Airlock Modules; Extravehicular Activity; Space Transportation System; Trusses

20020088706 NASA Johnson Space Center, Houston, TX USA

STS-110 Flight Day 10 Highlights

Apr. 17, 2002; In English; 28 min., 41 sec. playing time, in color, with sound

Report No.(s): BRF-1433J; NONP-NASA-VT-2002140932; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The STS-110 tenth flight day begins with a live view of the flight deck of The Space Shuttle Atlantis. Commander Michael Bloomfield, Pilot Stephen Frick, Mission Specialists Lee Morin, Jerry L. Ross, Steven Smith, Ellen Ochoa, and Rex Walheim are joined by Cosmonaut Yury Onufrienko and Flight Engineers Dan Bursch and Carl Walz. Commander Michael Bloomfield thanks everyone who participated in the STS-110 mission and who made it a success. Commander Bloomfield bids farewell to the Expedition four crew before undocking of the Space Shuttle Atlantis from the International Space Station. A live shot of Atlantis and the newly installed S0 truss is shown.

CASI

International Space Station; Trusses; Spacecraft Docking; Atlantis (Orbiter); Manned Space Flight

20020089420 NASA Johnson Space Center, Houston, TX USA

STS-111 Mission Highlights Resource Tape, Part 1 of 4, Flight Days 1 - 4

Aug. 02, 2002; In English; 1 hr., 20 min. playing time, in color, with sound

Report No.(s): JSC-1930; NONP-NASA-VT-2002139357; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

This video, Part 1 of 4, shows the activities of the STS-111 crew (Kenneth Cockrell, Commander; Paul Lockhart, Pilot; Franklin Chang-Diaz, Phillipe Perrin, Mission Specialists) during flight days 1 through 4. Also shown are the incoming Expedition 5 (Valeri Korzun, Commander; Peggy Whitson, NASA ISS Science Officer; Sergei Treschev, Flight Engineer) and outgoing Expedition 4 (Yuri Onufriyenko, Commander; Carl Walz, Daniel Bursch, Flight Engineers) crews of the ISS (International Space Station). The activities from other flight days can be seen on 'STS-111 Mission Highlights Resource Tape' Part 2 of 4 (internal ID 2002139469), 'STS-111 Mission Highlights Resource Tape' Part 3 of 4 (internal ID 2002139468), and 'STS-111 Mission Highlights Resource Tape' Part 4 of 4 (internal ID 2002139474). The primary activity of flight day 1 is the launch of Space Shuttle Endeavour. The crew is seen before the launch at a meal and suit-up, and some pre-flight procedures are

shown. Perrin holds a sign with a personalized message. The astronauts communicate with Mission Control extensively after launch, and an inside view of the shuttle cabin is shown. The replays of the launch include close-ups of the nozzles at liftoff, and the fall of the solid rocket boosters and the external fuel tank. Flight day 2 shows footage of mainland Asia at night, and daytime views of the eastern United States and Lake Michigan. Flight day three shows the Endeavour orbiter approaching and docking with the ISS. After the night docking, the crews exchange greetings, and a view of the Nile river and Egypt at night is shown. On flight day 4, the MPLM (Multi-Purpose Logistics Module) Leonardo was temporarily transferred from Endeavour's payload bay to the ISS.
CASI
Endeavour (Orbiter); International Space Station; Spacecrews; Launching; Spacecraft Docking; Payload Transfer; Spacecraft Docking Modules

20020089421 NASA Johnson Space Center, Houston, TX USA
STS-111 Mission Highlights Resource Tape, Part 3 of 4, Flight Days 8 - 10
Aug. 07, 2002; In English; 1 hr., 19 min., 2 sec. playing time, in color, with sound
Report No.(s): JSC-1930; NONP-NASA-VT-2002139468; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

An overview of the STS-111 Endeavour mission is given through footage of each flight day. Scenes from flight days 8 through 10 show activities such as extravehicular activity (EVA) preparation, EVA activity to replace the wrist roll joint on the International Space Station's (ISS) robotic arm, logistics transfer operation, space suit check-out and loading of the Leonardo Multi-Purpose Logistics Module onto the Endeavour's cargo bay. Individual shots of Africa, Italy, Hispaniola, Mexico and the Strait of Gilbraltar are shown. For mission footage from flight days 1 to 7 and 11-14, see also, 'STS-111 Mission Highlights Resource Tape, Part 1', 'STS-111 Mission Highlights Resource Tape, Part 2' and 'STS-111 Mission Highlights Resource Tape, Part 4'.
CASI
Spacecrew Transfer; Loading Operations; Extravehicular Activity; Astronauts; Robot Arms; Orbital Assembly; Payload Transfer; Endeavour (Orbiter); International Space Station

20020089422 NASA Johnson Space Center, Houston, TX USA
STS-111 Mission Highlights Resource Tape, Part 2 of 4, Flight Days 5 - 7
Aug. 07, 2002; In English; 1 hr., 24 min., 30 sec. playing time, in color, with sound
Report No.(s): JSC-1930; NONP-NASA-VT-2002139469; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

This video, Part 2 of 4, shows the activities of the STS-111 crew (Kenneth Cockrell, Commander; Paul Lockhart, Pilot; Franklin Chang-Diaz, Phillipe Perrin, Mission Specialists) during flight days 5 through 7. Also shown are the incoming Expedition 5 (Valeri Korzun, Commander; Peggy Whitson, NASA ISS Science Officer; Sergei Treschev, Flight Engineer) and outgoing Expedition 4 (Yuri Onufriyenko, Commander; Carl Walz, Daniel Bursch, Flight Engineers) crews of the ISS (International Space Station). The activities from other flight days can be seen on 'STS-111 Mission Highlights Resource Tape' Part 1 of 4 (internal ID 2002139357), 'STS-111 Mission Highlights Resource Tape' Part 3 of 4 (internal ID 2002139468), and 'STS-111 Mission Highlights Resource Tape' Part 4 of 4 (internal ID 2002139474). On flight day 5, the transfer and installation of a Power and Data Grapple Fixture onto the P6 Truss during an EVA (extravehicular activity) is shown. The relocation of micrometeorite debris shields is also shown. Canadarm 2 is used to move the Mobile Base System near the Mobile Transporter on the ISS Destiny Module. The capture of the Mobile Base System takes place on flight day 6, along with a crew transfer ceremony on board the ISS. The video includes a view of the South Pacific just before dawn, and the Endeavour crew answers questions from the public.
Author
Endeavour (Orbiter); International Space Station; Spacecrews; Extravehicular Activity; Orbital Assembly; Payload Transfer

20020089423 NASA Johnson Space Center, Houston, TX USA
STS-111 Mission Highlights Resource Tape, Part 4 of 4, Flight Days 11-14
Aug. 08, 2002; In English; 49 min., 30 sec. playing time, in color, with sound
Report No.(s): JSC-1930; NONP-NASA-VT-2002139474; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

An overview of the STS-111 Endeavour mission is given through footage of each flight day. Scenes from flight days 11 through 14 show activities such as preparations for hatch closure and undocking of Endeavour from the International Space Station (ISS), the actual undocking operation, prelanding spacesuit and equipment checks and the landing at Edwards Air Force base.

Numerous shots of the ISS and Endeavour are shown. For footage from flight days 1-10, see 'STS-111 Mission Highlights Resource Tape, Part 1', 'STS-111 Mission Highlights Resource Tape, Part 2', and 'STS-111 Mission Highlights Resource Tape, Part 3'.
CASI
Endeavour (Orbiter); Spacecraft Landing; Crew Procedures (Inflight); Astronauts; Space Suits; Spacecraft Reentry; Spacecraft Docking

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

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

20020089610 NASA Dryden Flight Research Center, Edwards, CA USA
Method and Apparatus for Flight Data Acquisition using an Optimized Multiple Frequency Waveform
Duke, Bryan D., Inventor, NASA Dryden Flight Research Center, USA; Sep. 03, 2002; 8p; In English
Patent Info.: Filed 23 Feb. 2000; NASA-Case-DRC-099-006; US-Patent-6,446,015; US-Patent-Appl-SN-511583; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The present invention comprises a method and apparatus that generates a waveform consisting of an arbitrary number of frequency sweeps combined from adding and subtracting mini frequency sweeps. Optimization routines determine the best combination order of frequency sweep to minimize or maximize design criteria such is aerodynamic surface deflection or maximum command rate of the wave form. The invention allows for arbitrary output timing, or commands per second issued for the desired waveform, arbitrary starting and ending frequencies and amplitudes, arbitrary number of frequency sweep components, arbitrary frequency sweep exponent, arbitrary amplitude sweep exponent, and arbitrary waveform length. For a given frequency range and sweep exponent, amplitude range and sweep exponent, desired total waveform time and number of frequency sweep components, the algorithm can determine the optimum arrangement of the components to minimize the maximum amplitude or rate.
Official Gazette of the U.S. Patent and Trademark Office
Flight Operations; Data Acquisition; Algorithms; Waveforms; Frequency Ranges; Sweep Frequency

20020090111 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA
A Study of Satelite Navigation, Dilution of Precision, and Positionig Techniques for use on and Around the Moon
MacNicol, John H.; Mar. 2002; 162p; In English; Original contains color images
Report No.(s): AD-A407106; AFIT/GE/ENG/02M-15; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The National Aeronautics and Space Agency is examining several approaches to meet navigational requirements for spacecraft in lunar orbit, in transit to or from the moon, and for personnel on the lunar surface requiring an accurate, real-time, on-board navigation capability. This work addresses one possible solution to the navigation problem in the vicinity of the moon using a lunar satellite navigation system. Dilution of precision is the figure of merit used to determine if a candidate lunar satellite navigation system can meet accuracy specifications based on a given satellite constellation and the measurement types used. Ten satellite constellations, using two measurement types (direct ranging and time-difference-of-arrival), are analyzed for numerous user locations on the moon. Using terrestrial and Earth-orbiting assets to augment the lunar constellations is also investigated. Sensitivity analyses are accomplished to determine the effect on the position solution accuracy of additional measurements, reduced measurements, and different combinations of measurement types.
DTIC
Lunar Surface; Moon; Position (Location); Satellite Navigation Systems; Satellite Constellations

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

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

20020087936 NASA Langley Research Center, Hampton, VA USA
Predicting Production Costs for Advanced Aerospace Vehicles
Bao, Han P., Old Dominion Univ., USA; Samareh, J. A., NASA Langley Research Center, USA; Weston, R. P., NASA Langley Research Center, USA; [2002]; 18p; In English; 61st Annual Conference of Society of Allied Weight Engineers, Inc., 20-22 May 2002, Virginia Beach, VA, USA; Sponsored by Society of Allied Weight Engineers, Inc., USA
Report No.(s): SAWE Paper-3246; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

For early design concepts, the conventional approach to cost is normally some kind of parametric weight-based cost model. There is now ample evidence that this approach can be misleading and inaccurate. by the nature of its development, a parametric cost model requires historical data and is valid only if the new design is analogous to those for which the model was derived. Advanced aerospace vehicles have no historical production data and are nowhere near the vehicles of the past. Using an existing weight-based cost model would only lead to errors and distortions of the true production cost. This paper outlines the development of a process-based cost model in which the physical elements of the vehicle are soared according to a first-order dynamics model. This theoretical cost model, first advocated by early work at MIT, has been expanded to cover the basic structures of an advanced aerospace vehicle. Elemental costs based on the geometry of the design can be summed up to provide an overall estimation of the total production cost for a design configuration. This capability to directly link any design configuration to realistic cost estimation is a key requirement for high payoff MDO problems. Another important consideration in this paper is the handling of part or product complexity. Here the concept of cost modulus is introduced to take into account variability due to different materials, sizes, shapes, precision of fabrication, and equipment requirements. The most important implication of the development of the proposed process-based cost model is that different design configurations can now be quickly related to their cost estimates in a seamless calculation process easily implemented on any spreadsheet tool.
Author
Aerospace Vehicles; Cost Analysis; Cost Estimates; Production Costs

20020088664 NASA Goddard Space Flight Center, Greenbelt, MD USA
Development of a Two-Wheel Contingency Mode for the MAP Spacecraft
Starin, Scott R., NASA Goddard Space Flight Center, USA; ODonnell, James R., Jr., NASA Goddard Space Flight Center, USA; [2002]; 10p; In English; AIAA GN and C Conference, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The Microwave Anisotropy Probe (MAP) is a follow-on mission to the Cosmic Background Explorer (COBE), and is currently collecting data from its orbit near the second Sun-Earth libration point. Due to limited mass, power, and financial resources, a traditional reliability concept including fully redundant components was not feasible for MAP. Instead, the MAP design employs selective hardware redundancy in tandem with contingency software modes and algorithms to improve the odds of mission success. One direction for such improvement has been the development of a two-wheel backup control strategy. This strategy would allow MAP to position itself for maneuvers and collect science data should one of its three reaction wheels fail. Along with operational considerations, the strategy includes three new control algorithms. These algorithms would use the remaining attitude control actuators-thrusters and two reaction wheels-in ways that achieve control goals while minimizing adverse impacts on the functionality of other subsystems and software.
Author
Astronomical Satellites; Spacecraft Control; Reaction Wheels; Failure

20020088666 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Anomalous Force on the Map Spacecraft
Starin, Scott R., NASA Goddard Space Flight Center, USA; ODonnell, James R., Jr., NASA Goddard Space Flight Center, USA; Ward, David K., NASA Goddard Space Flight Center, USA; Wollack, Edward J., NASA Goddard Space Flight Center, USA; Bay, P. Michael, Jackson and Tull, Inc., USA; Fink, Dale R., Computer Sciences Corp., USA; [2002]; 11p; In English; AIAA GN and

C Conference, 5-8 Aug. 2002, Monterey, CA, USA; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The Microwave Anisotropy Probe (MAP) orbits the second Earth-Sun libration point (L2)-about 1.5 million kilometers outside Earth's orbit-mapping cosmic microwave background radiation. to achieve orbit near L2 on a small fuel budget, the MAP spacecraft needed to swing past the Moon for a gravity assist. Timing the lunar swing-by required MAP to travel in three high-eccentricity phasing loops with critical maneuvers at a minimum of two, but nominally all three, of the perigee passes. On the approach to the first perigee maneuver, MAP telemetry showed a considerable change in system angular momentum that threatened to cause on-board Failure Detection and Correction (FDC) to abort the critical maneuver. Fortunately, the system momentum did not reach the FDC limit; however, the MAP team did develop a contingency strategy should a stronger anomaly occur before or during subsequent perigee maneuvers, Simultaneously, members of the MAP team developed and tested various hypotheses for the cause of the anomalous force. The final hypothesis was that water was outgassing from the thermal blanketing and freezing to the cold side of the solar shield. As radiation from Earth warmed the cold side of the spacecraft, the uneven sublimation of frozen water created a torque on the spacecraft.

Author

Space Probes; Trajectory Planning; Orbital Maneuvers; Transfer Orbits; Swingby Technique; Trajectory Analysis; Instrument Errors; Applications Programs (Computers)

20020089856 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA

Coordination and Control of Multiple Spacecraft using Convex Optimization Techniques

How, Jonathan P.; Jun. 2002; 164p; In English

Contract(s)/Grant(s): F49620-99-1-0095

Report No.(s): AD-A406790; AFRL-SR-AR-TR-02-034; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Formation flying of multiple spacecraft is an enabling technology for many future space science missions. These future missions will, for example, use the highly coordinated, distributed array of vehicles for earth mapping interferometers and synthetic aperture radar. This thesis presents coordination and control algorithms designed for a fleet of spacecraft. These algorithms are embedded in a hierarchical fleet archi- tecture that includes a high-level coordinator for the fleet maneuvers used to form, re-size, or re-target the formation configuration and low-level controllers to generate and implement the individual control inputs for each vehicle. The trajectory and control problems are posed as linear programming (LP) optimizations to solve for the minimum fuel maneuvers. The combined result of the high-level coordination and low-level controllers is a very flexible optimization framework that can be used off-line to analyze aspects of a mission design and in real-time as part of an on-board autonomous formation flying control system. This thesis also investigates several crit- ical issues associated with the implementation of this formation flying approach. In particular, modifications to the LP algorithms are presented to: include robustness to sensor noise, include actuator constraints, ensure that the optimization solutions are always feasible, and reduce the LP solution times. Furthermore, the dynamics for the control problem are analyzed in terms of two key issues: 1) what dynamics model should be used to specify the desired state to maintain a passive aperture; and 2) what dynamics model should be used in the LP to represent the motion about this state. Several linearized models of the relative dynamics are considered in this analysis, including Hill's equations for circular orbits, modified linear dynamics that partially account for the J2 effects, and Lawden's equations for eccentric orbits.

DTIC

Optimization; Formation Flying; Spacecraft Control; Automatic Control; Trajectory Control

20020090099 Naval Postgraduate School, Monterey, CA USA

A Framework for Designing Optimal Spacecraft Formations

King, Jeffrey T.; Sep. 2002; 97p; In English

Report No.(s): AD-A407073; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This thesis presents a new approach to solving a class of problems arising in the design of satellite swarms. Using the fundamentals of optimal control theory, a framework is developed that captures the essence of "concurrent" design and control of spacecraft formations. This framework is used to articulate a variety of formations including the notion of an aperiodic formation. Additionally, formations that require active control are presented along with their corresponding thrust profile. Based on a deliberate problem formations, which includes mass as a state variable, it is shown that the numerical approach easily handles nonlinearities. Using the general-purpose dynamic optimization software, DIDO, this thesis demonstrates how a minimum-propellant formation configuration can be easily designed for satellite swarms without the use of any analytical results. If a zero-propellant configuration does not exist, then this method automatically determines the minimum fuel and the associated controls required to maintain the configuration. This thesis lends credence to the notion of numerically searching for

minimum-fuel formation configurations for spacecraft swarms subject to arbitrary nonlinear dynamics. Thus, practical formations may be designed and controlled using this method.
DTIC
Computer Programs; Artificial Satellites; Design Analysis; Spacecraft Control

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also 07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations; and 44 Energy Production and Conversion.

20020087574 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Rocket-Based Combined Cycle Flowpath Testing for Modes 1 and 4 ***Final Report***
Rice, Tharen, Johns Hopkins Univ., USA; Oct. 15, 2002; 30p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG3-2333
Report No.(s): RTDC-TPS-425; RAS-03-017; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Under sponsorship of the NASA Glenn Research Center (NASA GRC), the Johns Hopkins University Applied Physics Laboratory (JHU/APL) designed and built a five-inch diameter, Rocket-Based Combined Cycle (RBCC) engine to investigate mode 1 and mode 4 engine performance as well as Mach 4 inlet performance. This engine was designed so that engine area and length ratios were similar to the NASA GRC GTX engine is shown. Unlike the GTX semi-circular engine design, the APL engine is completely axisymmetric. For this design, a traditional rocket thruster was installed inside of the scramjet flowpath, along the engine centerline. A three part test series was conducted to determine Mode I and Mode 4 engine performance. In part one, testing of the rocket thruster alone was accomplished and its performance determined (average Isp efficiency = 90%). In part two, Mode 1 (air-augmented rocket) testing was conducted at a nominal chamber pressure-to-ambient pressure ratio of 100 with the engine inlet fully open. Results showed that there was neither a thrust increment nor decrement over rocket-only thrust during Mode 1 operation. In part three, Mode 4 testing was conducted with chamber pressure-to-ambient pressure ratios lower than desired (80 instead of 600) with the inlet fully closed. Results for this testing showed a performance decrease of 20% as compared to the rocket-only testing. It is felt that these results are directly related to the low pressure ratio tested and not the engine design. During this program, Mach 4 inlet testing was also conducted. For these tests, a moveable centerbody was tested to determine the maximum contraction ratio for the engine design. The experimental results agreed with CFD results conducted by NASA GRC, showing a maximum geometric contraction ratio of approximately 10.5. This report details the hardware design, test setup, experimental results and data analysis associated with the aforementioned tests.
Author
Computational Fluid Dynamics; Engine Design; Engine Inlets; Rocket-Based Combined-Cycle Engines; Fabrication; Performance Tests

20020087939 NASA Marshall Space Flight Center, Huntsville, AL USA
Rocket Engine Turbine Blade Surface Pressure Distributions Experiment and Computations
Hudson, Susan T., Mississippi State Univ., USA; Zoladz, Thomas F., NASA Marshall Space Flight Center, USA; Dorney, Daniel J., NASA Marshall Space Flight Center, USA; [2002]; 51p; In English
Report No.(s): AIAA Paper 2000-3239; Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Understanding the unsteady aspects of turbine rotor flow fields is critical to successful future turbine designs. A technology program was conducted at NASA's Marshall Space Flight Center to increase the understanding of unsteady environments for rocket engine turbines. The experimental program involved instrumenting turbine rotor blades with miniature surface mounted high frequency response pressure transducers. The turbine model was then tested to measure the unsteady pressures on the rotor blades. The data obtained from the experimental program is unique in two respects. First, much more unsteady data was obtained (several minutes per set point) than has been possible in the past. Also, an extensive steady performance database existed for the turbine model. This allowed an evaluation of the effect of the on-blade instrumentation on the turbine's performance. A three-dimensional unsteady Navier-Stokes analysis was also used to blindly predict the unsteady flow field in the turbine at the design operating conditions and at +15 degrees relative incidence to the first-stage rotor. The predicted time-averaged and unsteady pressure distributions show good agreement with the experimental data. This unique data set, the lessons learned for

acquiring this type of data, and the improvements made to the data analysis and prediction tools are contributing significantly to current Space Launch Initiative turbine airflow test and blade surface pressure prediction efforts.
Author
Rocket Engines; Turbine Blades; Pressure Distribution; Experimentation; Computation; Flow Distribution

20020088421 NASA Glenn Research Center, Cleveland, OH USA
Development and Design of Zero-g Liquid Quantity Gauge for Solar Thermal Vehicle
Dodge, Franklin T., Southwest Research Inst., USA; Green, Steven T., Southwest Research Inst., USA; Petullo, Steven P., Southwest Research Inst., USA; VanDresar, Neil T., NASA Glenn Research Center, USA; November 2002; 18p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 721-26-CF
Report No.(s): NASA/TP-2002-211595; NAS 1.60:211595; E-13367; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The development and design of a cryogenic liquid quantity gauge for zero-gravity (zero-g) applications are described. The gauge, named the compression mass gauge (CMG), operates on the principle of slightly changing the volume of the tank by an oscillating bellows. The resulting pressure change is measured and used to predict the volume of vapor in the tank, from which the volume of liquid is computed. For each gauging instance, pressures are measured for several different bellows frequencies to enable minor real-gas effects to be quantified and thereby to obtain a gauging accuracy of 11 percent of tank volume. The CMG has been selected by NASA's Future-X program for a flight demonstration on the USA Air Force-Boeing Solar Orbit Transfer Vehicle Space Experiment (SOTVSE). This report reviews the design trade studies needed for the CMG to satisfy the SOTVSE limitations on its power, volume, and mass and also describes the mechanical design of the CMG.
Author
Measuring Instruments; Manufacturing; Design Analysis; Cryogenic Fluids; Microgravity

20020089437 Department of Defense, Office of the Inspector General, Arlington, VA USA
Cooperative Threat Reduction: Cooperation Threat Reduction Program Liquid Propellant Disposition Project
Sep. 30, 2002; 43p; In English; Original contains color images
Report No.(s): AD-A406593; IG/DOD-D-2002-154; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This audit is one in a series of audits the Deputy Secretary of Defense requested. As part of the Cooperative Threat Reduction (CTR) Program, DoD agreed to assist the Russian Federation in disposing of its liquid rocket propellant. Public Law 102-228 (section 2551 NOTE, title 22, USA Code), the Soviet Nuclear Threat Reduction Act of 1991 designates DoD as the executive agent for the CTR Program. Specific objectives of the act are to destroy chemical, nuclear, and other weapons; transport, store, disable, and safeguard weapons in connection with their destruction; and establish verifiable safeguards against proliferation of weapons of mass destruction. The Office of the Assistant Secretary of Defense (International Security Policy), under the Office of the Under Secretary of Defense for Policy, develops, coordinates, and oversees implementation of policy for the CTR Program. The CTR Directorate, Defense Threat Reduction Agency operates the program.
DTIC
Liquid Rocket Propellants; Defense Program; Weapon Systems; Nuclear Warfare

20020089460 Air Force Research Lab., Edwards AFB, CA USA
The Air Force Clustered Hall Thruster Program
Hargus, W. A., Jr; Reed, G.; Jun. 13, 2002; 12p; In English
Report No.(s): AD-A406805; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Preliminary results of the Air Force program investigating clustered Hall thrusters are presented, primarily experimental results on a cluster of four 200 W Busek BHT-200-X3 Hall thrusters. Preliminary measurements of plume current density, start transient interactions, cathode current sharing, and near exit plane magnetic fields are presented. Greatest thruster interaction occurs when cathodes are electrically connected. In a two thruster case, one cathode dominated electron emission, producing 90% of the required current. When the cathodes are electrically independent, the greatest cluster interaction occurs during a Start following exposure of the thruster discharge chambers to water vapor. In this case, the thrusters enter and exit a high anode current mode related to internal plasma oscillations in a non-continuous manner. This is unlike the typical smoothly continuous anode current transient of a single thruster. Individual thrusters appear able to affect the anode current mode, and presumably the plasma oscillations, of neighboring thrusters. Once the thrusters are conditioned and if the cluster is electrically unconnected, no significant interaction is observed. Plume ion current measurements of two thrusters have yielded what appears to he a slight narrowing of the ion current density profile from that e%pected from linear superposition of individual thruster measurements.

Near exit plane magnetic field measurements indicate that the magnetic fields between the thrusters are affected by neighboring thruster magnetic fields. As such, the near plume electric fields would also he modified and may be responsible for apparent plume narrowing.
DTIC
Hall Effect; Propulsion System Configurations; Thrustors

20020089469 NASA Glenn Research Center, Cleveland, OH USA
Minimally Intrusive and Nonintrusive Supersonic Injectors for LANTR and RBCC/Scramjet Propulsion Systems
Buggele, Alvin E., Inventor, NASA Glenn Research Center, USA; Gallagher, John R., Inventor, NASA Glenn Research Center, USA; Oct. 29, 2002; 20p; In English; Provisional US-Patent-Appl-SN-219002, filed 17 Jul. 2000
Patent Info.: Filed 16 Jul. 2001; NASA-Case-LEW-17017-1; US-Patent-6,470,672; US-Patent-Appl-SN-909170; US-Patent-Appl-SN-219002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A family of supersonic injectors for use on spaceplanes, rockets and missiles and the like is disclosed and claimed. Each injector maintains a specific constant (uniform) Mach number along its length when used while being minimally intrusive at significantly higher injectant pressure than combuster freestream total pressure. Each injector is substantially non-intrusive when it is not being used. The injectors may be used individually or in a group. Different orientations of the injectors in a group promotes greater penetration and mixing of fuel or oxidizer into a supersonic combustor. The injectors can be made from single piece of Aluminum, investment cast metal, or ceramic or they can be made from starboard and port blocks strapped together to accurately control the throat area. Each injector includes an elongated body having an opening which in cross section is an hour glass (venturi shaped) and the opening diverges in width and depth from the bow section to the stem section of the opening.
Official Gazette of the U.S. Patent and Trademark Office
Supersonic Combustion Ramjet Engines; Propulsion System Performance; Propulsion System Configurations; Nonintrusive Measurement; Injectors

20020089486 Boeing Co., Canoga Park, CA USA
Development of a Lightweight Thrust Chamber Assembly Utilizing In-Situ Reinforced Silicon Nitride
Elvander, J.; Wherley, B.; Claflin, S.; Jun. 1999; 11p; In English; Pres: 35th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20-24 Jun 1999, Los Angeles, CA
Report No.(s): AD-A406745; AFRL-PR-ED-TP-FY99-0136; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper describes the status of the Light Weight Thrust Chamber Assembly (LWTCA) program currently underway at Boeing Rocketdyne Propulsion and Power, under contract with the US Air Force Research Laboratory. The goal of the program is to demonstrate technology which will lead to a 40% reduction in weight (including the nozzle), a 50% reduction in cost, a 75% reduction in part count and a 3% increase in specific impulse on a full scale, 400 klbf thrust LOX/hydrogen booster engine. The demonstration will be performed through the use of manufacturing technology demonstrator hardware and 60 klbf thrust hot-fire tests. The primary means to achieving these goals is by using in-situ reinforced silicon nitride for structural components. Silicon nitride is an advanced ceramic material that has high specific strength and fracture toughness, and can be cast to near- net part shape. Tests to validate the material properties of in-situ reinforced silicon nitride are discussed, along with the resulting changes to traditional thrust chamber design as a result of the improved properties. The progress towards manufacturing and hot-fire testing a thrust chamber assembly from the material is also described.
DTIC
Thrust Chambers; Silicon Nitrides; Fracture Strength; Liquid Oxygen; Specific Impulse

20020089513 Air Force Research Lab., Edwards AFB, CA USA
AFRL Hall Thruster Development
Hargus, William; Dec. 09, 1999; 17p; In English
Report No.(s): AD-A406697; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

No abstract
Author
Hall Thrusters; Product Development; Hall Effect

20020089588 Air Force Research Lab., Edwards AFB, CA USA
A Proposed On-Orbit Demonstration of an Advanced Pulsed-Plasma Thruster for Small Satellite Applications
Bromaghim, D. R.; Spanjers, G. G.; Spores, R. A.; Burton, R. L.; Carroll, D.; Dec. 06, 1999; 11p; In English
Report No.(s): AD-A406810; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USAF Research Laboratory's (AFRL) Electric Propulsion Group is developing an Advanced pulsed-plasma thruster (PPT) technology demonstration for small satellites. The initial flight opportunity was on MightySat 11.2 - a satellite bus specifically designed to advance AFRL-developed technologies and serve as a risk reduction mission for systems required for TechSat 21. This experiment will demonstrate a high performance PPT, making it a viable thruster for various applications such as orbit raising and initiating and maintaining clusters of small satellites. The experiment will also be the first flight of a new micro-propulsion thruster - a miniaturized version of the PPT, known as the micro-PPT (%-PPT). The u-PPT is ideal for very precise attitude control and pointing, formation flying, and for primary propulsion on microsatellites. A novel on-board diagnostic package will be used to assess the contamination of optical and thermal control surfaces as a result of firing the PPTs. Ground-based observations will also be conducted to assess the on-orbit performance and possible communication impacts of the thruster firings.
DTIC
Miniaturization; Pulsed Plasma Thrusters; Small Satellite Technology; Spacecraft Propulsion

20020089986 Air Force Research Lab., Space and Missile Propulsion Div., Edwards AFB, CA USA
Current Efforts to Develop Alternate "TB700-2" Test Protocols for the Hazard Classification of Large Rocket Motors
Schwartz, Daniel F.; Bennett, Robert R.; Graham, Kenneth J.; Boggs, Thomas L.; Atwood, Alice I.; Sep. 2001; 26p; In English; Prepared in collaboration with Thiokol Propulsion, Brigham City, UT, Atlantic Research Corp, Gainesville, VA and Safety Management Services Inc., West Jordan, UT
Report No.(s): AD-A407047; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

When the Department of Defense (DoD) revised Technical Bulletin (TB) 700-2, NAVSEAINST 8020.8B, TO 11A-1-47, DLAR 8220.12 hazard classification guidelines in January 1998 1, it significantly changed the procedures used to determine the explosive classification of rocket motors, to be shipped or placed in DoD storage facilities. The revised test protocols outlined in this document, (hereafter referred to as TB 700-2) are far more conservative and costly to implement than the previous ones. These changes could have a profound impact on the solid rocket community and in particular those involved with the research and development and manufacture of large (equal to or greater than) 304.8-millimeter (equal to or greater than 12-inch diameter solid rocket motors (SRMs). The ramifications may include higher development costs and limitations on performance improvements. This paper outlines current efforts of the solid rocket community to develop acceptable alternate test protocols for large rocket motors that could fulfill the intent of TB 700-2 and be considered by the Department of Defense Explosive Safety Board (DDESB) for incorporation into a future revision to TB 700-2.
DTIC
Defense Program; Hazards; Protocol (Computers); Solid Propellant Rocket Engines

23
CHEMISTRY AND MATERIALS (GENERAL)

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

20020087692 National Inst. of Standards and Technology, Materials Science and Engineering Lab., Gaithersburg, MD USA
Materials Science and Engineering Laboratory, Polymers Division, FY 2002 Programs and Accomplishments
Sep. 2002; 78p; In English
Report No.(s): PB2003-100238; NISTIR-6906; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The advent of controlled polymerization, advanced electronics, biomimetic materials, nanostructured systems, and a range of other new avenues for polymeric materials has raised the bar for measurements and standards research. This report of the 2002 activities and accomplishments describes many of the projects designed by the scientists in the Polymers Division at NIST to creatively meet this ongoing challenge.
NTIS
Polymers; Research Projects

20020087816 Pacific Northwest National Lab., Richland, WA USA

Chemometric Classification of Unknown Vapors by Conversion of Sensor Array Pattern Vectors to Vapor Descriptors: Extension from Mass-Transducing Sensors to Volume-Transducing Sensors

Grate, J. W.; Jun. 28, 2001; 21p; In English

Report No.(s): DE2001-786791; PNNL-13529; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A new chemometric method was recently described for classifying unknowns by transforming the vector containing the responses from a multivariate detector to a vector containing descriptors of the detected analyte (Grate et al. 1999). This approach was derived for sensor arrays where each sensor's signal is proportional to the amount of vapor sorbed by a polymer on the sensor surface. In this case, the response is proportional to the partition coefficient, K, and the concentration of the vapor in the gas phase, Cv, where K is the ratio of the concentration of vapor in the sorbent polymer phase, Cs, to Cv.

NTIS

Vapors; Sensors; Multivariate Statistical Analysis; Sorbents

20020088662 Environmental Protection Agency, Cincinnati, OH USA

Life Cycle Design of In-Mold Surfacing Film. 3M Demonstration Project

Kar, K.; Keoleian, G. A.; Spitzley, D. V.; Malone, K.; Whitney, S.; 2001; 58p; In English

Report No.(s): PB2003-101103; EPA/600/R-01/058; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This life cycle design project was a collaborative effort between the Center for Sustainable Systems (formerly National Pollution Prevention Center) at the University of Michigan, 3M Corporation, and the National Risk Management Research Laboratory of the U.S. Environmental Protection Agency. The primary objective of this project was to apply life cycle design tools to a new product introduced by 3M. In-mold surfacing film (ISF) is an alternative color-coating system to the traditional paint coating process. It has been tested for application on body side molded (BSM) plastic parts on automobiles. In contrast to painting processes, ISF is manufactured at 3M and is shipped to tier 1 (relative to Original Equipment Manufacturers (OEM), i.e. automobile manufacturers) suppliers for application into BSM parts. ISF is a layered product consisting of clear coat, color coat, adhesive, and a Thermoplastic Polyolefin (TPO) backing. A Polyethylene Terepthalate (PET) liner is used during manufacturing, but is removed before the film is die. The analysis is performed for 12.2 g of die cut ISF film applied to a BSM part of surface area of 399 cm2. The material production inventories of Poly Vinylidene Fluoride (PVDF), acrylic, PET, and TPO, which constitute the ISF, were evaluated as part of the analysis. The of the LCD study encompasses manufacturing, application, use and retirement stages.

NTIS

Coatings; Life (Durability)

20020089442 Dayton Univ. Research Inst., Research Inst., OH USA

Self-Etch Environmentally Acceptable Primer Testing (SEEAPT) Deliver Order 0001 ***Interim Report, 17 Mar. 2000-21 Dec. 2001***

Joseph, Christopher A.; Dec. 2001; 82p; In English; Original contains color images

Contract(s)/Grant(s): F42620-00-D-0039; Proj-AESM

Report No.(s): AD-A406649; UDRI-2187-G1-05(F); AFRL-ML-WP-TR-2002-4125; No Copyright; Avail: CASI; A05, Hardcopy

Self-etching and wash primers have the potential to reduce depot and field flow times and related wasted streams by combining several steps in the coating application process. These materials have been used with limited success. A project was initiated to ascertain the state-of-the-art with these materials. An initial screening was completed with 12 candidate self-etching and wash primers under current MIL-PRE-85285 topcoats. The focus of the testing was on primer properties. Filiform corrosion, salt fog exposure, pencil hardness, crosshatch adhesion, impact testing, and wet tape adhesion testing were conducted on the 12 candidate systems, along with 4 control systems. Six test primer systems performed reasonably compared to the control coating systems. They were down-selected for further testing in final phases of the program.

DTIC

Etching; Primers (Coatings); Hardness Tests; Environmental Surveys

20020089476 Naval Research Lab., Washington, DC USA

Characterization of Intrinsic PAH Biodegradation in Groundwater During Tidal Cycles at the Naval Station Norfolk: Interim Report ***Interim Report, for Jul. 1999-Jul 2001***

Boyd, Thomas J.; Montgomery, Michael T.; Coffin, Richard B.; Reatherford, Sheila R.; Badger, Catherine V.; Sep. 17, 2002; 51p; In English; Original contains color images

Report No.(s): AD-A406731; NRL/FR/6110--02-10; 029; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

From July 1999 through July 2001, NRL (Naval Research Laboratory) sampled a single groundwater monitoring well located at the Naval Station Norfolk over the course of several tidal cycles. Groundwater at the site is impacted by subsurface fuel spill(s). Groundwater was assessed for fuel hydrocarbon concentrations, stable carbon isotope fingerprints, temperature, salinity, total microbial carbon demand, and PAH (polycyclic aromatic hydrocarbons) mineralization rates. The following was discovered: PAH concentrations were negligible in groundwater although alkanes were detected and used for stable carbon isotope analysis. PAH mineralization rates and bacterial productivity suggest active microbial communities degrade fuel hydrocarbons in the subsurface. Because different parameters (salinity, DO) influence phenanthrene and fluoranthene mineralization independently, there may be distinct bacterial assemblages involved in their biodegradation. There was little tidal recharge at the sampled monitoring well. There was no significant delivery of dissolved oxygen from the adjacent river water (groundwater was hypoxic during entire tidal cycle). There were indications that overall bacterial production varied with season. PAH mineralization rates were independent of season. It appears that fuel hydrocarbons are a larger component of microbial carbon diet during cooler seasons.
DTIC
Ground Water; Water Pollution; Biodegradation; Bacteria; Carbon Isotopes; Earth Tides; Polycyclic Aromatic Hydrocarbons; Hydrocarbon Fuels

20020089534 Florida Univ., Dept. of Chemistry and Physics, Gainesville, FL USA
Catalytic Oxidation of Mustard Simulants in Basic Solution ***Final Report, 1 Jan. 1998-31 Dec. 2001***
Richardson, David E.; Apr. 01, 2002; 8p; In English
Contract(s)/Grant(s): DAAG55-98-1-0265
Report No.(s): AD-A406835; ARO-37580-CH; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The results of the current project to date show various approaches that can be used to improve the efficiency of bicarbonate-activated hydrogen peroxide for CWA and BWA destruction. Kinetic and spectroscopic results support the formation of peroxymonocarbonate ion (HCO4-) as the oxidant in the catalytic reactions. Variation of bicarbonate source and the cosolvent can allow optimization of substrate solubility and oxidation rates for applications in chemical warfare agent decontamination, Use of surfactants and microemulsions in place of non-aqueous cosolvents has proven to be effective for mustard simulants. Surfactant-catalyst formulations have been developed that enhance oxidation reaction rates up to 20-fold or more over usual cosolvent-based BAP formulations. Biochemically-relevant oxidations have been studied in view of the possible combination of enzymatic and chemical decontamination approaches as well as the potential of BAP for BWA applications. Recent work has determined the enhancement of peroxide biocidal activity in the BAP system via direct studies of bacterial culture survival rates under various treatments.
DTIC
Catalysts; Oxidation; Chemical Warfare; Peroxides; Reaction Kinetics; Solutions

20020089552 South Carolina Univ., Columbia, SC USA
Multilayer Optical Filters for Automatic Detection of Analytes in Mixtures with Interferrants - Basic Research in Materials and Techniques ***Interim Report, 13 Jun. 2000-12 Jun 2001***
Myrick, Michael L.; Aug. 2001; 151p; In English
Contract(s)/Grant(s): F33615-00-2-6059; Proj-0600
Report No.(s): AD-A406882; AFRL-HE-WP-TR-2002-0047; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Research during the first year of the USC optical computing project demonstrated that multivariate optical elements (MOEs) could be designed, fabricated and characterized. Results of the first MOE tests revealed that near-theoretical performance could be obtained in the simple situations tested. New tools for designing MOEs were developed that bypass many anticipated problems. The limits of precision due to fabrication errors were assessed. Process control algorithms for fabrication that incorporate design tools periled fabrication of MOEs with performance exceeding those expected theoretically for real fabricated devices; this was achieved by redesigning MOEs on the fly to offset deposition errors. Design concepts were developed for imaging tools based on MOEs, and initial demonstrations were begun for imaging applications. Mid-infrared, near-infrared and Raman spectra were acquired for nearly 50 organophosphorus compounds to explore the regions of the spectral that are most definitive for their detection.
DTIC
Organic Phosphorus Compounds; Optical Filters

20020089842 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA
Benzoxazole and Benzothiazole Antirust Greases. Work Unit Directive (WUD) 51
Christian, John B.; Tamborski, Christ; May 1980; 6p; In English

Contract(s)/Grant(s): Proj-2421
Report No.(s): AD-A406919; AFRL-ML-WP-TP-2002-404; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Peifluoroalkyl and perfluoroalkylether substituted betizoxazoles, benzothiazoles, bisbenzoxazoles, and bisbeazothiazoles have been synthesized and have been extensively tested as antitrust and anticorrosion additives in grease compositions based on fluorine- containing fluids and fluorinated ethylene-propylene (FEP) and polytetrafluoroethylene (PTFE) thickeners. Testing has shown that one percent concentrations of the additives in the grease formulations provide inhibition against rusting of ferrous metal components under conditions of high humidity. Testing in high-temperature environments has shown that corrosion of the ferrous metals is inhibited under these conditions also. Variations in fluid and thickener concentrations or grease consistency had no deleterious or synergistic effects on the inhibiting characteristics of the additives.
DTIC
Benzene; Azoles; Greases; Corrosion Resistance; Ethylene

20020089853 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
NMR Method for the Quantitative Purity Analysis of Neat Feed Stock Samples ***Final Report, for Jul. 2002***
O'Connor, Richard J.; Brickhouse, Mark D.; McGarvey, David; Durst, H. D.; Creasy, William R.; Aug. 2002; 16p; In English; Prepared in collaboration with EAI Corp. Abingdon, MD
Report No.(s): AD-A406815; ECBC-TR-253; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the current method for the Qualitative NMR Analysis of Neat Materials of Interest. This includes purity analysis of V-type, G-type, and blister-type materials unique to this command.
DTIC
Quantitative Analysis; Nuclear Magnetic Resonance; Chemical Warfare

24
COMPOSITE MATERIALS

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

20020087678 National Inst. of Standards and Technology, Materials Science and Engineering Lab., Gaithersburg, MD USA
Materials Science and Engineering Laboratory, Polymers Division, FY 2001 Programs and Accomplishments
Sep. 2001; In English
Report No.(s): PB2001-108272; NISTIR-6796; No Copyright; Avail: CASI; C01, CD-ROM

The Polymers Division provides measurement methods, standards, and concepts to facilitate technology development, manufacture of products, commerce, and use of synthetic polymers. Projects are selected based on assessments of current needs and in anticipation of future needs as determined from topical workshops, industry roadmaps, as well as visits to companies and other research organizations. Much of our work is performed collaboratively with customers. Over 35 companies, in addition to trade associations and other federal agencies participated in the work of the Division. The close interactions with customers assure that the work remains focused. The work of the Division is organized into three groups that focus on areas where synthetic polymers are exploited for their unique properties-electronics materials, lightweight structural materials, and biomedical materials. Two other groups are concerned with needs that crosscut the applications areas-better control of polymer processing and more rapid test methodology.
NTIS
Polymers; Commerce; Product Development; Industries; Organizations

20020087948 Georgia Inst. of Tech., Atlanta, GA USA
Nanotube Reinforcement of Adhesively Bonded Joints ***Final Report, 1 Jul. 2001 - 30 Apr. 2002***
Johnson, W. S., Georgia Inst. of Tech., USA; Saltysiak, Bethany, Georgia Inst. of Tech., USA; October 2002; 10p; In English
Contract(s)/Grant(s): NAG1-2312; Proj-1806636
Report No.(s): Rept-E-18-636; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Over the past five years there has been much excitement about the development of nanotubes and nanofibers and the potential that these materials may offer in enhancing electrical and mechanical properties of systems. The purpose of this paper is to present research into improving the mechanical performance of polymers by using nanofibers as a reinforcement to make high performance composite materials. This paper will present theoretical predictions of the composite modulus and then present the

actual performance of the composite. Fabrication details will be given along with photos of the microstructure. The matrix material is polymethylmethacrylate (PMMA) and the nanofibers are vapor-grown carbon nanofibers produced by Pyrograph Products, Inc. Author

Nanotubes; Reinforced Plastics; Adhesive Bonding; Polymethyl Methacrylate; Fabrication; Bonded Joints

20020089441 Dayton Univ. Research Inst., Research Inst., OH USA

Aerospace Composite Materials Delivery Order 0002: Development and Validation of Micromechanical Models for Composites ***Interim Report, 30 Nov. 2000-29 Nov 2001***

Buryachenko, V.; Iarve, E.; Kim, R.; Sihn, S.; Tandon, G. P.; Mar. 2002; 167p; In English; Original contains color images

Contract(s)/Grant(s): F33615-00-D-5006; Proj-4347

Report No.(s): AD-A406603; UDR-TR-2002-00033; AFRL-ML-WP-TR-2002-4060; No Copyright; Avail: CASI; A08, Hardcopy

Mechanics modeling and verification of a variety of systems continues to be examined. Systems successfully examined include the single filament cruciform test, identification of failure modes in composites, woven fabric composite, carbon foams, the fiber pushout test, and slanted free-edge plies. Techniques used include concentric cylinder modeling, finite element method, B-spline approximation, and in situ observation of damage during testing via scanning electron microscopy (SEM). The iteration method was found to be superior to the Fourier transform method of modeling inhomogeneous composites except where an analytical solution is required. This knowledge was then applied to functionally graded materials and to computer-generated models of locally nonuniform composites. The radial distribution function for fiber locations and second-order intensity functions are needed to predict properties beyond estimating their bounds.

DTIC

Micromechanics; Mathematical Models; Approximation; Aerospace Systems; Spacecraft Construction Materials

20020089457 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA

Advanced Composites. Work Unit Directive (WUD) 45

Curliss, David B.; Sep. 2002; 107p; In English

Contract(s)/Grant(s): Proj-2419

Report No.(s): AD-A406797; AFRL-ML-WP-TP-2002-406; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This final report is a bibliography of technical journal articles, presentations, patents, and reports generated by members of AFRL/MLBC and collaborators. The work was accomplished at Wright-Patterson AFB over a period of 23 years and covers such areas as high temperature organic matrix composites (HTOMC), environmental durability of HTOMCs, intelligent processing of composite materials, process modeling and sensor development for composite materials, multiscale modeling, fiber/matrix interfaces, ply-level fracture mechanics, and mechanics for emerging materials.

DTIC

Composite Materials; Bibliographies; Composite Structures

20020090000 Air Force Research Lab., Edwards AFB, CA USA

Investigating the Effects of Pressure on the Near Tip Behavior and Crack Growth in a Particulate Composite Material

Liu, C. T.; Tam, M.; Sep. 10, 2002; 14p; In English

Report No.(s): AD-A407017; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this report is the investigate the effects of confining pressure and loading history on the near tip behavior and crack growth in a particulate composite material. The conclusions are: the crack growth rate under ambient pressure is significantly higher than that under 8697 KPa confining pressure. At the onset of crack growth, the crack opening displacement under 8697 KPA confining pressure is greater than that under ambient pressure. At the onset of crack growth, confining pressure has no significant effect on the size of the high-strain zone. Under constant strain condition, the crack stops growing after it propagates a short distance.

DTIC

Composite Materials; Crack Propagation; Particulates

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20020087666 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden
Results and Experiences from Research on ETC ***Resultat och Erfarenheter fran Forskningen Inom ETK-Omradet***
Andreasson, S.; Bemm, E.; Nyholm, S. E.; Dec. 2001; 30p; In Swedish
Report No.(s): PB2003-100494; FOI-R-0299-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experiments with the objective to stimulate the combustion of solid propellants through addition of electric energy are reported. The current is conducted through the flame and will supply energy via resistive heating, which adds to the chemical energy release of the flame and thus increases the heat feedback to the unburnt propellant. The electric conductivity of the flame needs to be increased in order to reduce random delay and to increase control of the electric discharge. Thermochemical calculations indicate that substantial increase in conductivity can be obtained by doping the propellants with alkali compounds, provided that the flame temperature is high enough. The experiments are performed in a closed vessel where a propellant slab is pinched between two copper plates connected to a pulsed power supply. The purpose of the present work is to determine whether the alkali doped propellants allow larger currents to be conducted through the reaction zone and if this substantially increases the burn rate. Presented results include comparisons of burn rates for different amounts of electric energy stimulation and for different propellant compositions as well as pressure, voltage and current recordings. The pressure measurements are compared with simulations based on the measured discharged electrical energy.
NTIS
Thermodynamic Properties; Research and Development; Chemical Energy; Solid Propellant Combustion

20020087739 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Soot Surface Growth in Laminar Hydrocarbon/Air Diffusion Flames, Appendix B
El-Leathy, A. M., Michigan Univ., USA; Xu, F., Michigan Univ., USA; Kim, C. H., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 57-95; In English
Contract(s)/Grant(s): NAG3-1245; NAG3-1878; NAG3-2048; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The structure and soot surface growth properties of round laminar jet diffusion flames were studied experimentally. Measurements were made along the axes of ethylene-, propylene-propane- and acetylene-benzene-fueled flames burning in coflowing air at atmospheric pressure with the reactants at normal temperature. The measurements included soot structure, soot concentrations, soot temperatures, major gas species concentrations, some radial species (H, OH and O) concentrations, and gas velocities. These measurements yielded the local flame properties that are thought to affect soot surface growth as well as local soot surface growth rates. When present results were combined with similar earlier observations of acetylene-fueled laminar jet diffusion flames, the results suggested that soot surface growth involved decomposition of the original fuel to form acetylene and H, which were the main reactants for soot surface growth, and that the main effect of the parent fuel on soot surface growth involved its yield of acetylene and H for present test conditions. Thus, as the distance increased along the axes of the flames, soot formation (which was dominated by soot surface growth) began near the cool core of the flow once acetylene and H appeared together and ended near the flame sheet when acetylene disappeared. Species mainly responsible for soot oxidation - OH and O2 were present throughout the soot formation region so that soot surface growth and oxidation proceeded at the same time. Present measurements of soot surface growth rates (corrected for soot surface oxidation) in laminar jet diffusion flames were consistent with earlier measurements of soot surface growth rates in laminar premixed flames and exhibited good agreement with existing Hydrogen-Abstraction/Carbon-Addition (HACA) soot surface growth mechanisms in the literature with steric factors in these mechanisms having values on the order of unity, as anticipated.
Author
Soot; Surface Properties; Laminar Flow; Crystal Growth; Hydrocarbons; Diffusion Flames

20020087740 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Extinction and Scattering Properties of Soot Emitted from Buoyant Turbulent Diffusion Flames, Appendix D
Krishnan, S. S., Michigan Univ., USA; Lin, K.-C., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 197-206; Repr. from Journal of Heat Transfer (ASME), v. 123, April 2001 p 331-339; In English

Contract(s)/Grant(s): NIST-60NANB8D0084; NAG3-1878; NAG3-2048; NIST-60NANB4D-1696; Copyright; Avail: Issuing Activity

Extinction and scattering properties at wavelengths of 250-5200 nm were studied for soot emitted from buoyant turbulent diffusion flames in the long residence time regime where soot properties are independent of position in the overfire region and characteristic flame residence times. Flames burning in still air and fueled with gas (acetylene, ethylene, propane, and propylene) and liquid (benzene, toluene, cyclohexane, and n-heptane) hydrocarbon fuels were considered Measured scattering patterns and ratios of total scattering/absorption cross sections were in good agreement with predictions based on the Rayleigh-Debye-Gans (RDG) scattering approximation in the visible. Measured depolarization ratios were roughly correlated by primary particle size parameter, suggesting potential for completing RDG methodology needed to make soot scattering predictions as well as providing a nonintrusive way to measure primary soot particle diameters. Measurements of dimensionless extinction coefficients were in good agreement with earlier measurements for similar soot populations and were independent of fuel type and wavelength except for reduced values as the near ultraviolet was approached. The ratios of the scattering/absorption refractive index functions were independent of fuel type within experimental uncertainties and were in good agreement with earlier measurements. The refractive index function for absorption was similarly independent of fuel type but was larger than earlier reflectometry measurements in the infrared. Ratios of total scattering/absorption cross sections were relatively large in the visible and near infrared, with maximum values as large as 0.9 and with values as large as 0.2 at 2000 nm, suggesting greater potential for scattering from soot particles to affect flame radiation properties than previously thought.

Author

Soot; Scattering Cross Sections; Emittance; Buoyancy; Turbulent Diffusion; Diffusion Flames

20020087741 NASA Lewis Research Center, Cleveland, OH USA

Structure and Soot Properties of Nonbuoyant Ethylene/Air Laminar Jet Diffusion Flames, Appendix E

Urban, D. L., NASA Lewis Research Center, USA; Yuan, Z.-G., NASA Lewis Research Center, USA; Sunderland, P. B., NASA Lewis Research Center, USA; Linteris, G. T., NASA Johnson Space Center, USA; Voss, J. E., NASA Johnson Space Center, USA; Lin, K.-C., Michigan Univ., USA; Dai, Z., Michigan Univ., USA; Sun, K., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 207-222; Repr. from AIAA Journal, v. 36, no. 8, Aug. 1998; In English

Contract(s)/Grant(s): NAG3-1245; NAG3-1878; NAG3-2048; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The structure and soot properties of round, soot-emitting, nonbuoyant, laminar jet diffusion flames are described, based on long-duration (175-230-s) experiments at microgravity carried out on orbit in the Space Shuttle Columbia. Experimental conditions included ethylene-fueled flames burning in still air at nominal pressures of 50 and 100 kPa and an ambient temperature of 300 K with luminous flame lengths of 49-64 mm Measurements included luminous flame shapes using color video imaging soot concentration (volume fraction) distributions using deconvoluted laser extinction imaging, soot temperature distributions using deconvoluted multiline emission imaging, gas temperature distributions at fuel-lean (plume) conditions using thermocouple probes, soot structure distributions using thermophoretic sampling and analysis by transmission electron microscopy, and flame radiation using a radiometer.The present flames were larger, and emitted soot more readily, than comparable flames observed during ground-based microgravity experiments due to closer approach to steady conditions resulting from the longer test times and the reduced gravitational disturbances of the space-based experiments.

Author

Soot; Ethylene; Chemical Properties; Concentration (Composition); Laminar Flow; Diffusion Flames

20020087743 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA

Soot Formation in Laminar Acetylene/Air Diffusion Flames at Atmospheric Pressure, Appendix J

Xu, F., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001; ISSN 0010-2180, pp. 284-300; Repr. from Combustion and Flame (Elsevier Science, Inc.), v. 125, 2001 p 804-819; In English

Contract(s)/Grant(s): NAG3-1245; NAG3-1878; NAG3-2048; Copyright; Avail: Issuing Activity

The flame structure and soot-formation (soot nucleation and growth) properties of axisymmetric laminar coflowing jet diffusion flames were studied experimentally. Test conditions involved acetylene-nitrogen jets burning in coflowing air at atmospheric pressure. Measurements were limited to the axes of the flames and included soot concentrations, soot temperatures, soot structure, major gas species concentrations, radical species (H, OH, and O) concentrations, and gas velocities. The results show that as distance increases along the axes of the flames, detectable soot formation begins when significant H concentrations are present, and ends when acetylene concentrations become small. Species potentially associated with soot oxidation--O2, CO2, H2O, O, and OH-are present throughout the soot-formation region so that soot formation and oxidation proceed at the same time.

Strong rates of soot growth compared to soot nucleation early in the soot-formation process, combined with increased rates of soot nucleation and oxidation as soot formation proceeds, causes primary soot particle diameters to reach a maximum relatively early in the soot-formation process. Aggregation of primary soot particles proceeds, however, until the final stages of soot oxidation. Present measurements of soot growth (corrected for soot oxidation) in laminar diffusion flames were consistent with earlier measurements of soot growth in laminar premixed flames and exhibited encouraging agreement with existing hydrogen-abstraction/carbon-addition (HACA) soot growth mechanisms in the literature that were developed based on measurements within laminar premixed flames. Measured primary soot particle nucleation rates in the present laminar diffusion flames also were consistent with corresponding rates measured in laminar premixed flames and yielded a crude correlation in terms of acetylene and H concentrations and the temperature.
Author
Soot; Formations; Laminar Flow; Acetylene; Diffusion Flames; Atmospheric Pressure

20020087744 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Flame Shapes of Nonbuoyant Laminar Jet Diffusion Flames
Xu, F., Michigan Univ., USA; Dai, Z., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 347-385; In English
Contract(s)/Grant(s): NCC3-661; NAG3-1878; NAG3-2048; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The shapes (flame-sheet and luminous-flame boundaries) of steady nonbuoyant round hydrocarbon-fueled laminar-jet diffusion flames in still and coflowing air were studied both experimentally and theoretically. Flame-sheet shapes were measured from photographs using a CH optical filter to distinguish flame-sheet boundaries in the presence of blue CO2 and OH emissions and yellow continuum radiation from soot. Present experimental conditions included acetylene-, methane-, propane-, and ethylene-fueled flames having initial reactant temperatures of 300 K, ambient pressures of 4-50 kPa, jet exit Reynolds number of 3-54, initial air/fuel velocity ratios of 0-9 and luminous flame lengths of 5-55 mm; earlier measurements for propylene- and 1,3-butadiene-fueled flames for similar conditions were considered as well. Nonbuoyant flames in still air were observed at micro-gravity conditions; essentially nonbuoyant flames in coflowing air were observed at small pressures to control effects of buoyancy. Predictions of luminous flame boundaries from soot luminosity were limited to laminar smokepoint conditions, whereas predictions of flame-sheet boundaries ranged from soot-free to smokepoint conditions. Flame-shape predictions were based on simplified analyses using the boundary layer approximations along with empirical parameters to distinguish flame-sheet and luminous flame (at the laminar smoke point) boundaries. The comparison between measurements and predictions was remarkably good and showed that both flame-sheet and luminous-flame lengths are primarily controlled by fuel flow rates with lengths in coflowing air approaching 2/3 lengths in still air as coflowing air velocities are increased. Finally, luminous flame lengths at laminar smoke-point conditions were roughly twice as long as flame-sheet lengths at comparable conditions due to the presence of luminous soot particles in the fuel-lean region of the flames.
Author
Shapes; Flames; Laminar Flow; Jet Flow; Diffusion Flames; Soot

20020087746 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Laminar Premixed Flame Study
Aung, K. T., Michigan Univ., USA; Hassan, M. I., Michigan Univ., USA; Lin, K.-C., Michigan Univ., USA; Xu, F., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 10-26; In English
Contract(s)/Grant(s): NAG3-1878; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One-dimensional laminar premixed flames are attractive for studying soot formation because they involve simple flows that promote the tractability of both measurements and detailed numerical simulations needed to evaluate soot formation models. These observations have motivated numerous studies of soot formation in burner-stabilized laminar premixed flames. Nevertheless, burner-stabilized laminar premixed flames are problematical for studies of soot formation for a number of reasons: spatial resolution and residence times are limited at the pressures typical of many practical applications, flame structure is sensitive to minor burner construction details so that experimental reproducibility is not very good; consistent burner behavior over the lengthy test programs needed to define soot formation properties is hard to achieve; burners have poor durability at pressures typical of many practical applications; it is difficult to quantify conductive, convective and radiative heat losses to the burner; it is difficult to define flow velocities near the burner where the flow is multidimensional and velocities change rapidly with streamwise distance due to effects of buoyancy; such flames are hard to seed for nonintrusive measurements of velocities and scalar properties; and it is difficult to carry out fundamental numerical simulations of premixed flame properties due to multidimensional effects and the complex geometries of flame holders, e.g., porous plates. Many of these problems are mitigated,

however, for soot containing outwardly-propagating spherical laminar premixed flames which offer a flow configuration that is tractable for measurements and computations with a durable and easily reproducible experimental arrangement. Thus, the objective of the present investigation was to determine both the properties of these flames and their potential for studying soot formation in premixed flame environments.
Derived from text
Buoyancy; Burners; Combustion; Convective Heat Transfer; Diffusion Flames; Laminar Flow; Premixed Flames

20020087747 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Laminar and Turbulent Gaseous Diffusion Flames, Appendix C
Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 97-196; Repr. from Microgravity Combustion: Fire in Free Fall, 2001 p 83-182; In English
Contract(s)/Grant(s): NAG3-1245; NAG3-1878; NAG3-2048; ISBN 0-12-598190-2; Copyright; Avail: Issuing Activity

Recent measurements and predictions of the properties of homogeneous (gaseous) laminar and turbulent non-premixed (diffusion) flames are discussed, emphasizing results from both ground- and space-based studies at microgravity conditions. Initial considerations show that effects of buoyancy not only complicate the interpretation of observations of diffusion flames but at times mislead when such results are applied to the non-buoyant diffusion flame conditions of greatest practical interest. This behavior motivates consideration of experiments where effects of buoyancy are minimized; therefore, methods of controlling the intrusion of buoyancy during observations of non-premixed flames are described, considering approaches suitable for both normal laboratory conditions as well as classical microgravity techniques. Studies of laminar flames at low-gravity and microgravity conditions are emphasized in view of the computational tractability of such flames for developing methods of predicting flame structure as well as the relevance of such flames to more practical turbulent flames by exploiting laminar flamelet concepts.
Author
Turbulent Flames; Laminar Flow; Diffusion Flames; Premixed Flames

20020087748 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Soot Formation in Laminar Premixed Ethylene/Air Flames at Atmospheric Pressure, Appendix G
Xu, F., Michigan Univ., USA; Sunderland, P. B., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001; ISSN 0010-2180, pp. 232-255; Repr. from Combustion and Flame (Elsevier Science, Inc), v. 108, 1997 p 471-493; In English
Contract(s)/Grant(s): N00014-93-0321; NAG3-1245; Copyright; Avail: Issuing Activity

Soot formation was studied within laminar premixed ethylene/air flames (C/O ratios of 0.78-0.98) stabilized on a flat-flame burner operating at atmospheric pressure. Measurements included soot volume fractions by both laser extinction and gravimetric methods, temperatures by multiline emission, soot structure by thermophoretic sampling and transmission electron microscopy, major gas species concentrations by sampling and gas chromatography, concentrations of condensable hydrocarbons by gravimetric sampling. and velocities by laser velocimetry. These data were used to find soot surface growth rates and primary soot particle nucleation rates along the axes of the flames. Present measurements of soot surface growth rates were correlated successfully by predictions based on typical hydrogen-abstraction/carbon-addition (HACA) mechanisms of Frenklach and co-workers and Colket and Hall. These results suavest that reduced soot surface growth rates with increasing residence time seen in the present and other similar flames were mainly caused by reduced rates of surface activation due to reduced H atom concentrations as temperatures decrease as a result of radiative heat losses. Primary soot particle nucleation rates exhibited variations with temperature and acetylene concentrations that were similar to recent observations for diffusion flames; however, nucleation rates in the premixed flames were significantly lower than in, the diffusion flames for reasons that still must be explained. Finally, predictions of yields of major gas species based on mechanisms from both Frenklach and co-workers and Leung and Lindstedt were in good agreement with present measurements and suggest that H atom concentrations (relevant to HACA mechanisms) approximate estimates based on local thermodynamic equilibrium in the present flames.
Author
Soot; Laminar Flow; Ethylene; Atmospheric Pressure; Flames; Premixed Flames; Growth

20020087749 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Soot Formation in Laminar Premixed Methane/Oxygen Flames at Atmospheric Pressure, Appendix H
Xu, F., Michigan Univ., USA; Lin, K.-C., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001; ISSN 0010-2180, pp. 256-271; Repr. from Combustion and Flame (Elsevier Science, Inc.), v. 115, 1998 p 195-209; In English
Contract(s)/Grant(s): NAG3-1245; NAG3-1878; NAG3-2048; Copyright; Avail: Issuing Activity

Flame structure and soot formation were studied within soot-containing laminar premixed methanefoxygen flames at atmospheric pressure. The following measurements were made: soot volume fractions by laser extinction, soot temperatures by multiline emission, gas temperatures (where soot was absent) by corrected fine-wire thermocouples, soot structure by thermophoretic sampling and transmission electron microscope (TEM), major gas species concentrations by sampling and gas chromatography, and gas velocities by laser velocimetry. Present measurements of gas species concentrations were in reasonably good agreement with earlier measurements due to Ramer et al. as well as predictions based on the detailed mechanisms of Frenklach and co-workers and Leung and Lindstedt; the predictions also suggest that H atom concentrations are in local thermodynamic equilibrium throughout the soot formation region. Using this information, it was found that measured soot surface growth rates could be correlated successfully by predictions based on the hydrogenabstraction/carbon-addition (HACA) mechanisms of both Frenklach and co-workers and Colket and Hall, extending an earlier assessment of these mechanisms for premixed ethylene/air flames to conditions having larger H/C ratios and acetylene concentrations. Measured primary soot particle nucleation rates were somewhat lower than the earlier observations for laminar premixed ethylene/air flames and were significantly lower than corresponding rates in laminar diffusion flames, for reasons that still must be explained.
Author
Soot; Growth; Laminar Flow; Premixed Flames; Methane; Oxygen; Atmospheric Pressure; Diffusion Flames

20020087750 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Soot Oxidation in Hydrocarbon/Air Diffusion Flames at Atmospheric Pressure, Appendix K
Xu, F., Michigan Univ., USA; El-Leathy, A. M., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 301-346; In English
Contract(s)/Grant(s): NCC3-661; NAG3-1878; NAG3-2048; NAG3-2404; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Soot oxidation was studied experimentally in laminar hydrocarbon/air diffusion flames at atmospheric pressure. Measurements were carried out along the axes of round jets burning in coflowing air considering acetylene, ethylene, propylene and propane as fuels. Measurements were limited to the initial stages of soot oxidation (carbon consumption less than 70%) where soot oxidation mainly occurs at the surface of primary soot particles. The following properties were measured as a function of distance above the burner exit: soot concentrations by deconvoluted laser extinction, soot temperatures by deconvoluted multiline emission, soot structure by thermophoretic sampling and analysis using Transmission Electron Microscopy (TEM), concentrations of stable major gas species (N2, H2O, H2, O2, CO, CO2, CH4, C2H2,C2H4, C2H6, C3H6, and C3H8) by sampling and gas chromatography, concentrations of some radical species (H, OH, O) by the deconvoluted Li/LiOH atomic absorption technique and flow velocities by laser velocimetry. It was found that soot surface oxidation rates are not particularly affected by fuel type for laminar diffusion flames and are described reasonably well by the OH surface oxidation mechanism with a collision efficiency of 0.10, (standard deviation of 0.07) with no significant effect of fuel type in this behavior; these findings are in good agreement with the classical laminar premixed flame measurements of Neoh et al. Finally, direct rates of surface oxidation by O2 were small compared to OH oxidation for present conditions, based on estimated O2 oxidation rates due to Nagle and Strickland-Constable (1962), because soot oxidation was completed near the flame sheet where O2 concentrations were less than 1.2% by volume.
Author
Soot; Oxidation; Hydrocarbons; Diffusion Flames; Atmospheric Pressure; Laminar Flow; Experimentation; Chemical Analysis

20020087751 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Soot Formation in Freely-Propagating Laminar Premixed Flames: Introduction
Aung, K. T., Michigan Univ., USA; Hassan, M. I., Michigan Univ., USA; Krishnan, S. S., Michigan Univ., USA; Lin, K.-C., Michigan Univ., USA; Xu, F., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 1-9; In English
Contract(s)/Grant(s): NAG3-1878; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An investigation of soot formation within freely-propagating laminar premixed flames is described. The findings of the research are relevant to several problems of society, as follows: the particulate soot pollutant emissions from flames, the radiant heat loads from combustion processes, the hazards of terrestrial and spacecraft fires, and the practical development of methods of computational combustion. The research was carried out in two phases, as follows: (1) study of soot formation in freely-propagating laminar premixed flames, and (2) study of the optical properties of soot needed to develop nonintrusive optical ways of finding soot structure within freely-propagating laminar premixed flames. It is widely recognized that soot processes in flames are a major unresolved problem of combustion science. This observation has motivated numerous studies of the physical, optical and reactive properties of soot during combustion processes. This research has also disclosed some problems concerning

studies of soot formation in burner-stabilized laminar premixed flames that frequently have been used for measurements of soot phenomena, as follows: (1) flame structure is sensitive to minor burner construction details so that laboratory-to-laboratory reproducibility is not very good, (2) consistent burner behavior over the lengthy test programs needed to define soot formation properties are hard to achieve due to poorly understood effects of burner aging, (3) it is difficult to accurately define near burner flame properties due to the intrusion of the flame holder, (4) it is difficult to quantify conductive, convective and radiative heat losses to the burner that are needed to define flame temperature properties, (5) it is difficult to define flow velocities near the burner where the flow is multidimensional and velocities change rapidly with streamwise distance due to effects of buoyancy, and (6) it is difficult to carry out fundamental numerical simulations of premixed flame properties due to the multidimensional effects and the complex geometries of flame holders (e.g., porous plates). These problems can largely be avoided, however, by studying freely-propagating laminar premixed flames at conditions where the flames have stable and smooth spherical flame surfaces as they propagate. The feasibility of experiments along these lines to study processes of soot formation is considered in the first part of the present study.
Derived from text
Soot; Combustion Physics; Contaminants; Feasibility Analysis; Flame Holders; Optical Measurement; Premixed Flames; Formations

20020087752 NASA Glenn Research Center, Cleveland, OH USA
Smoke-Point Properties of Non-Buoyant Round Laminar Jet Diffusion Flames, Appendix F
Urban, D. L., NASA Glenn Research Center, USA; Yuan, Z. G., NASA Glenn Research Center, USA; Sunderland, P. B., NASA Glenn Research Center, USA; Lin, K.-C., Michigan Univ., USA; Dai, Z., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 224-230; Repr. from Proceedings of the Combustion Institute, v. 28, 2000 p 1965-1972; In English
Contract(s)/Grant(s): NAG3-1878; NAG3-2048; NCC3-661; Copyright; Avail: Issuing Activity

The laminar smoke-point properties of non-buoyant round laminar jet diffusion flames were studied emphasizing results from long-duration (100-230 s) experiments at microgravity carried out in orbit aboard the space shuttle Columbia. Experimental conditions included ethylene- and propane-fueled flames burning in still air at an ambient temperature of 300 K, pressures of 35-130 kPa, jet exit diameters of 1.6 and 2.7 mm, jet exit velocities of 170-690 mm/s, jet exit Reynolds numbers of 46-172, characteristic flame residence times of 40-302 ms, and luminous flame lengths of 15-63 mm. Contrary to the normal-gravity laminar smoke point, in microgravity, the onset of laminar smoke-point conditions involved two flame configurations: closed-tip flames with soot emissions along the flame axis and open-tip flames with soot emissions from an annular ring about the flame axis. Open-tip flames were observed at large characteristic flame residence times with the onset of soot emissions associated with radiative quenching near the flame tip: nevertheless, unified correlations of laminar smoke-point properties were obtained that included both flame configurations. Flame lengths at laminar smoke-point conditions were well correlated in terms of a corrected fuel flow rate suggested by a simplified analysis of flame shape. The present steady and nonbuoyant flames emitted soot more readily than non-buoyant flames in earlier tests using ground-based microgravity facilities and than buoyant flames at normal gravity, as a result of reduced effects of unsteadiness, flame disturbances, and buoyant motion. For example, present measurements of laminar smokepoint flame lengths at comparable conditions were up to 2.3 times shorter than ground-based microgravity measurements and up to 6.4 times shorter than buoyant flame measurements. Finally, present laminar smoke-point flame lengths were roughly inversely proportional to pressure to a degree that is a somewhat smaller than observed during earlier tests both at microgravity (using ground-based facilities) and at normal gravity.
Author
Smoke; Jet Flow; Laminar Flow; Diffusion Flames; Soot

20020087753 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Hydrodynamic Suppression of Soot Formation in Laminar Coflowing Jet Diffusion Flames, Appendix A
Dai, Z., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 49-56; Repr. from Proceedings of the Combustion Institute, v. 28, 2000 p 2085-2092; In English
Contract(s)/Grant(s): NCC3-661; NAG3-1878; NAG3-2048; Copyright; Avail: Issuing Activity

Effects of flow (hydrodynamic) properties on limiting conditions for soot-free laminar non-premixed hydrocarbon/air flames (called laminar soot-point conditions) were studied, emphasizing non-buoyant laminar coflowing jet diffusion flames. Effects of air/fuel-stream velocity ratios were of particular interest; therefore, the experiments were carried out at reduced pressures to minimize effects of flow acceleration due to the intrusion of buoyancy Test conditions included reactant temperatures of 300 K; ambient pressures of 3.7-49.8 kPa, methane-, acetylene-, ethylene-, propane-, and methane-fueled flames burning in coflowing air with fuel-port diameters of 1.7, 3.2, and 6.4 mm; fuel jet Reynolds numbers of 18-121; air coflow velocities of 0-6 m/s; and

air/fuel-stream velocity ratios of 0.003-70. Measurements included laminar soot-point flame lengths, laminar soot-point fuel flow rates, and laminar liftoff conditions. The measurements show that laminar soot-point flame lengths and fuel flow rates can be increased, broadening the range of fuel flow rates where the flames remain soot free, by increasing air/fuel-stream velocity ratios. The mechanism of this effect involves the magnitude and direction of flow velocities relative to the flame sheet where increased air/fuel-stream velocity ratios cause progressive reduction of flame residence times in the fuel-rich soot-formation region. The range of soot-free conditions is limited by both liftoff, particularly at low pressures, and the intrusion of effects of buoyancy on effective air/fuel-stream velocity ratios, particularly at high pressures. Effective correlations of laminar soot- and smoke-point flame lengths were also found in terms of a corrected fuel flow rate parameter, based on simplified analysis of laminar jet diffusion flame structure. The results show that laminar smoke-point flame lengths in coflowing air environments are roughly twice as long as soot-free (blue) flames under comparable conditions due to the presence of luminous soot particles under fuel-lean conditions when smoke-point conditions are approached. This is very similar to earlier findings concerning differences between laminar smoke- and soot-point flame lengths in still environments.
Author
Soot; High Pressure; Diffusion Flames; Flames; Flow Stability

20020087793 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Fractal DNA-Assembly
Carbone, A.; Seeman, N.; Apr. 2002; In English
Report No.(s): PB2003-100651; IHES/M/02/24; Copyright; Avail: National Technical Information Service (NTIS), CD-ROM

Crystallization is periodic self-assembly on the molecular scale. Individual DNA components have been used several times to achieve self-assembled crystalline arrangements in two dimensions. The design of a fractal system is a much more difficult goal to achieve on this scale. We present DNA components whose cohesive portions are compatible with a fractal assembly. These components are DNA parallelgrams that have been used previously to produce two dimensional arrays. to obtain a fractal arrangement, however, we find it necessary to combine these parallelograms with glue-like constructs. The assembly of the individual parallelgrams and a series of glues and protecting groups appear to ensure the fractal growth of the systems in two dimensions. Synthetic protocols are suggested for the implementation of this approach to fractal assembly.
NTIS
Crystallization; Deoxyribonucleic Acid; Sequencing

20020087827 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Soot Optical Property Study
Aung, K. T., Michigan Univ., USA; Hassan, M. I., Michigan Univ., USA; Krishnan, S. S., Michigan Univ., USA; Lin, K.-C., Michigan Univ., USA; Xu, F., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001, pp. 27-47; In English
Contract(s)/Grant(s): NAG3-1878; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent past studies of soot reaction processes in laminar premixed and nonpremixed flames generally have used the intrusive technique of thermophoretic sampling and analysis by transmission electron microscopy (TEM) to observe soot structure and obtain important fundamental information about soot particle properties, such as soot primary particle diameters, the rate of change of soot primary particle diameter as a function of time (or rate of soot surface growth or oxidation), the amount of soot particle reactive surface area per unit volume, the number of primary soot particles per unit volume, and the rate of formation of primary soot particles (or the rate of soot primary particle nucleation). Given the soot volume per unit volume of the flame (or the soot volume fraction), all these properties are readily found from a measurement of the soot primary particle diameter (which usually is nearly a constant for each location within a laminar flame). This approach is not possible within freely propagating flames, however, because soot properties at given positions in such flames vary relatively rapidly as a function of time in the soot formation and oxidation regions compared to the relatively lengthy sampling times needed to accumulate adequate soot samples and to minimize effects of soot collected on the sampling grid as it moves to and from the sampling position through other portions of the flame. Thus, nonintrusive optical methods must be used to find the soot primary particle diameters needed to define the soot surface reaction properties mentioned earlier. Unfortunately, approximate nonintrusive methods used during early studies of soot reaction properties in flames, found from laser scattering and absorption measurements analyzed assuming either Rayleigh scattering or Mie scattering from polydisperse effective soot particles having the same mass of soot as individual soot aggregates, have not been found to be an effective way to estimate the soot surface reaction area per unit volume. Thus, alternative nonintrusive optical methods of finding these properties must be sought, which was the objective of this phase of the investigation. The alternative method used here involves use of the Rayleigh-Debye-Gans-Polydisperse-Fractal-Aggregate (RDG-PFA) scattering

approximation for soot aggregates in flames. Thus, the development of this method will be discussed next before describing its evaluation as a means of nonintrusively measuring soot primary particle diameters in soot-containing flames.
Derived from text
Soot; Optical Properties; Flames; Infrared Spectra; Laminar Flow; In Situ Measurement; Reaction Kinetics

20020087867 Pacific Northwest National Lab., Richland, WA USA
Pilot-Scale Test of Counter-Current Ion Exchange (CCIX) Using UOP IONSIV IE-911
Wester, D. W.; Leugemors, R. K.; Taylor, P. W.; Sep. 24, 2001; 28p; In English
Report No.(s): DE2001-786812; PNNL-13625; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A pilot-scale test of a moving-bed configuration of a UOP IONSIV. IE-911 ion-exchange column was performed over 17 days at Severn Trent Services facilities. The objectives of the test, in order of priority, were to determine if aluminosilicate precipitation caused clumping of IE-911 particles in the column, to observe the effect on aluminum-hydroxide precipitation of water added to a simulant-filled column, to evaluate the extent of particle attrition, and to measure the expansion of the mass-transfer zone under the influence of column pulsing. The IE-911 moved through the column with no apparent clumping during the test, although analytical results indicate that little if any aluminosilicate precipitated onto the particles. A precipitate of aluminum hydroxide was not produced when water was added to the simulant-filled column, indicating that this upset scenario is probably of little concern. Particle-size distributions remained relatively constant with time and position in the column, indicating that particle attrition was not significant. The expansion of the mass-transfer zone could not be accurately measured because of the slow loading kinetics of the IE-911 and the short duration of the test; however, the information obtained indicates that back-mixing of sorbent is not extensive.
NTIS
Aluminum Silicates; Ion Exchanging; Mass Transfer; Precipitates; Hydroxides

20020088426 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Structure of the Soot Growth Region of Laminar Premixed Methane/Oxygen Flames, Appendix I
Xu, F., Michigan Univ., USA; Faeth, G. M., Michigan Univ., USA; Soot Formation in Freely-Propagating Laminar Premixed Flames; Dec. 15, 2001; ISSN 0010-2180, pp. 272-283; Repr. from Combustion and Flame (Elsevier Science, Inc.), v. 121, 2000 p 640-650; In English
Contract(s)/Grant(s): NAG3-1245; NAG3-2048; NAG3-1878; Copyright; Avail: Issuing Activity

The structure of the soot growth region of laminar premixed methane/oxygen flames (fuel-equivalence ratios of 1.60-2.77) was studied both experimentally and computationally. Measurements were carried out in flames stabilized on a flat flame burner operated at standard temperature and pressure, and included velocities by laser velocimetry, soot volume fractions by laser extinction, soot temperatures by multiline emission, gas temperatures (where soot was absent) by corrected fine-wire thermocouples, major gas species concentrations by sampling and gas chromatography, and hydrogen atom concentrations by the Li/LiOH technique in conjunction with atomic absorption to find the proportion of free lithium in the flames. The measured concentrations of major gas species were in reasonably good agreement with predictions based on the detailed mechanisms of Leung and Lindstedt, and Frenklach and coworkers. The measurements also confirmed predictions of both these mechanisms that H-atom concentrations are in local thermodynamic equilibrium throughout the soot growth region even through the concentrations of major gas species are not. Thus, present findings support recent evaluations of the hydrogen-abstraction/carbon-addition (HACA) soot growth mechanism in similar flames, where the approximation that H-atom concentrations were in local thermodynamic equilibrium was adopted, based on predictions using the two mechanisms, due to the absence of direct H-atom concentration measurements.
Author
Soot; Structural Analysis; Crystal Growth; Laminar Flow; Methane; Premixed Flames; Oxygen

20020089855 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Stereospecificity of the Catalysis of GF by the Organophosphorus Acid Anhydrolase and Phosphotriesterse Enzymes *Final Report, Dec. 1999-Jul. 2002*
Harvey, Steven P.; Kolakowski, Jan E.; Cheng, Tu-chen; Rastogi, Vipin K.; De Frank, Joseph J.; Sep. 2002; 27p; In English; Prepared in cooperation with Texas A&M Univ., College Station, TX
Contract(s)/Grant(s): Proj-PR-100600
Report No.(s): AD-A406793; ECBC-TR-257; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The stereospecificity of the catalysis of GF hydrolysis by several enzymes was investigated. Stereospecificity was not evident at higher (3 mM) GF concentrations but was clearly apparent at 0.5 mM GF. The differential effect was due to fluoride-catalyzed

racemization of the substrate. The enzymes JD6.5 organophosphorus acid anhydrolase (OPAA), Alteromonas haloplanktis OPAA, and the wild-type phosphotriesterase (PTE) enzymes were all found to preferentially catalyze the hydrolysis of the (+)GF isomer, as determined by GC analysis of the remaining isomer. Acetylcholinesterase inhibition experiments showed the purified (-)GF isomer to be approximately twice as toxic as the racemic compound. One PTE mutant, H254G/H259W/L303T, was found to preferentially catalyze the hydrolysis of the (-)GF isomer, as shown by its complementation of JD6.5 OPAA and subsequent GC analysis of the remaining (+)GF isomer. Thus, either GF isomer could be individually prepared enzymatically and analyzed isothermally on a GC.
DTIC
Enzymes; Catalysis; Hydrolysis; Isothermal Processes; Acetyl Compounds

20020090112 Hampton Univ., Dept. of Chemistry, VA USA
Design, Synthesis and Evaluation of Organic Non-linear Optical Chromophores with Configurationally and Conformationally Locked Polyene Bridges ***Final Report, May 1995-30 Jun. 2002***
Nwokogu, Godson C.; Simpson, Samuel A.; Sep. 30, 2002; 21p; In English
Contract(s)/Grant(s): N00014-98-1-0486
Report No.(s): AD-A407110; ONR-331; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A modular, synthetic scheme was developed for versatile variation of donors, acceptors and polyene bridge length of NLO-chromophores. Configurational- and conformational rigidity of the polyene bridges were realized by making each set of adjacent double and single bond pair part of a fused cylohexene ring. Substituent effects on the reactions leading to the establishment of the donor, elongation of the fused polyene bridge and the final introduction of the acceptor moiety were uncovered and used to control regioselectivity, chemo-selectivity and reactivity in the overall synthetic scheme.
DTIC
Chromophores; Synthesis (Chemistry); Nonlinear Optics; Chemical Reactions; Polymers

26
METALS AND METALLIC MATERIALS

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

20020087674 National Inst. of Standards and Technology, Materials Science and Engineering Lab., Gaithersburg, MD USA
Materials Science and Engineering Laboratory, Metallurgy Division, FY 2002 Programs and Accomplishments
Sep. 2002; 80p; In English
Report No.(s): PB2003-100237; NISTIR-6907; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This report describes the major technical activities, accomplishments and areas of scientific expertise in the Metallurgy Division of the NIST Materials Science and Engineering Laboratory in FY2002 (October 2001 through September 2002). In this report, we have tried to provide insight into how our research programs meet the needs of our customers, how the capabilities of the Metallurgy Division are being used to solve problems important to the national economy and the materials metrology infrastructure, and how we interact with our customers to establish new priorities and programs. We welcome feedback and suggestions on how we can better serve the needs of our customers and encourage increasing collaboration to this end.
NTIS
Metallurgy; Metrology; Research Projects

20020087698 Stanford Linear Accelerator Center, Stanford, CA USA
Temperature Dependence of Oxide Decomposition on Titanium Surfaces in UHV
Mizuno, Y.; Nov. 9, 2001; 22p; In English
Report No.(s): DE2002-798917; SLAC-PUB-9046; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
It is well known that the titanium surface forms stable oxides of Ti2O, TiO, Ti2O3, Ti3O5, TinO2n-1 (4 is less than n is less than 38) and TiO2 and, as a result, exhibits a high degree of immunity against attack by acids and chlorides. However, titanium is also a very active getter. In the gettering characterizing the process, we have investigated the temperature dependence of stable titanium oxides on titanium in ultra-high vacuum (UHV) using Auger electron spectroscopy (AES), quadrupole mass spectrometry (QMS) and x-ray photoelectron spectroscopy (XPS) in the temperature range RT- 600 C. Surfaces of titanium specimens were prepared by electro-polishing (EP) and a thin titanium oxide layer was formed on the surface, principally TiO2. On increasing the temperature to above 300 C, the OKLL Auger intensity began to decrease in a drastic way while, in contrast, the TiLMM Auger intensity was increased. Above 450 C, no oxygen was detected on the titanium surface in UHV. However, the

outgassing rates of H2O, O2, CO, and CO2 from the surface did not show any changes in QMS measurements below 450 C. This behavior is explained as gettering, which is an enhancement of diffusion of oxygen from the surface into the bulk. to investigate the temperature dependence of the chemical states of titanium oxides on an EP surface, XPS analysis was also performed in the range 200 - 450 C in the same way. The results showed drastic changes of the titanium oxide core levels such that the TiO2 decomposed to suboxides at 180oC, and even the remaining TiO2 was still decreasing on heating up to 420 C. The titanium surface has a very sensitive oxide composition, depending on temperature.
NTIS
Ultrahigh Vacuum; Temperature Dependence; Titanium; Decomposition

20020089456 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA
Metals Processing/Processing Science. Work Order Directive (WUD) 49 ***Final Report, 1 Sep. 1979-1 Sep 1999***
Semiatin, S. L.; May 2002; 40p; In English
Contract(s)/Grant(s): Proj-2306
Report No.(s): AD-A406788; AFRL-ML-WP-TM-2002-4147; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A wide range of research related to the deformation, solidification, and vapor processing of materials of importance to the Air Force was conducted under this Work Unit Directive. The primary theme of all of the research was to establish the physics of materials behavior during processing and to exploit this knowledge to improve existing processes and develop new processes. The important results are discussed in the following sections on intermetallic alloys, conventional alloys, advanced modeling tools, composite materials/ thermal barrier coatings, and novel processes.
DTIC
Composite Materials; Alloys; Intermetallics; Deformation

20020089473 California Univ., Irvine, CA USA
Deformation and Damage Process in Nanostructured Metallic Systems ***Interim Report, 1 Oct. 2001-30 Sep. 2002***
Lavernia, E. J.; Sep. 30, 2002; 5p; In English
Contract(s)/Grant(s): N00014-01-1-0882
Report No.(s): AD-A406728; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
In this reporting period, processing of nanostructured powders, consolidation of nanostructured powders, computer simulation, microstructural characterization, and mechanical deformation tests were carried out. The nanostructured powders and bulk nanostructured materials were produced successfully via optimization of processing parameters. The observed highly grain stability can be explained by a grain boundary pinning mechanism arising from the dispersoid particles as well as impurity segregation. The microstructures of the as- extruded and the deformed bulk nanocrystalline aluminum alloys were investigated using transmission electron microscopy. A nanoindentation technique and traditional mechanical tests as well as computer simulation were also used to evaluate the mechanical performance. A discrete dislocation dynamics model has been developed to bridge the gap between atomic simulations and continuum approaches. It has the potential to provide a rigorous description of the complex relationships between the macroscopic mechanical behavior of materials and the underlying fundamental physical mechanisms. The tensile test results showed that grain size effects, solid solution strengthening, Orowan strengthening and dislocation strengthening contribute significantly to the properties of the cryomilled Al alloys. The future work for the next period is also discussed in the report.
DTIC
Metal Powder; Nanostructure (Characteristics); Deformation; Mechanical Properties

20020089494 Naval Surface Warfare Center, Carderock Div., Bethesda, MD USA
Process, Chemistry, and Property Relations for Spray Formed NiCr Alloys
Kohler, Leslie K.; Aprigliano, Louis F.; Sep. 2002; 24p; In English; Original contains color images
Report No.(s): AD-A406761; NSWCCD-61-TR-2002/07; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A series of NiCr spray forming runs were completed in order to investigate the mechanisms for exceptional high strength and ductility in previous spray formed 5ONi-5OCr (all compositions in wt%) tubes. Although tests showed good strength results, the best mechanical properties of these spray formed alloys were not achieved in this series. The mechanical properties of this eutectic region alloy were found to be sensitive to small changes in processing parameters and chemical composition. More specifically, it was found that slight increases in chromium and nitrogen content can increase strength but decrease ductility and fracture toughness. Crevice corrosion testing was also performed on a spray formed 5ONi-5OCr disk. After a six month exposure in coastal seawater, the alloy showed no evidence of crevice corrosion. This result may be a result of one or all of three different known corrosion resistance enhancements: small scale spray formed microstructure, increased chromium, and increased nitrogen. Slow

strain rate (SSR) tests were also performed on 5ONi-5OCr samples, which showed good performance under freely corroding conditions, but experienced a reduction in maximum load under polarized conditions. Based on the results of this series of NiCr spray forming experiments, it is proposed that future work includes NiCr alloys with slightly higher nickel and lower chromium contents (52Ni-48Cr). These changes are likely to increase fracture toughness values without compromising strength and corrosion resistance It is also suggested that future corrosion tests compare spray formed and cast NiCr alloys, as well as varying the chromium and nitrogen components in order to pinpoint and capitalize on the reason for the excellent crevice corrosion resistance of the 5ONi-5OCr material.
DTIC
Nickel Alloys; Chromium Alloys; Protective Coatings; Sprayed Coatings

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.

20020087756 Pacific Northwest National Lab., Richland, WA USA
Polymers for Chemical Sensors Using Hydrosilylation Chemistry
Grate, J. W.; Kaganove, S. N.; Nelson, D. A.; Jun. 28, 2001; 26p; In English
Report No.(s): DE2001-786795; PNNL-13556; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Sorbent and functionalized polymers play a key role in a diverse set of fields, including chemical sensors, separation membranes, solid phase extraction techniques, and chromatography. Sorbent polymers are critical to a number of sensor array or 'electronic nose' systems. The responses of the sensors in the array give rise to patterns that can be used to distinguish one compound from another, provided that a sufficiently diverse set of sensing materials is present in the array. Figure 1 illustrates the concept of several sensors, each with a different sensor coating, giving rise to variable responses to an analyte that appear as a pattern in bar graph format. Using hydrosilylation as the bond-forming reaction, we have developed a versatile and efficient approach to developing sorbent polymers with diverse interactive properties for sensor applications. Both the chemical and physical properties of these polymers are predictable and tunable by design.
NTIS
Polymers; Sensors; Solid Phases; Sorbents

20020087757 Pacific Northwest National Lab., Richland, WA USA
Noble Metals and Spinel Settling in High Level Waste Glass Melters
Sundaram, S. K.; Perez, J. M., Jr.; Sep. 30, 2000; 85p; In English
Report No.(s): DE2001-786806; PNNL-13347; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In the continuing effort to support the Defense Waste Processing Facility (DWPF), the noble metals issue is addressed. There is an additional concern about the amount of noble metals expected to be present in the future batches that will be considered for vitrification in the DWPF. Several laboratory, as well as melter-scale, studies have been completed by various organizations (mainly PNNL, SRTC, and WVDP in the USA). This letter report statuses the noble metals issue and focuses at the settling of noble metals in melters.
NTIS
Radioactive Wastes; Vitrification

20020087859 Stanford Linear Accelerator Center, Stanford, CA USA
Rheo-Optics and X-Ray Scattering Study of Elastomeric Polypropylene
Pople, J. A.; Oct. 16, 2001; 6p; In English
Report No.(s): DE2002-798896; SLAC-PUB-9028; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Elastomeric polypropylenes (ePP) have been known since the early history of polypropylene. Elastomeric polypropylenes were first synthesized by Natta using heterogenous Ziegler-type catalysts; he attributed the elastomeric behavior to their low crystallinity and stereoisomer blocks consisting of alternating isotactic crystalline and atactic amorphous segments. Subsequent to Nattas work, there have been a number of reports of the production of related materials produced with different catalysts, with notable advances by Collette, iii Chien, and Collins. Recently, we reported that metallocene catalysts derived from 2-arylindene ligands produce elastomeric polypropylenes which can be separated into fractions differing in tacticity and crystallinity. Studies of the elastomeric polypropylenes using rheological and optical-polarimetry methods reveal evidence of a physical network in

contrast to the blend of atactic and isotactic fractions.viii, Dynamic infrared (IR) polarimetry studies provide evidence of cocrystallization of solvent fractions of the materials subjected to step-shear flows. In the current study, we examine the tensile flow properties of elastomeric polypropylene and its solvent fractions derived from 2-arylindene metallocenes catalysts. The origin of tensile set is studied by simultaneously measuring the tensile stress and optical birefringence. The birefringence follows the flowinduced anisotropy arising from amorphous chain orientation and oriented crystallites. Wide Angle and Small Angle X-ray Scattering (WAXS and SAXS, respectively) were performed to investigate the crystallite orientation as well as strain-induced crystallinity.
NTIS
Polypropylene; Elastomers; X Ray Scattering; Crystals

20020089985 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA
Advanced Lubricants for Aircraft Turbine Engines. Work Unit Directive (WUD) 51
Beane, G. A., IV; Gschwender, Lois J.; Snyder, Carl E., Jr; Oct. 1985; 22p; In English; Presented at Conference and Exposition on Aerospace Technology, held in Long Beach, CA on 14-17 Oct. 1985
Contract(s)/Grant(s): Proj-2421
Report No.(s): AD-A407048; AFRL-ML-WP-TP-2002-405; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An assessment of the performance of oils in Air Force turbine engines and helicopter gearboxes is presented along with predicted performance of current and upgraded military specification oils in advanced and growth engine designs. Data is presented on advanced ester base oils evolving from current research efforts. Future high temperature candidate oils representing the ultimate stability for turbine engines are also discussed. Their use, in most cases, entails engine design considerations to accommodate their unique properties. The advantages and disadvantages of the various classes of synthetic oils for turbine engines are discussed, and deficiencies are identified where additional research programs are needed.
DTIC
Aircraft Engines; Gas Turbines; Lubricants

28
PROPELLANTS AND FUELS

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

20020089517 Department of Defense, Office of the Assistant Inspector General for Audit, Arlington, VA USA
Acquisition: Controls for the DoD Aviation Into-Plane Reimbursement Card
Oct. 03, 2002; 72p; In English; Original contains color images
Report No.(s): AD-A406705; OAIG-AUD-D-2003-003; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The Office of the Secretary of Defense issued a memorandum regarding the Department of Defense Charge Card Programs on June 21, 2002. That memorandum discusses the fraud and misuse of Government cards. The memorandum directs that all DoD Components provide the Under Secretary of Defense (Comptroller) a report of actions taken that resolve the current cases of charge card misuse, abuse, and deliquencies and preclude future cases from occurring. Further, the memorandum requests that the Inspector General of the Department of Defense coordinate audits and investigations of charge card programs to ensure fraudulent and inappropriate activities are addressed. The DoD Charge Card Task Force, formed in March 2002 by the Under Secretary of Defense (Comptroller), issued a report on June 27, 2002, regarding its evaluation of the credit card programs and offering 25 recommendations for improvement of the programs. The Government Aviation Into-Plane Reimbursement Card is a commercially accepted credit card that DoD uses to purchase aviation fuel, fuel-related supplies, and ground handling services from commercial airport Fixed Base Operators. Kropp Holdings, Incorporated, doing business as AVCARD, is the credit card processor under contract for the Aviation Into-Plane Reimbursement-Card. The Aviation Into-Plane Reimbursement Card is accepted at Defense Energy Support Center into-plane contract locations and locations that do not have a contract with the Defense Energy Support Center. The Defense Energy Support Center negotiates and manages the Aviation Into-Plane Reimbursement Card contract as well as implements future changes of the transaction processing procedures. In FY 2001 the card was used to make $222 million in purchases.
DTIC
Reports; Logistics Management; Aircraft Fuels; Accounting

29
SPACE PROCESSING

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

20020087576 Johns Hopkins Univ., Dept. of Mechanical Engineering, Baltimore, MD USA
The Action of Pressure-Radiation Forces on Pulsating Vapor Bubbles
Hao, Y., Johns Hopkins Univ., USA; Oguz, N., Johns Hopkins Univ., USA; Prosperetti, A., Johns Hopkins Univ., USA; Physics and Fluids; May 2001; ISSN 1070-6631; Volume 13, No. 5, pp. 1167-1177; In English
Contract(s)/Grant(s): NAG3-1924; Copyright; Avail: Issuing Activity

The action of pressure-radiation (or Bjerknes) forces on gas bubbles is well understood. This paper studies the analogous phenomenon for vapor bubbles, about which much less is known. A possible practical application is the removal of boiling bubbles from the neighborhood of a heated surface in the case of a downward facing surface or in the absence of gravity. For this reason, the case of a bubble near a plane rigid surface is considered in detail. It is shown that, when the acoustic wave fronts are parallel to the surface, the bubble remains trapped due to secondary Bjerknes force caused by an ”image bubble.” When the wave fronts are perpendicular to the surface, on the other hand, the bubble can be made to slide laterally.
Author
Bubbles; Sound Waves; Vapors; Gravitation; Mathematical Models; Radiation Distribution; Pressure Distribution

20020090250 NASA Goddard Space Flight Center, Greenbelt, MD USA
Burning in Outer Space: Microgravity
Matkowsky, Bernard, Northwestern Univ., USA; Aldushin, Anatoly, Academy of Sciences (USSR), USSR; 2000 NCCS Highlights: Enabling NASA Earth and Space Sciences; 2000, pp. 72-75; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A better understanding of combustion can lead to significant technological advances, such as less polluting, more fuel-efficient vehicles. Unfortunately, gravity can interfere with the study of combustion. Gravity drags down gases that are cooler- and, therefore, denser-than heated gases. This movement mixes the fuel and the oxidizer substance that promotes burning. Because of this mixing, an observer cannot necessarily distinguish what is happening as a result of the natural combustion process and what is caused, by the pull of gravity. to remove this uncertainty, scientists can conduct experiments that simulate the negation of gravity through freefall. This condition is known as a microgravity environment. A micro-gravity experiment may take place in a chamber that is dropped down a hole or from a high-speed drop tower. The experiment also be conducted in an airplane or a rocket during freefall in a parabolic flight path. This method provides less than a minute of microgravity at most. An experiment that requires the prolonged absence of gravity may necessitate the use of an orbiting spacecraft as a venue. However, access to an orbital laboratory is difficult to acquire. High-end computing centers such as the NCCS can provide a practical alternative to operating in microgravity. Scientists can model phenomena such as combustion without gravitys observational interference. The study of microgravity combustion produces important benefits beyond increased observational accuracy. Certain valuable materials that are produced through combustion can be formed with a more uniform crystal structure-and, therefore, improved structural quality-when the pull of gravity is removed. Furthermore, understanding how fires propagate in the absence of gravity can improve fire safety aboard spacecraft.
Author
Combustion; Gravitational Effects; Microgravity; Oxidizers; Reaction Kinetics

31
ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see categories 32 through 39.

20020089467 Research and Technology Organization, Systems Concepts and Integration Panel, Neuilly-sur-Seine, France
Collaboration for Land, Air, Sea, and Space Vehicles: Developing the Common Ground in Vehicle Dynamics, System Identification, Control, and Handling Qualities ***La Collaboration dans le Domaine des Vehicules Terrestres, Aeriens, Maritimes et Spatiaux: L’Etablissement d’une approche Commune de la dynamique des Vehicules, l’Identification des Systemes, et les Qualites de Controle et de Pilotage***
November 2002; 180p; In English; CD-ROM contains full text document in PDF format

Report No.(s): RTO-TR-061; AC/323(SCI-053)TP/51; ISBN 92-837-1090-8; Copyright Waived; Avail: CASI; C01, CD-ROM; A09, Hardcopy; A02, Microfiche

This technical report is the culmination of the SCI-053 Task Group - Vehicle Dynamics, System Identification, Control and Handling Qualities. It summarizes the discussions of tank, truck, aircraft, helicopter, ship, submarine and satellite experts held over a three-year period. It addresses the various technical areas identified in the name of the task group, exploring the similarities and differences between the vehicle types and identifying areas where collaboration between experts would be the most valuable. Twenty-three specific technical issues are identified as initial areas with high potential for valuable collaboration. Overall, the report provides the vehicle expert of one environment a sufficient background on the other vehicle environments, so that meaningful discussions towards these technical collaborations can be initiated.

Author

Controllability; Aerospace Vehicles; Military Vehicles; Mathematical Models; Systems Engineering; Water Vehicles

20020089611 NASA Johnson Space Center, Houston, TX USA

Solar-Powered Refrigeration System

Ewert, Michael K., Inventor, NASA Johnson Space Center, USA; Bergeron, David J., III, Inventor, NASA Johnson Space Center, USA; Oct. 22, 2002; 10p; In English; Division of US-Patent-Appl-SN-337208, filed 3 Jun. 1999

Patent Info.: Filed 19 Apr. 2001; NASA-Case-MSC-22970-2; US-Patent-6,469,487; US-Patent-Appl-SN-838679; US-Patent-Appl-SN-337208; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A solar powered vapor compression refrigeration system is made practicable with thermal storage and novel control techniques. In one embodiment, the refrigeration system includes a photovoltaic panel, a variable speed compressor, an insulated enclosure, and a thermal reservoir. The photovoltaic (PV) panel converts sunlight into DC (direct current) electrical power. The DC electrical power drives a compressor that circulates refrigerant through a vapor compression refrigeration loop to extract heat from the insulated enclosure. The thermal reservoir is situated inside the insulated enclosure and includes a phase change material. As heat is extracted from the insulated enclosure, the phase change material is frozen, and thereafter is able to act as a heat sink to maintain the temperature of the insulated enclosure in the absence of sunlight. The conversion of solar power into stored thermal energy is optimized by a compressor control method that effectively maximizes the compressor's usage of available energy. A capacitor is provided to smooth the power voltage and to provide additional current during compressor start-up. A controller monitors the rate of change of the smoothed power voltage to determine if the compressor is operating below or above the available power maximum, and adjusts the compressor speed accordingly. In this manner, the compressor operation is adjusted to convert substantially all available solar power into stored thermal energy.

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

Control Systems Design; Refrigerating Machinery; Enclosure; Heat Storage; Solar Energy Conversion

20020089860 University of Electro-Communications, Dept. of Human Communication, Tokyo, Japan

Design and Construction of Alkali Metals Evaporation Unit for UHV Systems

Choo, Cheow-Keong, University of Electro-Communications, Japan; Ogoshi, Kazuteru, University of Electro-Communications, Japan; Tanaka, Katsumi, University of Electro-Communications, Japan; Bulletin of the University of Electro-Communications; January 2002; ISSN 0915-0935; Volume 14, No. 2, pp. 177-181; In Japanese; Copyright; Avail: Issuing Activity

The design and construction of alkali metals evaporation system/unit for VG ESCALAB5-MK2 ultra high vacuum systems are described. The unit incorporates a free rotate stainless holder that allows very simple loading. by using this unit Seas alkali metal getters can be easily installed or replaced by a wobble-stick without breaking the vacuum. A series of cesium deposition on a Teflon substrate was carried out in vacuum at room temperature. The binding energy of the deposited Cs metal was measured in-situ with X-ray photoelectron spectroscopy. The Cs deposition rate was estimated to be 1.28 A per minute, in a standard condition.

Author

Alkali Metals; Evaporation; Cesium; X Ray Spectroscopy; Design Analysis

32
COMMUNICATIONS AND RADAR

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

20020087725 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
True Anonymity Without Mixes
Molina-Jimenez, C.; Marshall, L.; Apr. 2002; 14p; In English
Report No.(s): PB2003-100628; CS-TR-727; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Anonymizers based on mix computers interposed between the sender and the receiver of an e-mail message have been used in the Internet for several years by senders of e-mail messages who do not wish to disclose their identity. Unfortunately, the degree of anonymity provided by this paradigm is limited and fragile. First, the messages sent are not truly anonymous but pseudo-anonymous since one of the mixes, at least, always knows the sender's identity. Secondly, the strength of the system to protect the sender's identity depends on the ability and the willingness of the mixes to keep the secret. If the mixes fail, the sender/'s anonymity is reduced to pieces. In this paper, we propose a novel approach for sending truly anonymous messages over the Internet where the anonymous message is sent from a PDA which uses dynamically assigned temporary, non-personal, random IP and MAC addresses. Anonymous E-cash is used to pay for the service.
NTIS
Communication Networks; Internet Resources

20020087726 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Anonymous and Confidential Communications from an IP Addressless Computer
Molina-Jimenez, C.; Marshall, L.; Apr. 2002; 8p; In English
Report No.(s): PB2003-100630; CS-TR-728; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Anonymizers based on a mediating computer interposed between the sender and the receiver of an e-mail message have been used for several years by senders of e-mail messages who do not wish to disclose their identity to the receivers. In this model, the strength of the system to protect the identity of the sender depends on the ability and willingness of the mediator to keep the secret. In this paper, we propose a novel approach for sending truly anonymous message over the Internet which does not depend on a third party. Our idea departs from the traditional approach by sending the anonymous messages from an Internet wireless and addressless computer, such as a Personal Digital Assistant (PDA) bridged to the Internet by a Mobile Support Station (MSS).
NTIS
Communication Networks; Internet Resources

20020087874 Department of Energy, Office of Scientific and Technical Information, Oak Ridge, TN USA
Edge Polynomial Fractal Compression Algorithm for High Quality Video Transmission ***Final Report***
Lin, F.; Jun. 01, 1999; 65p; In English
Report No.(s): DE2002-761345; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this final report, Physical Optics Corporation (POC) provides a review of its Edge Polynomial Autonomous Compression (EPAC) technology. This project was undertaken to meet the need for low bandwidth transmission of full-motion video images. In addition, this report offers a synopsis of the logical data representation study that was performed to compress still images and video. The mapping singularities and polynomial representation of 3-D surfaces were found to be ideal for very high image compression. Our efforts were then directed to extending the EPAC algorithm for the motion of singularities by tracking the 3-D coordinates of characteristic points and the development of system components. Finally, we describe the integration of the software with the hardware components. This process consists of acquiring and processing each separate camera view, combining the information from different cameras to calculate the location of an object in three dimensions, and tracking the information history and the behavior of the objects.
NTIS
Physical Optics; Bandwidth; Fractals; Polynomials; Singularity (Mathematics)

20020088425 General Accounting Office, Washington, DC USA
Telecommunications: Issues in Providing Cable and Satellite Television Services
Oct. 2002; 60p
Report No.(s): PB2003-100910; GAO-03-130; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report provides information on (1) whether the availability of cable modem Internet access service appears to be affecting the competitiveness of direct broadcast satellite (DBS) companies in the provision of video services, (2) whether cable prices and DBS penetration rates appear to be affected in areas where the DBS companies offer local broadcast channels, and (3) whether the two individual DBS companies are technologically capable of expanding local broadcast channel services into all 210 television markets in the USA.
NTIS
Cable Television; Satellite Television

20020088428 NASA Ames Research Center, Moffett Field, CA USA
Analysis and Testing of Mobile Wireless Networks
Alena, Richard, NASA Ames Research Center, USA; Evenson, Darin, Naval Postgraduate School, USA; Rundquist, Victor, DeAnza Coll., USA; [2002]; 14p; In English; IEEE Aerospace Conference, 10 Mar. 2002, Big Sky, MT, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Report No.(s): IEEE Paper-410; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Wireless networks are being used to connect mobile computing elements in more applications as the technology matures. There are now many products (such as 802.11 and 802.11b) which ran in the ISM frequency band and comply with wireless network standards. They are being used increasingly to link mobile Intranet into Wired networks. Standard methods of analyzing and testing their performance and compatibility are needed to determine the limits of the technology. This paper presents analytical and experimental methods of determining network throughput, range and coverage, and interference sources. Both radio frequency (BE) domain and network domain analysis have been applied to determine wireless network throughput and range in the outdoor environment- Comparison of field test data taken under optimal conditions, with performance predicted from RF analysis, yielded quantitative results applicable to future designs. Layering multiple wireless network- sooners can increase performance. Wireless network components can be set to different radio frequency-hopping sequences or spreading functions, allowing more than one sooner to coexist. Therefore, we ran multiple 802.11-compliant systems concurrently in the same geographical area to determine interference effects and scalability, The results can be used to design of more robust networks which have multiple layers of wireless data communication paths and provide increased throughput overall.
Author
Computer Networks; Wireless Communication; Frequency Domain Analysis; Network Analysis

20020089511 Swedish Defence Research Establishment, Stockholm, Sweden
C4 Challenges in Swedish Defence Doctrine and Programmes
Gundmark, Thomas; Sep. 2001; 4p; In English; See Also ADM001419 for whole conference on CD-ROM. These papers are from the Harnessing Advanced Technology for C4ISTAR, The Annual Advanced Technology Conference (2d), held 25-27 September 2001 at The Great Malvern Theatre Complex
Contract(s)/Grant(s): F61775-01-W-F031
Report No.(s): AD-A406693; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

NO abstract
Author
Communication; Swedish Space Program; Command and Control; Defense Program

20020089546 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Joint Forward Operating Base Elements of Command and Control
Summers, William C.; Jan. 2002; 104p; In English
Report No.(s): AD-A406873; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Since the 1986 Goldwater-Nichols Act directed the Chairman of the Joint Chiefs of Staff to develop doctrine for the joint employment of the armed forces, tactics, techniques, and procedures have evolved at different rates depending on the competency. Whereas the command of joint air forces is well prescribed within the structure of the air operations center and its associated leadership, command of air assets at a joint forward operating base lacks guidance. Today, the USA prosecutes an air war over Afghanistan from bases in Uzbekistan, Pakistan, and Afghanistan. Elements of the USA Army, Air Force, and Marines combine at these geographically minute locations, each bringing a certain complement of support and command and control. Evidence from operations during the 1999 air war for Kosovo at Tirana Rinas Airport in Albania suggests that when these service elements meet at the airfield for the first time, there are problems associated with local procedure. At best, time is wasted creating local joint systems to overcome the difficulties. At worst, safety and mission accomplishment are jeopardized. This thesis will address the

need to develop doctrine and a jointly integrated organization to support the command and control function at a forward operating base.
DTIC
Command and Control; Armed Forces; Military Operations

20020089560 Naval Postgraduate School, Monterey, CA USA
Mixed Signal Processor for a Robust Symmetrical Number System Direction Finding Antenna
Babb, Charles F.; Sep. 2002; 118p; In English; Original contains color images
Report No.(s): AD-A406906; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This applied research project has designed, simulated, constructed and tested the performance of a processing system for a prototype direction finding antenna. A mixed signal architecture to derive the direction of arrival from a Robust Symmetrical Number System (RSNS) encoded direction finding array is based on a new phase sampling interferometer approach that can be easily incorporated into established techniques to provide a high resolution, small-baseline array with few number of phase sampling comparators. The approach is based on preprocessing the received signal using the RSNS. The preprocessing is used to decompose the spatial filtering operation into a number of parallel suboperations (moduli) that are of smaller computational complexity. A much higher direction finding spatial resolution is achieved after the N different moduli are used and the results of the low precision suboperations are recombined, in addition to the reduction of the number of possible encoding errors due to the RSNS' inherent Gray-coding properties. This has resulted in a four inch antenna array being able to attain an angular resolution of less than 1.8 degrees with a continuous field of view of 120 degrees. The accompanying electronics occupy two 6 inch by 8 inch printed circuit boards, making this system ideal for platforms with limited space and volume.
DTIC
Signal Processing; Direction Finding

20020089990 Naval Postgraduate School, Monterey, CA USA
Performance of the IEEE 802.11a Wireless Lan Standard Over Frequency-Selective, Slow, Ricean Fading Channels
Kao, Chi-han; Sep. 2002; 115p; In English; Original contains color images
Report No.(s): AD-A407042; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

With the rapidly growing demand for more reliable and higher data rate wireless communications, the Institute of the Electrical and Electronics Engineers (IEEE) 802.11 working group approved a standard for 5-GHz band, Wireless Local Area Networks (WLAN) in 1999. This standard, IEEE 802.lla, supports data rates from 6 up to 54 Mbps and uses Orthogonal Frequency Division Multiplexing (OFDM) for transmission in indoor wireless environments. This thesis examines the performance of the IEEE 802.lla standard for different combinations of sub-carrier modulation type and code rate and determines the signal-to-noise ratio required to obtain a probability of bit error P(b) of 10(sub -5). The channel is modeled as frequency-selective, slow, Ricean fading channel with Additive White Gaussian Noise (AWGN). Contrary to expectations, for the combinations of sub-carrier modulation type and code rate utilized by the IEEE 802.11a standard, some of the higher data rate combinations outperform some of the lower data rate combinations. On the other hand, the results also show significant coding gain when applying convolutional coding with Viterbi decoding, and hence highlight the importance of Forward Error Correction (FEC) coding to the performance of wireless communications systems.
DTIC
Local Area Networks; Electrical Engineering; Radiotelephones; Telecommunication; Radio Communication; Channels (Data Transmission); Wireless Communication

20020089995 Naval Postgraduate School, Monterey, CA USA
Quantifying the Differences in Low Probability of Intercept Radar Waveforms Using Quadrature Mirror Filtering
Jarpa, Pedro; Sep. 2002; 174p; In English; Original contains color images
Report No.(s): AD-A407033; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Low Probability of Intercept (LPI) radars are a class of radar systems that possess certain performance% characteristics causing them to be nearly undetectable by most modern digital intercept receivers, Consequently, LPI radar systems can operate undetected until the intercept receiver is much closer than the radar's target detector, The enemy is thus faced with a significant problem To detect these types of radar, new direct digital receivers that use sophisticated signal processing are required, This thesis describes a novel signal processing architecture, and shows simulation results for a number of LPI waveforms. The LPI signal detection receiver is based on Quadrature Minor Filter Bank (QMFB) Tree processing and orthogonal wavelet techniques to decompose the input waveform into components representing the signal energy in rectangular "tiles" in the time-frequency plane, by analyzing the outputs at different layers of the tree it is possible to do feature extraction, identify and classify the LPI waveform

parameters, and distinguish among the various LPI signal modulations Waveforms used as input signals to the detection algorithm include Frequency Modulated Continuous Wave, Polyphase Codes, Costas Codes and Frequency Shift Keying/Phase Shift Keying waveforms. The output matrices resulting from the most relevant layers of the QMFB tree processing are examined and the LPI modulation parameters are extracted under various signal-to-noise ratios,
DTIC
Digital Systems; Signal Processing; Interception; Quantitative Analysis; Continuous Radiation; Architecture (Computers); Target Recognition; Radar Signatures

20020089998 Naval Postgraduate School, Monterey, CA USA
Coding-Spreading Tradeoff in CDMA Systems
Bolas, Eduardo J.; Sep. 2002; 111p; In English
Report No.(s): AD-A407027; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In this thesis we investigate the usage of low rate codes primarily to provide the total bandwidth expansion required for a Code Division Multiple Access (CDMA) combinations of coding and spreading with a traditional DS-CDMA, as defined in the IS-95 standard, allows the criteria to be defined for the best coding-spreading tradeoff in CDMA systems. The analysis of the coding-spreading tradeoff is divided into two parts. The first part is dedicated to the study of the deterministic components of the problem. This includes the different factors with non-random behavior that the system's designer can determine. The processing gain, the code characteristics and the number of users are well-defined variables that can determine the overall performance and can consequently affect the tradeoff. The second part of the study is dedicated to analyzing different combinations of coding and spreading with no ideal channel estimation and interference reduction techniques. Small-scale fading channel conditions are emulated through Nakagami-m distribution. Large-scale path loss was incorporated through the extended Hata model while Lognormal shadowing considered the fluctuations on the received power at points with the same distance to the transmitter. We assessed the performance of different combinations of coding and spreading considering in two cases: a worst-case scenario in which the mobile user was located at the corner of a hexagon cell in a seven-cell cluster and a more realistic scenario in which the user could be physically located anywhere in the cell, following a uniform probability distribution function. Furthermore, we investigated the improvement in performance generated by interference reduction techniques, such as sectoring and power control.
DTIC
Signal Processing; Coding; Wireless Communication; Channels (Data Transmission); Transmitters

20020090002 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Study of Clutter Reduction Techniques in Wide Bandwidth HF/VHF Deep Ground Penetrating Radar
Hammett, Darien J.; Aug. 2002; 147p; In English; Original contains color images
Report No.(s): AD-A407013; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Reducing clutter is one of the most daunting problems a radar processing engineer faces. Clutter causes a significant problem when attempting to detect sub-surface targets, as any significant change in the ground dielectric will produce a return at the receiver. The difficulty in reducing the clutter is compounded by the fact that the spectral characteristics of the clutter are similar to that of the target. While there are many methods that exist to reduce clutter, few do not require a prior information of either the target or the clutter. There are applications, of interest to the electromagnetic community, that are restricted in the amount of a prior information available to them. Estimation-subtraction filters calculate an estimate of the clutter from the statistics of the data collected and subtract that estimate from the original data. The Wiener filter has long been used as a way to suppress noise signals when a target reference is known. Using it to reduce clutter is a relatively new area of research. This research proposes estimation-subtraction filters and an application of the Wiener filter, which do not require a priori information to reduce the clutter of a bi-static synthetic aperture based, wideband deep ground penetrating radar system. The results of applying these filters to data collected in this way, at these depths, are illustrated here for the first time. x
DTIC
Clutter; Ground Penetrating Radar; Broadband

20020090100 Naval Postgraduate School, Monterey, CA USA
Performance Analysis of a Digital Image Synthesizer as a Counter-Measure Against Inverse Synthetic Aperture Radar
LeDantec, Fernando A.; Sep. 2002; 156p; In English; Original contains color images
Report No.(s): AD-A407076; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This thesis is concerned with the development of a model to analyze a Digital Image Synthesizer (DIS) integrated circuit designed to create false target images to deceive Inverse Synthetic Aperture Radar (ISAR). The DIS is able to recreate the

scattering effect of a moving target by using appropriate phase and gain modulations on an intercepted ISAR chirp signal before retransmitting it with the proper time delay. The DIS signal processing and the ISAR compression of the modulated return are modeled to examine the range-Doppler profile of a synthesized false target image. The image is representative of the image that would appear on an ISAR display. ISAR image quality is used to evaluate different DIS architectures and bit formats. Evaluation of the image quality is based on the deviation from an infinite resolution false target image. The results obtained from evaluating different DIS architectures indicate that the design is tolerant of significant quantization errors. The model is used to validate the architecture of the integrated circuit being fabricated. Finally, various different ISAR integration times and pulse repetition frequencies are used to confirm the integrity of the model.
DTIC
Signal Processing; Image Processing; Digital Systems; Synthetic Aperture Radar; Performance Tests; Synthesizers

20020090104 Naval Postgraduate School, Monterey, CA USA
Smart Antenna Application in DS-CDMA Mobile Communication System
Ng, Kok K.; Sep. 2002; 83p; In English; Original contains color images
Report No.(s): AD-A407090; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This thesis examine the use of an equally-spaced linear adaptive antenna array at the mobile station for a typical Direct Sequence Code Division Multiple Access (DS-CDMA) cellular mobile communications system with forward error correction, with soft decision decoding is studied, We analyze the performance of a randomly positioned mobile terminal with a randomly orientated adaptive antenna array in the forward channel (base- station to mobile) of a multi-cell DS-CDMA system and established four performance% boundaries, Using the more conservative optimized array antenna performance boundary for the 2-, 3- and 4-element linear array, we compare the capacity and the performance% of different cellular systems under a range of shadowing conditions, with and without antenna sectoring at the base-station, and for various user capacities, using Monte Carlo simulation We further apply tapped-delay line (transversal filter) to each antenna element channel, to allow frequency dependent amplitude and phase adjustment for broadband signals, The performance of a DS-CDMA cellular system with a mobile terminal equipped with a linear array and a tapped-delay line is analyzed, It has been demonstrated that the optimization process has been extremely computationally expensive and hence minimum taps should be used for practical consideration, The results illustrated that, in general, for a 2-element linear array system, a 3-tap delay line would be sufficient to equalize the broadband signal while providing a similar performance level to that of a narrow-band adaptive array system In the case of a 3-element linear array system, a 2-tap delay line would suffice.
DTIC
Linear Arrays; Radio Signals; Antenna Components; Communication; Broadcasting

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ELECTRONICS AND ELECTRICAL ENGINEERING

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

20020087670 Swedish Defence Research Establishment, Stockholm, Sweden
Proposal of a Model for Balancing Resources between Projects in the Electromagnetic Field *Foerslag till Modell foer Resursavvaegning Mellan Projekt inom det Eletromagnetiska Omradet*
Kindvall, G.; Wiss, A.; Feb. 2002; 32p; In Swedish
Report No.(s): PB2003-100473; FOI-R-0416-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors propose a model for allocation of funds between existing and proposed projects within the research field named 'Electromagnetic weapons and protection.' Central parts in the model are zero-base budgeting connected to a so called 'research ladder,' identification of influence factors and matrices used in statistics and decision theory. The model is to be verified during the spring of 2002, after which a revised version of this report will be published.
NTIS
Electronic Warfare; Electromagnetic Fields; Research Projects; Balancing

20020087755 Oak Ridge National Lab., TN USA
Radioisotope Power: System Materials Production and Technology Program ***Semiannual Report, Sep. 2000 - Mar. 2001***
Moore, J. P.; May 22, 2001; 50p; In English
Report No.(s): DE2001-786330; ORNL/CF-01/24; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available
NTIS
Radioisotope Batteries; Production Planning; Auxiliary Power Sources

20020087798 National Inst. of Standards and Technology, Office of Mircroelectronics Program, Gaithersburg, MD USA
Silicon Microelectronics Programs at the National Institute of Standards and Technology: Programs, Activities, and Accomplishments
Knight, S.; Martinez de Pinillos, J. V.; Belzer, B. J.; Buckley, M.; Apr. 2001; 176p; In English
Report No.(s): PB2001-103938; NISTIR-6731; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The microelectronics industry supplies vital components to the electronics industry and to the U.S. economy, enabling rapid improvements in productivity and in new high technology growth industries such as electronic comer and biotechnology. The National Institute of Standards and Technology, NIST, in fulfilling its mission of strengthening the U.S. economy, works with industry to develop and apply technology, measurements and standards; and applies substantial efforts on behalf of the semiconductor industry and its infrastructure. This report describes the many projects being conducted at NIST that constitute that effort.
NTIS
Semiconductor Devices; Microelectronics

20020087870 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Point-spread function in depleted and partially depleted CCDs
Groom, D. E.; Eberhard, P. H.; Holland, S. E.; Levi, M. E.; Palaio, N. P.; Oct. 13, 1999; 8p; In English
Report No.(s): DE2001-788013; LBNL-45276; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The point spread function obtainable in an astronomical instrument using CCD readout is limited by a number of factors, among them the lateral diffusion of charge before it is collected in the potential wells. They study this problem both theoretically and experimentally, with emphasis on the thick CCDs on high-resistivity n-type substrates being developed at Lawrence Berkeley National Laboratory.
NTIS
Optical Measuring Instruments; Charge Coupled Devices; Electrical Resistivity

20020087871 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Recent progress on CCDs for astronomical imaging
Groom, D. E.; Feb. 28, 2000; 12p; In English
Report No.(s): DE2001-788014; LBNL-45277; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We review recent progress in the field, using as a framework a partial list of present limitations and problems: CCD and mosaic size, packing fraction in mosaics, red response and fringing, and intrinsic point-spread function due to lateral charge diffusion. Related topics such as orthogonal-transfer CCDs and the special requirements of adaptive-optics wavefront sensors are also discussed. Only cursory attention is given to other relevant issues, such as readout speed and anti-blooming techniques.
NTIS
Telescopes; Charge Coupled Devices; Adaptive Optics; Imaging Techniques

20020087949 NASA Goddard Space Flight Center, Greenbelt, MD USA
Recent Flight Results of the TRMM Kalman Filter
Andrews, Stephen F., NASA Goddard Space Flight Center, USA; Bilanow, Stephen, Science Applications International Corp., USA; [2002]; 10p; In English; AIAA/AAS Astrodynamics Specialist Conference, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright
The Tropical Rainfall Measuring Mission (TRMM) spacecraft is a nadir pointing spacecraft that nominally controls the roll and pitch attitude based on the Earth Sensor Assembly (ESA) output. TRMM's nominal orbit altitude was 350 km, until raised to 402 km to prolong mission life. During the boost, the ESA experienced a decreasing signal to noise ratio, until sun interference at 393 km altitude made the ESA data unreliable for attitude determination. At that point, the backup attitude determination

algorithm, an extended Kalman filter, was enabled. After the boost finished, TRMM reacquired its nadir-pointing attitude, and continued its mission. This paper will briefly discuss the boost and the decision to turn on the backup attitude determination algorithm. A description of the extended Kalman filter algorithm will be given. In addition, flight results from analyzing attitude data and the results of software changes made onboard TRMM will be discussed. Some lessons learned are presented.
Author
Trmm Satellite; Attitude (Inclination); Satellite Attitude Control; Kalman Filters; Altitude Control; Algorithms; Mathematical Models

20020088728 Cleveland State Univ., Dept. of Electrical and Computer Engineering, Cleveland, OH USA
A Nonlinear Digital Control Solution for a DC/DC Power Converter ***Final Report***
Zhu, Minshao, Cleveland State Univ., USA; February 2002; 309p; In English
Contract(s)/Grant(s): NCC3-699; CSU-GAOZH08; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
A digital Nonlinear Proportional-Integral-Derivative (NPID) control algorithm was proposed to control a 1-kW, PWM, DC/DC, switching power converter. The NPID methodology is introduced and a practical hardware control solution is obtained. The design of the controller was completed using Matlab (trademark) Simulink, while the hardware-in-the-loop testing was performed using both the dSPACE (trademark) rapid prototyping system, and a stand-alone Texas Instruments (trademark) Digital Signal Processor (DSP)-based system. The final Nonlinear digital control algorithm was implemented and tested using the ED408043-1 Westinghouse DC-DC switching power converter. The NPID test results are discussed and compared to the results of a standard Proportional-Integral (PI) controller.
Author
Voltage Converters (DC to DC); Control Systems Design; Power Converters; Algorithms; Hardware-In-The-Loop Simulation; Design Analysis

20020089436 Ioffe (A. F.) Physical-Technical Inst., Saint Petersburg, Russia
Nanostructures: Physics and Technology 6th International Symposium
Alferov, Zh.; Esaki, L.; Jun. 26, 1998; 552p; In English, 22-26 Jun. 1998, Saint Petersburg, Russia; For individual articles, see ADP012712 thru ADP012852
Report No.(s): AD-A406591; No Copyright; Avail: CASI; A24, Hardcopy
6TH International Symposium held in St. Petersburg Russia on 22-26 Jun 1998.
DTIC
Conferences; Nanostructure (Characteristics); Semiconductor Lasers; Technology Utilization; Quantum Electronics

20020089451 Slovak Academy of Sciences, Inst. of Electrical Engineering, Bratislava, Slovak Republic
Critical Currents and AC Losses in Model YBCO Structures ***Final Report, 19 Apr. 2001-29 Aug. 2002***
Polak, Milan; Krempasky, L.; Demencik, E.; Moenter, B.; Kreiskott, S.; May 2002; 27p; In English; Original contains color images
Contract(s)/Grant(s): F61775-01-WE027
Report No.(s): AD-A406682; EOARD-SPC-01-4027; No Copyright; Avail: CASI; A03, Hardcopy
This report results from a contract tasking Institute of Electrical Engineering as follows: The contractor will investigate yttrium-barium-copper oxide (YBCO) coatings divided into filaments with various widths and separations. AC loss measurements as well as magnetization measurements will be conducted using a Hall Probe magnetometer. Experimental results will then be compared with the theoretical models and predictions by the UK research group (SPC 014028).
DTIC
Coatings; YBCO Superconductors; Magnetometers; Critical Current

20020089459 California Univ., Electrical Engineering Dept., Los Angeles, CA USA
Photonic Band Engineering ***Final Report, 1 Sept 1996-31 Sep. 2001***
Yabonovitch, Eli; Sep. 2001; 23p; In English
Contract(s)/Grant(s): DAAH04-96-1-0389
Report No.(s): AD-A406802; ARO-35875-PH-MUR.164; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Scientists at UCLA, Caltech, and Polytechnic University have developed a new concept in Electromagnetics called ”Photonic Bandgaps’ that permits unprecedented control of Electromagnetic Waves, at both radio frequencies, and optical frequencies. This new paradigm of Electromagnetics is based on Nature’s design for semiconductor crystals, but it is a crystal structure that is artificially engineered for electromagnetic waves rather than for electron waves. Beginning in 1996, new frontiers in the

engineered control of electromagnetic waves have emerged from this design paradigm. For example, the very tiniest, most miniaturized electromagnetic cavity ever created was engineered, and demonstrated, under this MURI; trapping optical energy in the smallest volume ever achieved. This world's most tiny light trap was also made into the most miniaturized laser ever made, occupying a volume smaller than a cubic wavelength. At the same time this MURI advanced the electromagnetic bandgap concept into microwaves and radio waves that are so important for military systems. This required new concepts that permitted the bandgap structure to be much smaller than the electromagnetic wavelength. As in the optical version of photonic crystals, these electromagnetic bandgaps permit unprecedented control over radio frequency electromagnetic waves. For example new antenna structures have been invented that permit near field control over radio emissions from antennas, so that the hand-held radio transmitters can be more efficient.
DTIC
Photonics; Electromagnetic Radiation; Radio Waves; Antenna Arrays; Energy Gaps (Solid State)

20020089529 Virginia Polytechnic Inst. and State Univ., Dept. of Electrical and Computer Engineering, Blacksburg, VA USA
Control and Optimization of Regenerative Power Flow in 21st Century Airlifters ***Final Report, 21 Jun. 1999-30 Nov. 2001***
Lindner, Douglas K.; Boroyevich, Dushan; Dec. 01, 2001; 168p; In English
Contract(s)/Grant(s): F49620-99-C-0035
Report No.(s): AD-A406718; AFRL-SR-AR-TR-02-0320; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
In this project we investigated the optimization of the power distribution system and some of its components for 21st century airlifters. Herein we describe the formulation of an optimization problem for typical components found in a power distribution system: an input filter and a buck converter. The optimization formulation includes time and frequency domain constraints as well as optimization of the inductors. An optimization problem is formulated for each of the components, but it is formulated in such a way that the two-optimization problems can be easily integrated into a single optimization problem accounting for internal stability. Using this principle, an optimization problem can be formulated for each component of the power distribution system, and then integrated into the combined optimization of the entire system. An example is given in which the system is optimized to bound the effect of the regenerative power flow onto the aircraft power bus. A bi-Level formulation is introduce which significantly reduces the computational complexity of the optimization problem. It is anticipated that the next generation aircraft will include novel actuators that incorporate piezoelectric material. Since this material is an energy transducer, we can expect these actuators to regenerate power back onto the power bus. to study this effect, models are developed of the actuators and the power flow is investigated as a function of the internal control loops. Then an optimization problem is formulated for the drive amplifiers for these actuators.
DTIC
Transport Aircraft; Inductors; Stability; Transducers; Actuators

20020089553 California Univ., Electrical Engineering Dept., Los Angeles, CA USA
Low Power/Low Noise Electronics Technologies for Wireless Communications ***Final Report***
Itoh, Tatsuo; Jan. 31, 2002; 7p; In English
Contract(s)/Grant(s): DAAH04-96-1-0005
Report No.(s): AD-A406885; ARO-34992.37-EL-MUR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
We had previously written a Final Report for this award on August 1, 2001. At that time we provided ARO, as Appendix to Final Report, with three copies of the book 'RF Technologies for Low Power Wireless Communications'. Due to administrative reasons, we requested and were granted an extended contractual period to January 31, 2002. This period was used only to complete the last remaining technical activity that was carried out by the group of T. Itoh in the area of Active Integrated Antennas based on GaN transistor.
DTIC
Low Noise; Transistors

20020089586 Air Force Research Lab., Directed Energy Directorate, Kirkland AFB, NM USA
Summary of Electromagnetic Interference Measurements at Mt. Haleakala Observation Facilities ***Final Report***
Lawry, Dean I.; Langdon, S. L.; Gutierrez, S. J.; Apr. 1998; 23p; In English
Contract(s)/Grant(s): Proj-4241
Report No.(s): AD-A406808; AFRL-DE-PS-TR-1998-1040; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report documents electromagnetic interference (EMI) measurements made at the Air Force's new Advanced Electro-Optical System (AEOS) and the Space Command Optical facilities located at the summit of Mt. Haleakala, Maui, Hawaii. It also documents EMI measurements made at the University of Hawaii 5 observation facilities also located on Mt. Haleakala.

EMI free field measurements were made at various external and internal locations at these facilities to determine the electromagnetic field characteristics created by local television and radio transmitters located nearby. Some limited cable coupling measurements were also made at the AEOS facility. A Tektronix 2716 spectrum analyzer and a EMCO 3104C bicone antenna were used to make the free field measurements. EG&G SCP-1 and SCP-5 clamp on current probes were used to make the cable measurements. External field levels measured within direct line of sight of nearby television transmitting antennas were as high as 5 V/m. Other measurements made inside well shielded areas were in the noise floor of the spectrum analyzer. Measured frequencies ranged from 61 MHz to 450 MHz.
DTIC
Electromagnetic Interference; Electro-Optics; Radio Transmitters; Television Transmission; Analyzers

20020089594 California Univ., San Diego, Office of Contract and Grant Administration, La Jolla, CA USA
Semiconductor Photonic Components for RF Applications ***Final Report, Mar.-Dec. 2001***
Yu, Paul K. L.; Wu, Yang; Li, G. L.; Zhuang, Yuling; Mages, Phil; Clawson, A. R.; Aug. 2002; 36p; In English; Original contains color images
Contract(s)/Grant(s): F30602-01-2-0516; Proj-2002
Report No.(s): AD-A406821; AFRL-SN-RS-TR-2002-214; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of this program was to advance the performance of the semiconductor waveguide modulator in externally modulated RF fiber-optic links for space-based and airborne platforms such as true time delay beam formation and beam steering subsystem in phased array antennas. Device and material approaches were investigated to improve the modulator based on semiconductor structures for achieving high spur free dynamic range (SFDR) and high frequency operation. In these approaches, the semiconductor optical modulators were specifically designed to achieve high slope efficiency and high center frequency, while at the same time maintaining minimal generation of spurious signals. The fiber-optic links using these modulators are expected to satisfy the low noise figure, high center frequencies, low power requirements. A high performance electroabsorption modulator with more than 40 GHz bandwidth has been fabricated and evaluated. A new design was investigated for a quantum well modulator that includes an intra-barrier to enhance the power handling and slope efficiency. Both theory and experiment has been carried out to demonstrate this concept.
DTIC
Radio Frequencies; Photonics; Fiber Optics; Semiconductor Devices; Fabrication; Waveguides

20020089606 NASA Pasadena Office, CA USA
Composite Material Switches
Javadi, Hamid, Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Sep. 03, 2002; 10p; In English; Division of abandoned US-Patent-Appl-SN-530976, filed 20 Sep. 1995
Patent Info.: Filed 28 Dec. 2000; NASA-Case-NPO-19442-3-CU; US-Patent-6,445,280; US-Patent-Appl-SN-808047; US-Patent-Appl-SN-530976; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A device to protect electronic circuitry from high voltage transients is constructed from a relatively thin piece of conductive composite sandwiched between two conductors so that conduction is through the thickness of the composite piece. The device is based on the discovery that conduction through conductive composite materials in this configuration switches to a high resistance mode when exposed to voltages above a threshold voltage.
Official Gazette of the U.S. Patent and Trademark Office
Circuits; Composite Materials; Switches; Electronic Equipment; Microelectronics

20020089851 Academy of Sciences of the Lithuanian SSR, Semiconductor Physics Inst., Vilnius, Lithuania
Generation of Very High and Ultrahigh Frequency Broadband Chaotic Signals Using Delay Line Oscillators ***Final Report, 19 Jul. 2001-19 Jul 2002***
Tamasevicius, Arunas; Aug. 20, 2002; 27p; In English
Contract(s)/Grant(s): F61775-01-W-E065
Report No.(s): AD-A406825; EOARD-SPC 01-4065; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report results from a contract tasking Semiconductor Physics Institute as follows: The contractor will investigate chaotic electronic oscillators operating in the VHF and the UHF ranges. Chaos oscillators will be investigated both numerically and experimentally with the goal of developing a systematic approach toward design, active nonlinear device selection, and performance optimization. The research will encompass three aspects in both the VHF frequency range and UHF frequency range:

Design of a delay line based oscillator; Development and numerical investigation of the mathematical model; Building and experimental investigation of a hardware prototype.
DTIC
Oscillators; Delay Lines; Frequency Ranges; Broadband; Semiconductors (Materials)

20020089858 Analog Devices, Inc., Wilmington, MA USA
Computer-Aided Design (CAD) for Integrated Microelectromechanical (MEMS) devices ***Final Report, Sep. 1996-Sep 2001***
Judy, Michael; Aug. 2002; 44p; In English; Original contains color images
Contract(s)/Grant(s): F30602-96-2-0290; Proj-E117
Report No.(s): AD-A406776; AFRL-IF-RS-TR-2002-176; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this ”CAD for Integrated MEMS Devices” research project was to develop MEMS CAD design and development tools that would facilitate the creation of behavioral models for complex MEMS devices. More complex and capable MEMS devices are becoming a reality to extend out country’s technological leadership in military and commercial electronics, which in turn would help maintain our military superiority. to this end, the project focused on creating a uniform design environment for the design and simulation of high-performance, complex integrated MEMS systems. The initial activity focused primarily on the MEMS systems design, however it became clear that incorporating integrated circuit simulations with the MEMS behavioral models was a priority. This provided more accurate simulations of the integrated MEMS systems as well as the environment they were intended to operate within. The resulting design environment provides the designer with an increased likelihood of functional first silicon. High performance MEMS devices such as accelerometers and gyros require the MEMS, circuits and their interactions to be fully simulated -primarily because MEMS devices exhibit fundamentally more complex interactions than those required in conventional electronic CAD.
DTIC
Computer Aided Design; Microelectromechanical Systems; Complex Systems

20020089991 Naval Postgraduate School, Monterey, CA USA
A Fixed-Point Phase Lock Loop in a Software Defined Radio
Johannes, Michael T.; Sep. 2002; 89p; In English; Original contains color images
Report No.(s): AD-A407041; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A software defined radio is a much more flexible platform than traditional, hardware implemented radios, by implementing radio functions in software, and putting those functions on a Field Programmable Gate Array (FPGA) chip, users will have the ability to download mission specific radio capabilities. This thesis examines a fundamental piece of the receiver, the Phase-Lock Loop (PLL), simulates a software PLL, and investigates the effects of fixed-point versus floating point mathematics required for an FPGA based PLL. With a fixed-point PLL simulator, figures of merit such as lock-time, lock range, and pull-in range are determined% for typical signal-to-noise ratio (SNR) levels.
DTIC
Computer Programs; Computer Programming; Phase Locked Systems; Radio Equipment; Signal to Noise Ratios

20020090271 Air Force Research Lab., Directed Energy Directorate, Kirkland AFB, NM USA
A Composite Capacitor/Inductor Assembly for Resonant Circuits ***Final Report, Jun. 2000-June 2001***
Hull, J. P.; Scholfield, D. W.; Jun. 2001; 24p; In English
Contract(s)/Grant(s): AF Proj. 4867
Report No.(s): AD-A406884; AFRL-DE-TR-2001-1060; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Resonant structures are of interest due to their ability to produce oscillatory voltages in circuits. Past resonant structures have typically been designed using a lumped element capacitor for energy storage and a separate inductor. A composite capacitor/inductor assembly has been developed which merges the capacitance utilized for energy storage into the inductor, creating a consolidated electrical component. Composite capacitor/inductor assemblies are of interest due to the ability of these devices to produce resonant responses with one half the number of parts required by more traditional resonant structures. This composite capacitor/inductor could be utilized in applications of frequency band suppression or frequency band pass for frequencies in excess of 100 MHz, or where a resonant circuit is required to reside in an area of minimum space - such as a printed circuit board or an integrated circuit. The device and the mathematical treatment to predict the device’s performance are described.
DTIC
Capacitors; Inductors; Integrated Circuits

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FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics.

20020087661 Johns Hopkins Univ., Dept. of Mechanical Engineering, Baltimore, MD USA
The Effect of Viscosity on the Spherical Stability of Oscillating Gas Bubbles
Hao, Y., Johns Hopkins Univ., USA; Prosperetti, A., Johns Hopkins Univ., USA; Physics of Fluids; June 1999; ISSN 1070-6631; Volume 11, No. 6, pp. 1309-1317; In English; Copyright; Avail: Issuing Activity

Gas bubbles driven in radial oscillations are subject to an instability of the spherical shape that is opposed by surface tension and viscosity. An exact linear formulation for the study of the phenomenon has been available for many years, but its complexity has discouraged a detailed investigation. With the recent theory of sonoluminescence of Lohse and co-workers, there has been a renewed interest in the problem and new data have become available. This paper presents a numerical method for the solution of the pertinent equations and compares the theory with these new data. The coupling of the strong nonlinearity of the bubble radial oscillations with the parametric mechanism of the surface instability results in a very complex structure for the stability boundary. Nevertheless, a good agreement between theory and data is found. A comparison with earlier approximate models is also made. Author
Viscosity; Surface Stability; Spherical Shells; Oscillations; Gases; Bubbles

20020088423 NASA Glenn Research Center, Cleveland, OH USA
An Experimental Investigation of the Flow Structure of Supersonic Impinging Jets
Henderson, Brenda, Kettering Univ., USA; Bridges, James, NASA Glenn Research Center, USA; Wernet, Mark, NASA Glenn Research Center, USA; Mar. 28, 2002; 12p; In English; 8th AIAA/CEAS Aeroacoustics Conference, 17-19 Jun. 2002, Breckinridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 781-30-12; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

An experimental investigation into the jet structure associated with sound production by a supersonic impinging jet is presented. Large plate impinging tones are investigated for a nozzle pressure ratio (NPR) of 4 and nozzle-to-plate spacings between 1 and 5 nozzle exit diameters, where NPR is equal to the ratio of the stagnation pressure to the pressure at the nozzle lip. Results from phase-locked shadowgraph and phase-averaged digital particle image velocimetry (DPIV) studies indicate that, during the oscillation cycle, the Mach disk oscillates axially, a well defined recirculation zone is created in the subsonic impingement region and moves toward the plate, and the compression and expansion regions in the outer supersonic flow move downstream, Sound appears to be generated in the wall jet at approximately 2.6R from the jet axis, where R is the nozzle exit radius. The oscillatory motion in the wall jet is the result of the periodic fluid motion in the near wall region.
Author
Jet Flow; Aeroacoustics; Supersonic Flow; Jet Impingement

20020089466 NASA Johnson Space Center, Houston, TX USA
Bubble Measuring Instrument and Method
Kline-Schoder, Robert, Inventor, NASA Johnson Space Center, USA; Magari, Patrick J., Inventor, NASA Johnson Space Center, USA; Oct. 15, 2002; 18p; In English; Divsion of US-Patent-Appl-SN-498440, filed 4 Feb. 2000
Patent Info.: Filed 26 Mar. 2002; NASA-Case-MSC-22980-2; US-Patent-6,463,785; US-Patent-Appl-SN-113647; US-Patent-Appl-SN-498440; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Method and apparatus are provided for a non-invasive bubble measuring instrument operable for detecting. distinguishing, and counting gaseous embolisms such as bubbles over a selectable range of bubble sizes of interest. A selected measurement volume in which bubbles may be detected is insonified by two distinct frequencies from a pump transducer and an image transducer, respectively. The image transducer frequency is much higher than the pump transducer frequency. The relatively low-frequency pump signal is used to excite bubbles to resonate at a frequency related to their diameter. The image transducer is operated in a pulse-echo mode at a controllable repetition rate that transmits bursts of high-frequency ultrasonic signal to the measurement volume in which bubbles may be detected and then receive, the echo. From the echo or received signal, a beat signal related to the repetition rate may be extracted and used to indicate the presence or absence of a resonant bubble. In a preferred

embodiment, software control maintains the beat signal at a preselected frequency while varying the pump transducer frequency to excite bubbles of different diameters to resonate depending on the range of bubble diameters selected for investigation.
Official Gazette of the U.S. Patent and Trademark Office
Bubbles; Signal Measurement; Measuring Instruments; Image Transducers; Detection

20020089488 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Numerical Boundary Conditions Simulating the Interaction Between Upstream Disturbances and an Axial Compressor
McMullan, Richard J.; Aug. 06, 2002; 128p; In English; Original contains color images
Report No.(s): AD-A406748; AFIT-CI02-522; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

New small disturbance and area reduction compressor face boundary conditions that model the unsteady interactions of acoustic disturbances with an axial compressor are presented. The new small disturbance boundary condition is formulated to correct the deficiencies associated with the Paynter small disturbance model. The area reduction boundary condition provides a simple approach for the inlet outflow boundary. Both of these boundary conditions are implemented in one-dimensional and axisymmetric turbulent flow models of the inlet/compressor experiment at the University of Cincinnati. Acoustic reflections from the compressor face boundary conditions are compared against the measured experimental reflection characteristics of the axial compressor. The performance of the boundary conditions is also compared against existing boundary conditions such as the Paynter small disturbance boundary condition. These comparisons show that the new small disturbance boundary condition provides the best accuracy in terms of the prediction of the reflected disturbance from the interaction of an acoustic disturbance with a compressor. The results also show that the area reduction boundary condition produces acoustic reflections that agree well with the experimental data.
DTIC
Numerical Analysis; Boundary Conditions; Axisymmetric Flow; Turbulent Flow; Turbocompressors

20020089514 Arizona Univ., Dept. of Aerospace and Mechanical Engineering, Tucson, AZ USA
The Effectiveness of Actuators Used in Active Flow Controls: Numerical Simulations, Analysis and Experiments ***Final Report, 1 Oct. 1998-31 Mar. 2002***
Fasel, Hermann; Wygnanksi, Israel J.; Gaster, Michael; May 2002; 109p; In English
Contract(s)/Grant(s): F49620-99-1-0015
Report No.(s): AD-A406701; AFRL-SR-AR-TR-02-0321; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Acquiring the ability to effectively modify and control the behavior of fluid flow continues to be a pervasive and important aspiration in many areas of engineering. The present research continues to advance the technology of various schemes that employ the use of wall-mounted actuators for active flow control. Any design in which fluid-flow characteristics are important (aircraft, turbomachinery, ships, etc.) stands to benefit from this new technology of manipulating the flow behavior by time dependent forcing. Research completed to date promises reduced cost, complexity, and weight along with significant improvement in design performance. A summary of this research indicates however, that the details of the disturbance excitation process have still not been completely explored, and hence an understanding of the important parameters in actuator design is currently unavailable to the engineer. Only with this knowledge will it be possible to design devices for specific tasks that are efficient and effective in their performance. Our program of research examines boundary value periodic point source excitations of laminar boundary layers, and considers how some more complex actuators might be modeled numerically. The study is carried out in three parts: 1. linear theory, and 2. wind tunnel measurements, iii. full Navier-Stokes modeling.
DTIC
Numerical Analysis; Flow Distribution; Flowmeters; Experimentation; Active Control

20020089524 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA
Computing Cluster for Large Scale Turbulence Simulations and Applications in Computational Aeroacoustics ***Final Report, 31 Mar. 2001-31 Mar 2002***
Lele, Sanjiva K.; Aug. 15, 2002; 10p; In English; Original contains color images
Contract(s)/Grant(s): F49620-01-1-0239
Report No.(s): AD-A406713; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Funds were received in April 2001 under the Department of Defense DURIP program for construction of a 48 processor high performance computing cluster. This report details the hardware which was purchased and how it has been used to enable and enhance research activities directly supported by, and of interest to, the Air Force Office of Scientific Research and the Department of Defense. The report is divided into two major sections. The first section after this summary describes the computer cluster, its

setup, and some cluster performance benchmark results. The second section explains ongoing research efforts which have benefited from the cluster hardware, and presents highlights of those efforts since installation of the cluster.
DTIC
Aerodynamic Noise; Computerized Simulation

20020089527 Louisiana State Univ., Dept. of Mechanical Engineering, Baton Rouge, LA USA
A 3D-PIV System for Gas Turbine Applications ***Final Report, 1 Apr. 2000-30 Sep. 2001***
Acharya, Sumanta; Aug. 19, 2002; 23p; In English
Contract(s)/Grant(s): F49620-00-1-0187
Report No.(s): AD-A406716; AFRL-SR-AR-TR-02-0304; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Funds were received in April 2001 under the Department of Defense DURIP program for construction of a 48 processor high performance computing cluster. This report details the hardware, which was purchased, and how it has been used to enable and enhance research activities directly supported by, and of interest to, the Air Force Office of Scientific Research and the Department of Defense. The report is divided into two major sections. The first section after the summary describes the computer cluster, its setup, and some cluster hardware, and presents highlights of those efforts since installation of the cluster.
DTIC
Particle Image Velocimetry; Flow Distribution

20020089530 Arizona Univ., Dept. of Aerospace and Mechanical Engineering, Tucson, AZ USA
Passive and Active Control of Supersonic Axisymmetric Base Flows: Direct Numerical Simulations and Large-Eddy Simulations ***Final Report, 1 May 1997-31 Jan. 2002***
Fasel, Hermann F.; Apr. 24, 2002; 116p; In English
Contract(s)/Grant(s): DAAG55-97-1-0128
Report No.(s): AD-A406719; ARO-36422.1-EG; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A new compressible Navier-Stokes code in cylindrical coordinates was developed for investigating axisymmetric wakes of bluff-based bodies in supersonic flows. In this code, high-order compact finite differences derived for non-equidistant grids are employed and a new state-of-the-art axis treatment is incorporated. Additionally, the fully three-dimensional transport equations for turbulent kinetic energy and turbulent dissipation are implemented to enable (steady or unsteady) Reynolds Averaged Navier Stokes (RANS) simulations. Furthermore, a new ”Flow Simulation Methodology” (FSM) was developed for computing complex compressible flows. The centerpiece of FSM is a strategy to provide the proper amount of modeling of the subgrid scales. This is accomplished by a ”contribution function” which locally and instantaneously compares the smallest relevant scales to the local grid size. The contribution function is designed such that it provides no modeling if the computation is locally well resolved so that the computation approaches a Direct Numerical Simulation (DNS) in the fine grid limit, or provides modeling of all scales in the coarse grid limit and thus approaches an unsteady RANS (URANS) calculation. In between these resolution limits, the contribution function adjusts the necessary modeling for the unresolved scales while the larger (resolved) scales are computed as in traditional Large Eddy Simulations (LES). Preliminary results have shown that the new high order code has great advantages for supersonic base flow simulations and that calculations, in particular together with FSM, will allow simulations of supersonic base flows at much higher Reynolds numbers than possible with conventional LES.
DTIC
Supersonic Flow; Large Eddy Simulation

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INSTRUMENTATION AND PHOTOGRAPHY

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

20020087566 Cornell Univ., Dept. of Physics, Ithaca, NY USA
Nanotube Sensors ***Final Report***
McEuen, Paul L., Cornell Univ., USA; [2002]; 2p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG1-01034; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Under this project, we explored the feasibility of utilizing carbon nanotubes in sensing applications. The grant primarily supported a graduate student, who worked on a number of aspects of the electrical properties of carbon nanotubes in collaboration

with other researchers in my group. The two major research accomplishments are described below. The first accomplishment is the demonstration that solution carbon nanotube transistors functioned well in an electrolyte environment. This was important for two reasons. First, it allowed us to explore the ultimate limits of nanotube electronic performance by using the electrolyte as a highly effective gate, with a dielectric constant of approximately 80 and an effective insulator thickness of approximately 1 nm. Second, it showed that nanotubes function well under biologically relevant conditions (salty water) and therefore offer great promise as biological sensors. The second accomplishment was the demonstration that a voltage pulse applied to an AFM tip could be used to electrically cut carbon nanotubes. We also showed that a carefully applied pulse could also 'nick' a nanotube, creating a tunnel barrier without completely breaking the tube. Nicking was employed to make, for example, a quantum dot within a nanotube.
Author
Carbon Nanotubes; Bioinstrumentation; Electrical Properties; Cutting; Remote Sensors

20020087888 Fermi National Accelerator Lab., Batavia, IL USA
Status of the CDF II experiment
Rolli, S.; Aug. 14, 2002; 11p; In English
Report No.(s): DE2002-798749; FERMILAB-CONF-02-154-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The status of the CDF II experiment is described. Since operations start-up for run II data taking in March 2001, the CDF detector has been commissioned using about 20 pb-1 of data provided by the Tevatron (utilized about 4-8). Most detector components are ready for physics quality data. The goal is to present the rst physics results by summer-fall 2002.
NTIS
Proton-Antiproton Interactions; Collisions

20020089443 National Information Display Lab., Princeton, NJ USA
Evaluation of the Sony GDM F500R 4 x 3 Aspect Ratio, 21-Inch Diagonal Color, Flat Face, 0.22 mm CRT Monitor
Jun. 19, 2000; 42p; In English; Original contains color images
Report No.(s): AD-A406663; NIDL-730080500-108; No Copyright; Avail: CASI; A03, Hardcopy

The Sony GDM F500R 21-inch, color, perfectly flat face, 0.22 mm aperture grill monitor (19.8' viewable area; the selling price is $ 1800) has good image quality and features that make it an excellent candidate display device for NIMA Imagery Exploitation Capability workstations. Based on our evaluation, NIDL certifies the Sony F500R color monitor as being suitable for IEC workstations. NIDL rates this color monitor as a "B-" in monoscopic mode and as "C" in stereographic mode. The monitor meets all critical IEC requirements in the monoscopic mode. The stereo extinction ratio of 13.3:1 measured with a NuVision panel and passive polarizing glasses is comparable to the best measured for a color monitor. However, the maximum refresh rate in stereo is 56 Hz per eye, not the 60 Hz per eye specified by the IEC specification, but is higher than the 46 Hz per eye for the 24 inch Sun. The refresh rate in stereo appears to be limited by the horizontal scan frequency of 121 kHz.
DTIC
Flat Panel Displays; Image Processing; Computer Components; Stereoscopy; Aspect Ratio

20020089444 National Information Display Lab., Princeton, NJ USA
Evaluation of the Sun Microsystems 365-1352-01 16 x 10 Aspect Ratio, 24-Inch Diagonal Color Monitor
Feb. 10, 2000; 45p; In English; Original contains color images
Report No.(s): AD-A406664; NIDL-730080200-099; No Copyright; Avail: CASI; A03, Hardcopy

The Sun 365-1352-01 24 inch monitor (24-inch CRT size, 22.5" viewable area; the Sun selling price is $2500) made by Sony is a color monitor with excellent image quality and features that make it an excellent display device for NIMA imagery Exploitation Capability workstations. NIDL certifies the Sun 365-1352-01 and the Sony GDM-W900 look-alike color monitors as being suitable for IEC workstations. NIDL rates this color monitor as an "A" for the Image Analyst and Cartographer applications.
DTIC
Optical Properties; Display Devices; Color; Image Resolution

20020089445 National Information Display Lab., Princeton, NJ USA
ViewSonic VP181 5 x 4 Aspect Ratio, 18.1 Viewable Color LCD ViewPanel
Dec. 08, 2000; 48p; In English; Original contains color images
Report No.(s): AD-A406665; NIDL-730080900-111; No Copyright; Avail: CASI; A03, Hardcopy

The Viewsonic VP 181 is an award-winning, widely used 18.1 inch diagonal LCD color monitor. It was the first 18 inch flat panel monitor to incorporate digital, analog and video inputs in one display. A picture in picture overlay is achievable with composite video input from a DVD or VCR running live while working on other analog applications on a PC. The VP 181 pivots to either landscape or portrait modes for frill page viewing. NIDL evaluated this monitor both for its static and motion video display for an IEC workstation for image analysis and geospatial information. NIDL certifies the Viewsonic VP 181 color LCD monitor as being suitable for monoscopic viewing for an IEC workstation, and rates this monitor an ”A” in the monoscopic mode. It easily passed all the IEC Working Group monoscopic specifications, and the contrast modulation is outstanding. Its native resolution is 1280 x 1024 pixels and is capable of scaling from 640 x 480 to 1600 x 1200 pixels. The maximum vertical refresh rate is 75 Hz so it cannot meet the 120 Hz refresh rate needed for flicker-free 3D sequential stereo viewing; NIDL rates its stereo performance as ”F”. Imagery analysts at some locations use their CRT color monitors only in the monoscopic mode. So, for this class of users, the Viewsonic LCD monitor should reduce space on the user’s desk, reduce heat to the office surroundings, while presenting an excellent image. The price is $2,880.
DTIC
Optical Properties; Display Devices; Image Analysis

20020089446 National Information Display Lab., Princeton, NJ USA
Evaluation of the Viewsonic P817 4 x 3 Aspect Ratio, 21-Inch Diagonal Color CRT Monitor
May 22, 2000; 42p; In English; Original contains color images
Report No.(s): AD-A406666; NIDL-730080400-103; No Copyright; Avail: CASI; A03, Hardcopy

The Viewsonic P817 21 inch monitor (20” viewable area; the selling price is $1600) is a color monitor with image quality and features that make it an excellent candidate display device for NIMA Imagery Exploitation Capability workstations. Based on results of our evaluation, NIDL certifies the Viewsonic P817 color monitor as being suitable for IEC workstations. NIDL rates this color monitor as a ”B” (meets IEC requirements) for the Image Analyst and Cartographer applications. The ”B” ratings, rather than ”A”, results from a slightly high halation value, and from a somewhat low, but typical of color monitors, stereo extinction ratio. In a light ambient, the monitor is calculated to achieve 158:1 dynamic range with 3 fc illumination, and 60:1 with 10 fc illumination falling onto the screen. NIDL evaluated the Sun/Sony 24 inch color monitor, gave it an ”A” for its performance, and recommended its use for imagery analysts. We based this recommendation on its measured performance, analysts’ preference for the 24 inch size with its greater area, and on its reliability. The Viewsonic P817 monitor is a very good color monitor, but the 24 inch Sony performs better in a number of areas but at a somewhat higher price.
DTIC
Optical Properties; Color; Image Resolution; Display Devices

20020089447 National Information Display Lab., Princeton, NJ USA
Evaluation of the ViewSonic PF815 4 x 3 Aspect Ratio, 22-Inch Diagonal Color Monitor
Dec. 29, 2000; 46p; In English; Original contains color images
Report No.(s): AD-A406667; NIDL-730081000-113; No Copyright; Avail: CASI; A03, Hardcopy

NIDL does not certify the ViewSonic PF815 color monitor as being suitable for IEC workstations requiring stereoscopic performance. NIDL rates this color monitor as ”A” in monoscopic, but ”C” in stereoscopic mode for the Image Analyst and Cartographer applications. The 1-pixel-on/1-pixel-off contrast modulation over the whole screen in monoscopic mode is excellent for a CRT color monitor. The ”C” rating results from the maximum vertical refresh rate of 55 Hz per eye in stereo mode. This is below the IEC Working Group specification of 60 Hz per eye. The monitor passes the stereo extinction requirement of 15:1 with StereoGraphics CrystalEyes shutter glasses at 50 Hz per eye. The flat face CRT in the PF815 is an aperture grill technology, much like the aperture grill Trinitron CRT used in Sony monitors. Originally, NIDL certified as acceptable for the IEC workstation the View Sonic P817 color CRT monitor. But, the manufacturer withdrew this product from the market. NIDL purchased the new flat face ViewSonic PF815 monitor to determine if this could be an acceptable color monitor in place of the P817. As we see from the discussion above, NIDL does not certify the PF815 monitor. NIDL evaluated two new monitors from Cornerstone and Eizo that can achieve the 60 Hz per eye minimum vertical refresh rate needed for stereo mode acceptability. These are shown in the following table along with the PF815 and other color CRT monitors.
DTIC
Optical Properties; Display Devices; Modulation; Apertures; Color

20020089465 NASA Kennedy Space Center, Cocoa Beach, FL USA
Transient Voltage Recorder
Medelius, Pedro J., Inventor, NASA Kennedy Space Center, USA; Simpson, Howard J., Inventor, NASA Kennedy Space Center,

USA; Sep. 17, 2002; 8p; In English; Provisional US-Patent-Appl-SN-175168, filed 7 Jan. 2000
Patent Info.: Filed 8 Jan. 2001; NASA-Case-KSC-11991; US-Patent-6,452,373; US-Patent-Appl-SN-758051; US-Patent-Appl-SN-175168; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A voltage transient recorder can detect lightning induced transient voltages. The recorder detects a lightning induced transient voltage and adjusts input amplifiers to accurately record transient voltage magnitudes. The recorder stores voltage data from numerous monitored channels, or devices. The data is time stamped and can be output in real time, or stored for later retrieval. The transient recorder, in one embodiment, includes an analog-to-digital converter and a voltage threshold detector. When an input voltage exceeds a pre-determined voltage threshold, the recorder stores the incoming voltage magnitude and time of arrival. The recorder also determines if its input amplifier circuits clip the incoming signal or if the incoming signal is too low. If the input data is clipped or too low, the recorder adjusts the gain of the amplifier circuits to accurately acquire subsequent components of the lightning induced transients.
Official Gazette of the U.S. Patent and Trademark Office
Electric Potential; Voltage Amplifiers; Transient Response; Recording

20020089555 Naval Postgraduate School, Monterey, CA USA
An Analysis of Serial Number Tracking Automatic Identification Technology as Used in Naval Aviation Programs
Csorba, Robert; Sep. 2002; 109p; In English; Original contains color images
Report No.(s): AD-A406895; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Government Accounting Office found that the Navy, between 1996 and 1998, lost $3 billion in materiel in-transit. This thesis explores the benefits and cost of automatic identification and serial number tracking technologies under consideration by the Naval Supply Systems Command and the Naval Air Systems Command. Detailed cost-savings estimates are made for each aircraft type in the Navy inventory. Project and item managers of repairable components using Serial Number Tracking were surveyed as to the value of this system. It concludes that two thirds of the in-transit losses can be avoided with implementation of effective information technology-based logistics and maintenance tracking systems. Recommendations are made for specific steps and components of such an implementation. Suggestions are made for further research.
DTIC
Military Aviation; Procurement Management

20020089598 NASA Langley Research Center, Hampton, VA USA
Ultrasonic Apparatus and Technique to Measure Changes in Intracranial Pressure
Yost, William T., Inventor, NASA Langley Research Center, USA; Cantrell, John H., Inventor, NASA Langley Research Center, USA; Nov. 05, 2002; 12p; In English; Provisional US-Patent-Appl-SN-117378, filed 27 Jan. 1999
Patent Info.: Filed 27 Jan. 2000; NASA-Case-LAR-15507-1; US-Patent-6,475,147; US-Patent-Appl-SN-493044; US-Patent-Appl-SN-117378; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Changes in intracranial pressure can be measured dynamically and non-invasively by monitoring one or more cerebrospinal fluid pulsatile components. Pulsatile components such as systolic and diastolic blood pressures are partially transferred to the cerebrospinal fluid by way of blood vessels contained in the surrounding brain tissue and membrane. As intracranial pressure varies these cerebrospinal fluid pulsatile components also vary. Thus, intracranial pressure can be dynamically measured. Furthermore, use of acoustics allows the measurement to be completely non-invasive. In the preferred embodiment, phase comparison of a reflected acoustic signal to a reference signal using a constant frequency pulsed phase-locked-loop ultrasonic device allows the pulsatile components to be monitored. Calibrating the device by inducing a known change in intracranial pressure allows conversion to changes in intracranial pressure.
Official Gazette of the U.S. Patent and Trademark Office
Cerebrospinal Fluid; Intracranial Pressure; Ultrasonics; Tissues (Biology); Measuring Instruments

20020089605 NASA Marshall Space Flight Center, Huntsville, AL USA
Video Image Stabilization and Registration
Hathaway, David H., Inventor, NASA Marshall Space Flight Center, USA; Meyer, Paul J., Inventor, NASA Marshall Space Flight Center, USA; Oct. 01, 2002; 16p; In English; Provisional US-Patent-Appl-SN-099056, filed 26 Aug. 1998
Patent Info.: Filed 26 Jul. 1999; NASA-Case-MFS-31243-1; US-Patent-6,459,822; US-Patent-Appl-SN-364919; US-Patent-Appl-SN-099056; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A method of stabilizing and registering a video image in multiple video fields of a video sequence provides accurate determination of the image change in magnification, rotation and translation between video fields, so that the video fields may be accurately corrected for these changes in the image in the video sequence. In a described embodiment, a key area of a key video

field is selected which contains an image which it is desired to stabilize in a video sequence. The key area is subdivided into nested pixel blocks and the translation of each of the pixel blocks from the key video field to a new video field is determined as a precursor to determining change in magnification, rotation and translation of the image from the key video field to the new video field.
Official Gazette of the U.S. Patent and Trademark Office
Pattern Registration; Images; Magnification; Video Communication

20020089896 Army Aeromedical Research Lab., Fort Rucker, AL USA
A Comparison of Visual Fields with Fixed and Moving Fixation Points. Volume II ***Final Report***
McLean, William E.; Sep. 2002; 102p; In English
Report No.(s): AD-A406933; USAARL-2002-23; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Four procedures were used to measure the extent of the detection fields of four primary meridians of the binocular visual fields of four subjects. Procedures I (Moving Target) used a horizontally moving target and a stationary fixation point. Procedure II (Fixed Target) used a stationary target and a horizontally moving fixation point. Procedure III (Saccadic Move) used a saccadic eye movement between two stationary horizontal fixation points and a stationary target. Procedure IV (Flashed Target) used a stationary fixation point and a .6 second flashed target. The results from the dynamic procedures (I and II) and the two static procedures (III and IV) were very similar for each subject. In the dynamic procedures, the relationship between a change in contrast and an equivalent change in velocity tends to support Bloch's Law (IxT=C) between 2 deg/s and 20 deg/s for a given retinal location. The relationship between the reciprocal of relative single glimpse probability of four subjects measured in this study and the mean detection times for comparable stimuli taken from Krendel and Wodinsky's Study (1960) appear to be linear and highly correlated (.92 to .99). Volume I of this report details the technical report and volume II contains the appendices.
DTIC
Target Recognition; Visual Fields; Eye Movements; Binocular Vision

20020089897 Aerospace Corp., El Segundo, CA USA
Radiometric Calibration Methodology for Near-Infrared Instrumentation
Rudy, R. J.; Oct. 20, 2002; 14p; In English
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A406925; TR-2002(8570)-10; SMC-TR-03-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document describes the selection of a laboratory-based, spectroradiometric standard to provide for the calibration of the near-infrared instrumentation of the Remote Sensing Department of the Space Sciences Application Laboratory. The goal is to provide a source whose spectral emittance is known to better than 1% over the entire near-infrared spectral region (0.8-2. 5 mironm) and which can be calibrated directly at the National Institute of Standards (NIST). The source selected is a freeze-point cavity blackbody that uses a copper melt with a temperature of 1084.62C and provides an on-axis effective emissivity of is greater than 0.999. The nominal temperature uncertainty provided by the vendor is +/-O.5C, sufficient to meet our specification. However, through the calibration (and certification) by NIST, the intent is to reduce this value to <O.15CwithrespecttotheNatin's primary radiometric standard. Acquisition of a transfer radiometer will make it possible to extend the calibration to other cavity and variable-temperature blackbodies resident in the department. The freeze-point has the spectral coverage to provide accurate spectroradiometric calibrations in the optical, mid-wave, and longwave infrared spectral regions as well as the near-IR.
DTIC
Calibrating; Radiometers; Near Infrared Radiation; Spectroradiometers; Aerospace Engineering; Aerodynamics

20020090251 SRI International Corp., Menlo Park, CA USA
Adaptive, Model-Based Monitoring and Threat Detection ***Final Report, Jun. 1999-Jan. 2002***
Valdes, Alfonso; Skinner, Keith; Sep. 2002; 38p; In English; Original contains color images
Contract(s)/Grant(s): F30602-99-C-0149; DARPA ORDER-H503; AF Proj. H503
Report No.(s): AD-A406875; AFRL-IF-RS-TR-2002-228; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We explore the suitability of model-based probabilistic techniques, such as Bayes networks, to the field of intrusion detection and alert report correlation. We describe a network intrusion detection system (IDS) using Bayes inference, wherein the knowledge base is encoded not as rules but as conditional probability relations between observables and hypotheses of normal and malicious usage. The same high-performance Bayes inference library was employed in a component of the Mission-Based Correlation effort, using an initial knowledge base that adaptively learns the security administrator's preference for alert priority and rank. Another major effort demonstrated probabilistic techniques in heterogeneous sensor correlation. We provide results for

simulated attack data, live traffic, and the CyberPanel Grand Challenge Problem. Our results establish that model-based probabilistic techniques are an important complementary capability to signature-based methods in detection and correlation.
DTIC
Threat Evaluation; Intrusion; Detection

20020090281 National Information Display Lab., Princeton, NJ USA
Evaluation of the Clinton Electronics DS2100HB-ST 4 X 3 Aspect Ratio, 21-Inch Diagonal Monochrome Monitor
Apr. 30, 2000; 41p; In English; Original contains color images
Report No.(s): AD-A406951; NIDL-730080400-106; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Clinton Electronics DS2100HB-ST Monochrome CRT Monitor (2 1-inch CRT size, 19.0" viewable area; the selling price is $1995) is a relatively low cost, 1600 x 1280 pixel, monochrome gray scale monitor. It has good image quality and features that make it an attractive candidate display device for NIMA Imagery Exploitation Capability workstations. Based on results of our evaluation, NIDL certifies the Clinton Electronics DS2100HB-ST monochrome monitor as being suitable only for monoscopic, and not for stereo, operation in IEC workstations. NIDL rates this monochrome monitor as a 'B' for monoscopic mode and 'F' for stereo mode for the Image Analyst and Cartographer applications. In stereo, this monitor can produce a 1024 x 1024 stereo image at 59 Hz per eye, but it has only 47% of the maximum luminance and only 44% of the stereo extinction ratio required by the IEC Specifications. Clinton states that the primary market for this lower cost monitor is for clinical tasks and for training purposes. It is not intended for primary diagnoses of x-ray images.
DTIC
Optical Properties; Display Devices

20020090282 National Information Display Lab., Princeton, NJ USA
Evaluation of the dpiX 19-Inch Diagonal 2560 x 2048 Monochrome AMLCD monitor
Aug. 12, 1999; 55p; In English; Original contains color images
Report No.(s): AD-A406952; NIDL-013699-089; No Copyright; Avail: CASI; A04, Hardcopy

This evaluation of the dpiX 5-megapixel (2560 x 2048 pixels) 19-inch diagonal monochrome AMLCD was performed by NIDL in support of the NIMA IEC effort to identify and determine suitability of COTS displays for IDEX-II replacement. A NIMA IA evaluation of this dpiX AMLCD was conducted following these measurements at NIDL.
DTIC
Optical Properties; Display Devices

20020090283 National Information Display Lab., Princeton, NJ USA
Evaluation of the EIZO F980 4 x 3 Aspect Ratio, 21-Inch Diagonal Color Monitor
Dec. 22, 2000; 48p; In English; Original contains color images
Report No.(s): AD-A406955; NIDL-730081100-115; No Copyright; Avail: CASI; A03, Hardcopy

NIDL certifies the EIZO F980 color monitor as being suitable for IEC workstations, NIDL rates this color monitor as a 'B' in both monoscopic and stereoscopic mode for the Image Analyst and Cartographer applications. The FlexScan F980 is EIZO's most advanced CRT monitor to date, and has been designed for high-end graphics use, EIZO's high maximum horizontal scanning frequency of 137 kHz allows it to easily meet the stringent 60 Hz per eye stereo refresh rate required for IEC monitors. The 1-pixel-on/1-pixel-off contrast modulation for the EIZO (37%) exceeds the IEC requirement (25%). It is about the same as NIDL measured for the Viewsonic P817 (29%), the Hitachi CM814 (35%), and for the Siemens SCM21130 (36%). The difference in contrast modulation for the EIZO compared to the 'A' rated Cornerstone (57%) comes about because of the EIZO's lower vertical grill values. The horizontal grill values for the EIZO and the Cornerstone are roughly equal.
DTIC
Optical Properties; Display Devices

20020090284 National Information Display Lab., Princeton, NJ USA
Evaluation of the Hitachi CM814U 4 x 3 Aspect Ratio, 21-Inch Diagonal Color CRT Monitor
Apr. 14, 2000; 43p; In English; Original contains color images
Report No.(s): AD-A406956; NIDL-730080400-107; No Copyright; Avail: CASI; A03, Hardcopy

The Hitachi CM814U 21 inch color monitor (20' viewable area, selling price $1200) has very good image quality and features that make it an excellent candidate display device for NIMA Imagery Exploitation Capability workstations. Based on our evaluation, NIDL certifies the Hitachi CM814U color monitor as being suitable for IEC workstations. NlDL rates this color monitor as a 'B' for the Image Analyst and Cartographer applications. The 'B' ratings, rather than 'A', result from a slightly high

halation and non-linearity values, and from a somewhat low stereo extinction ratio. In a light ambient, the monitor is calculated to achieve 158:1 dynamic range with 3 fc illumination, and 62:1 with 10 fc illumination falling onto the screen.
DTIC
Optical Properties; Display Devices

36
LASERS AND MASERS

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

20020087895 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Relative Advantages of Direct and Indirect Drive for an Inertial Fusion Energy Power Plant Driven by a Diode-Pumped Solid-State Laser
Orth, C. D.; Mar. 06, 2001; 8p; In English
Report No.(s): DE2002-798778; UCRL-JC-142244; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This paper reviews our current understanding of the relative advantages of direct drive (DD) and indirect drive (ID) for a 1 GWe inertial fusion energy (IFE) power plant driven by a diode-pumped solid-state laser (DPSSL). This comparison is motivated by a recent study (1) that shows that the projected cost of electricity (COE) for DD is actually about the same as that for ID even though the target gain for DD can be much larger. We can therefore no longer assume that DD is the ultimate targeting scenario for IFE, and must begin a more rigorous comparison of these two drive options. The comparison begun here shows that ID may actually end up being preferred, but the uncertainties are still rather large.
NTIS
Solid State Lasers; Diodes

20020088657 National Inst. of Standards and Technology, (BFRL), Gaithersburg, MD USA
Calibration Experiments of a Laser Scanner
Cheok, G. S.; Leigh, S.; Rukhin, A.; Sep. 2002; 132p
Report No.(s): PB2003-100824; NISTIR-6922; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
A LADAR is an instrument which can rapidly capture 3-D data of a scene in the form of x, y, z points. The confidence in end products of the applications 3-D models, positioning, derived quantities-depends largely on the accuracy and precision of the laser scanner. For global uncertainty analysis via error propagation, specific instrumental uncertainties need to be determined. This report chronicles exploratory experiments conducted at the National Institute of Standards and Technology to characterize a LADAR, focusing on accuracy and precision. The specific variables considered were distance, angle of incidence, and target color. Other characteristics of the LADAR such as the returned intensity and beam divergence were also examined.
NTIS
Laser Range Finders; Scanners; Calibrating

20020089433 Ceskoslovenska Akademie Ved, Inst. of Physics, Prague, Czechoslovakia
Investigation of Chemical Generation of Atomic Iodine for COIL and Testing of the Supersonic COIL Using Diode Probe Diagnostics ***Final Report, 10 Jul. 2001-21 Aug. 2002***
Spalek, Otomar; Jirasek, Vit; Censky, Miroslav; Kodymova, Jarmila; Jul. 10, 2002; 65p; In English; Original contains color images
Contract(s)/Grant(s): F61775-01-W-E057
Report No.(s): AD-A406556; EOARD-SPC-01-4057; No Copyright; Avail: CASI; A04, Hardcopy
This report results from a contract tasking Institute of Physics Academy of Sciences as follows: The contractor will investigate the previously developed supersonic COIL driven by a jet singlet oxygen generator. Its operation will be explored using a tunable diode laser. They will also investigate the chemical generation of atomic iodine for a COIL using alternative chemical processes.
DTIC
Iodine; Oxygen; Tunable Lasers; Chemical Reactions; Supersonic Jet Flow; Chemical Lasers

20020089492 Northwestern Univ., Center for Quantum Devices, Evanston, IL USA
Semiconductor Laser for the 2-5 Micrometers and 7-9 Micrometers Region/ Quantum Cascade Lasers ***Final Report, 5 Jan. 1999-31 Mar. 2002***
Razeghi, M.; Slivken, S.; Huang, Z.; Evans, A.; Jun. 2002; 12p; In English
Contract(s)/Grant(s): DAAD19-99-1-0217
Report No.(s): AD-A406754; ARO-40016-PH-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The quantum cascade laser is one of the strong candidates for a portable mid-infrared light source for a variety of DoD applications We have seen dramatic improvements in high temperature performance at long wavelengths, including threshold current densities as low as 1.4 kA/cm(2) and peak power outputs greater than 7 W for a single 20 mm aperture. Along with the significant design improvements, we have also demonstrated laser operation at 9 and 11 mm up to 425 K. Single mode operation has been accomplished with the use of surface distributed feedback gratings. An important parallel development to these performance improvements is the integration of discrete lasers into a compact, durable laser pointer system. A compact, battery-driven power supply has been designed and tested, as well as a simple, laboratory optical system for pointer evaluation. DTIC
Semiconductor Lasers; Infrared Radiation; Military Technology

20020089600 NASA Langley Research Center, Hampton, VA USA
High Precision Wavelength Monitor for Tunable Laser Systems
Froggatt, Mark E., Inventor, NASA Langley Research Center, USA; Childers, Brooks A., Inventor, NASA Langley Research Center, USA; Jul. 30, 2002; 12p; In English
Patent Info.: Filed 22 Aug. 2000; NASA-LAR-16005-1; US-Patent-6,426,496; US-Patent-Appl-SN-648529; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A solid-state apparatus for tracking the wavelength of a laser emission has a power splitter that divides the laser emission into at least three equal components. Differing phase shifts are detected and processed to track variations of the laser emission. Official Gazette of the U.S. Patent and Trademark Office
Solid State; Monitors; Wavelengths; Laser Outputs

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 Cybernetics, Artificial Intelligence, and Robotics; and 54 Man/System Technology and Life Support.

20020087580 Toledo Univ., Dept. of Mechanical, Industrial, and Manufacturing Engineering, OH USA
Centrifugal Compressor Aeroelastic Analysis Code ***Final Report***
Keith, Theo G., Jr., Toledo Univ., USA; Srivastava, Rakesh, Toledo Univ., USA; [2002]; 19p; In English
Contract(s)/Grant(s): NCC3-719; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Centrifugal compressors are very widely used in the turbomachine industry where low mass flow rates are required. Gas turbine engines for tanks, rotorcraft and small jets rely extensively on centrifugal compressors for rugged and compact design. These compressors experience problems related with unsteadiness of flowfields, such as stall flutter, separation at the trailing edge over diffuser guide vanes, tip vortex unsteadiness, etc., leading to rotating stall and surge. Considerable interest exists in small gas turbine engine manufacturers to understand and eventually eliminate the problems related to centrifugal compressors. The geometric complexity of centrifugal compressor blades and the twisting of the blade passages makes the linear methods inapplicable. Advanced computational fluid dynamics (CFD) methods are needed for accurate unsteady aerodynamic and aeroelastic analysis of centrifugal compressors. Most of the current day industrial turbomachines and small aircraft engines are designed with a centrifugal compressor. With such a large customer base and NASA Glenn Research Center being, the lead center for turbomachines, it is important that adequate emphasis be placed on this area as well. Currently, this activity is not supported under any project at NASA Glenn.
Author
Centrifugal Compressors; Rotating Stalls; Surges; Computational Fluid Dynamics; Aerodynamic Stalling; Unsteady Aerodynamics

20020089470 NASA Marshall Space Flight Center, Huntsville, AL USA

Captive Fastener Device

Dowling, Timothy Edward, Inventor, NASA Marshall Space Flight Center, USA; Oct. 15, 2002; 6p; In English

Patent Info.: Filed 9 Aug. 2001; NASA-Case-MFS-31544-1; US-Patent-6,464,438; US-Patent-Appl-SN-928017; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A captive fastener device is utilized to hold two members together. The device is comprised of a housing which may be securely attached to the first member. Within the housing is a spring which biases a bottom of a first lip of a cup washer. The top of the first lip contacts the top of the housing when the fastener is not engaged. The fastener has a ledge at the bottom of the fastener head which rests on a top surface of a second lip of the cup washer. The bottom surface of the second lip contacts the first member when the fastener has fully engaged the second member to secure the first and second members together. The first lip of the cup washer has a greater diameter than the second lip. The first lip also has a greater diameter than the fastener. When the fastener is not engaged, a top surface of the first lip engages a bottom surface of the top of the housing. The housing top has an access hole of smaller diameter than the outer diameter of the fastener head which retains the fastener within the housing when the fastener is not engaging the second member.

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

Fasteners; Bias; Mechanical Devices

20020089599 NASA Langley Research Center, Hampton, VA USA

Blood Pump Having a Magnetically Suspended Rotor

Antaki, James F., Inventor, NASA Langley Research Center, USA; Paden, Bradley, Inventor, NASA Langley Research Center, USA; Burgreen, Gregory, Inventor, NASA Langley Research Center, USA; Groom, Nelson J., Inventor, NASA Langley Research Center, USA; Sep. 10, 2002; 50p; In English; Continuation of US-Patent-Appl-SN-356662, filed 19 Jul. 1999, which is a continuation-in-part of US-Patent-Appl-SN-673627, filed 26 Jun. 1996, which is provisional US-Patent-Appl-SN-142354, filed 1 Jul. 1999

Patent Info.: Filed 24 Apr. 2001; NASA-Case-LAR-16536-1; US-Patent-6,447,266; US-Patent-Appl-SN-841223; US-Patent-Appl-SN-356662; US-Patent-Appl-SN-673627; US-Patent-Appl-SN-142354; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A blood pump preferably has a magnetically suspended rotor that rotates within a housing. The rotor may rotate about a stator disposed within the housing. Radial magnetic bearings may be defined within the stator and the rotor in order to suspend the rotor. The radial magnetic bearings may be passive magnetic bearings that include permanent magnets disposed within the stator and the rotor or active magnetic bearings. The pump may further include an axial magnetic bearing that may be either a passive or an active magnetic bearing. A motor that drives the rotor may be disposed within the housing in order to more easily dissipate heat generated by the motor. A primary flow path is defined between the rotor and the stator, and a secondary flow path is defined between the stator and the rotor. Preferably, a substantial majority of blood passes through the primary flow path. The secondary flow path is large enough so that it provides adequate flushing of the secondary flow path while being small enough to permit efficient operation of the radial magnet bearings across the secondary flow path.

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

Blood Pumps; Magnetic Suspension; Rotors; Permanent Magnets

20020089601 NASA Langley Research Center, Hampton, VA USA

Blood Pump Having a Magnetically Suspended Rotor

Antaki, James F., Inventor, NASA Langley Research Center, USA; Paden, Bradley, Inventor, NASA Langley Research Center, USA; Burgreen, Gregory, Inventor, NASA Langley Research Center, USA; Groom, Nelson J., Inventor, NASA Langley Research Center, USA; Jun. 12, 2001; 50p; In English; Continuation-in-part of US-Patent-Appl-SN-673627, filed 26 Jun. 1995, which is provisional US-Patent-Appl-SN-142354, filed 1 Jul. 1999

Patent Info.: Filed 19 Jul. 1999; NASA-Case-LAR-16040-1; US-Patent-6,244,835; US-Patent-Appl-SN-356662; US-Patent-Appl-SN-673627; US-Patent-Appl-SN-142354; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A blood pump preferably has a magnetically suspended rotor that rotates within a housing. The rotor may rotate about a stator disposed within the housing. Radial magnetic bearings may be defined within the stator and the rotor in order to suspend the rotor. The radial magnetic bearings may be passive magnetic bearings that include permanent magnets disposed within the stator and the rotor or active magnetic bearings. The pump may further include an axial magnetic bearing that may be either a passive or an active magnetic bearing. A motor that drives the rotor may be disposed within the housing in order to more easily dissipate heat generated by the motor. A primary flow path is defined between the rotor and the stator, and a secondary flow path is defined between the stator and the rotor. Preferably, a substantial majority of blood passes through the primary flow path. The secondary

flow path is large enough so that it provides adequate flushing of the secondary flow path while being small enough to permit efficient operation of the radial magnet bearings across the secondary flow path.
Official Gazette of the U.S. Patent and Trademark Office
Blood Pumps; Rotors; Magnetic Suspension; Permanent Magnets

20020089604 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Active Control of Engine Dynamics ***Le Controle Actif pour la Dynamique des Moteurs***
November 2002; 402p; In English, 14-18 May 2001, Brussels, Belgium; Sponsored by Research and Technology Organization, France; CD-ROM contains full text document in PDF format
Report No.(s): RTO-EN-020; AC/323(AVT-083)TP/57; ISBN 92-837-1081-9; Copyright Waived; Avail: CASI; C01, CD-ROM; A18, Hardcopy; A04, Microfiche

Active control can alleviate design constraints and improve the response to operational requirements in gas turbines. The Course presented the state-of-the-art including experimental, theoretical knowledge and practical information. Topics treated: stability characteristics; active control approaches; robustness and fundamental limits; combustion systems processes; combustor dynamics; compression system dynamics models; diagnostics and control of compression instabilities; sensor and actuator architectures; R&D needs of future prospects. The course has shown that for combustion systems, as well as in actuator and sensor technologies the active control approach is a viable option even at full scale with potential for aero engines and air breathing missiles.
Author
Active Control; Gas Turbine Engines; Fluid Dynamics; Dynamic Characteristics; Combustion Physics

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QUALITY ASSURANCE AND RELIABILITY

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

20020087671 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Systematic Design of Protectors for Employing OTS Items
Popov, P.; Riddle, S.; Romanovsky, A.; Strigini, L.; Apr. 2002; 14p; In English
Report No.(s): PB2003-100624; CS-TR-730; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Off-the-shelf (OTS) components are increasingly used in application areas with stringent dependability requirements. Component wrapping is a well known structuring technique used in many areas. We propose a general approach to developing protective wrappers that assist in integrating OTS items with a focus on the overall system dependability. The wrappers are viewed as redundant software employed to detect errors or suspicious activity and to execute appropriate recovery when possible; wrapper development is considered as a part of system integration. Wrapper are to be rigorously specified and executed at run time as a means of protecting OTS items against faults in the rest of the system, and the system against the OTS items faults. Possible symptoms of erroneous behavior to be detected by a protective wrapper are classified and a list of possible actions to be undertaken is discussed. The information required for the wrapper development is provided by traceability analysis. Possible approaches to implementing 'protectors' in the standard component technologies are briefly outlined.
NTIS
Software Engineering; Applications Programs (Computers); Signs and Symptoms

20020087675 National Inst. of Standards and Technology, Gaithersburg, MD USA
Materials Science and Engineering Laboratory, Materials Reliability Division, FY 2002 Programs and Accomplishments
Sep. 2002; 58p; In English
Report No.(s): PB2003-100236; NISTIR-6905; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Materials Reliability Division mission is to develop and disseminate measurement methods and standards enhancing the quality and reliability of materials for industry. Our focus in FY02 continues development of measurements for materials evaluation in micro- and optoelectronics.
NTIS
Research and Development; Reliability Engineering; Electro-Optics

20020087690 Swedish Defence Research Establishment, Stockholm, Sweden

Evaluation of Stirrer Efficiency in FOI Mode-Stirred Reverberation Chambers

Lunden, O.; Baeckstroem, M.; Wellander, N.; Nov. 2001; 70p; In English

Report No.(s): PB2003-100492; FOI-R-0250-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this report investigations of the correlation coefficients have been performed using single and dual mode-stirrers independently in FOI large reverberation chamber. Also in focus has been to quantify the fit to the presumed statistical power distribution using goodness-of-fit test techniques. Moreover, investigations have been performed on the maximum value distribution in the chambers and the relations between statistical independence and correlation of measured data. A stringent methodology, using significant tests on stirrer correlation and on the assumed statistical distribution, has been used to evaluate reverberation chamber performance.

NTIS

Reverberation Chambers; Electronic Equipment; Data Correlation; Statistical Distributions

20020087932 NASA Ames Research Center, Moffett Field, CA USA

Toward Failure Modeling In Complex Dynamic Systems: Impact of Design and Manufacturing Variations

Tumer, Irem Y., NASA Ames Research Center, USA; McAdams, Daniel A., Missouri Univ., USA; Dec. 12, 2001; 10p; In English; 2002 ASME Design Engineering Technical Conferences, Sep. 2002, Montreal, Canada; Sponsored by American Society of Mechanical Engineers, USA; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

When designing vehicle vibration monitoring systems for aerospace devices, it is common to use well-established models of vibration features to determine whether failures or defects exist. Most of the algorithms used for failure detection rely on these models to detect significant changes during a flight environment. In actual practice, however, most vehicle vibration monitoring systems are corrupted by high rates of false alarms and missed detections. Research conducted at the NASA Ames Research Center has determined that a major reason for the high rates of false alarms and missed detections is the numerous sources of statistical variations that are not taken into account in the. modeling assumptions. In this paper, we address one such source of variations, namely, those caused during the design and manufacturing of rotating machinery components that make up aerospace systems. We present a novel way of modeling the vibration response by including design variations via probabilistic methods. The results demonstrate initial feasibility of the method, showing great promise in developing a general methodology for designing more accurate aerospace vehicle vibration monitoring systems.

Author

Aerospace Systems; Aerospace Vehicles; Failure Analysis; Vibration Measurement; Rotation; Systems Health Monitoring

20020087933 NASA Ames Research Center, Moffett Field, CA USA

Deriving Function-Failure Similarity Information for Failure-Free Rotorcraft Component Design

Roberts, Rory A., Missouri Univ., USA; Stone, Robert B., Missouri Univ., USA; Tumer, Irem Y., NASA Ames Research Center, USA; Jan. 15, 2002; 10p; In English; ASME 2002 Design Engineering Technical Conference, 29 Sep. - 2 Oct. 2002, Montreal, Montreal, Canada, Canada; Sponsored by American Society of Mechanical Engineers, USA

Report No.(s): DETC2002/DFM-34166; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Performance and safety are the top concerns of high-risk aerospace applications at NASA. Eliminating or reducing performance and safety problems can be achieved with a thorough understanding of potential failure modes in the design that lead to these problems. The majority of techniques use prior knowledge and experience as well as Failure Modes and Effects as methods to determine potential failure modes of aircraft. The aircraft design needs to be passed through a general technique to ensure that every potential failure mode is considered, while avoiding spending time on improbable failure modes. In this work, this is accomplished by mapping failure modes to certain components, which are described by their functionality. In turn, the failure modes are then linked to the basic functions that are carried within the components of the aircraft. Using the technique proposed in this paper, designers can examine the basic functions, and select appropriate analyses to eliminate or design out the potential failure modes. This method was previously applied to a simple rotating machine test rig with basic functions that are common to a rotorcraft. In this paper, this technique is applied to the engine and power train of a rotorcraft, using failures and functions obtained from accident reports and engineering drawings.

Author

Rotary Wing Aircraft; Aircraft Design; Failure Modes

20020087935 NASA Ames Research Center, Moffett Field, CA USA

Analytical Method to Evaluate Failure Potential During High-Risk Component Development

Tumer, Irem Y., NASA Ames Research Center, USA; Stone, Robert B., Missouri Univ., USA; Jun. 25, 2001; 11p; In English; 2001 ASME Design Engineering Technical Conference, 9-12 Sep. 2001, Pittsburgh, PA, USA; Sponsored by American Society of Mechanical Engineers, USA

Report No.(s): DETC2001/DFM-21173; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Communicating failure mode information during design and manufacturing is a crucial task for failure prevention. Most processes use Failure Modes and Effects types of analyses, as well as prior knowledge and experience, to determine the potential modes of failures a product might encounter during its lifetime. When new products are being considered and designed, this knowledge and information is expanded upon to help designers extrapolate based on their similarity with existing products and the potential design tradeoffs. This paper makes use of similarities and tradeoffs that exist between different failure modes based on the functionality of each component/product. In this light, a function-failure method is developed to help the design of new products with solutions for functions that eliminate or reduce the potential of a failure mode. The method is applied to a simplified rotating machinery example in this paper, and is proposed as a means to account for helicopter failure modes during design and production, addressing stringent safety and performance requirements for NASA applications.

Author

Failure Modes; Failure; Components; Failure Analysis; Manufacturing

20020088424 NASA Ames Research Center, Moffett Field, CA USA

A Framework for Creating a Function-Based Design Tool for Failure Mode Identification

Arunajadai, Srikesh G., Missouri Univ., USA; Stone, Robert B., Missouri Univ., USA; Tumer, Irem Y., NASA Ames Research Center, USA; Jan. 15, 2002; 12p; In English; ASME 2002 Design Engineering Technical Conference, 29 Sep. - 2 Oct. 2002, Montreal, Montreal, Canada, Canada; Sponsored by American Society of Mechanical Engineers, USA

Report No.(s): DETC2002/DTM-34018; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Knowledge of potential failure modes during design is critical for prevention of failures. Currently industries use procedures such as Failure Modes and Effects Analysis (FMEA), Fault Tree analysis, or Failure Modes, Effects and Criticality analysis (FMECA), as well as knowledge and experience, to determine potential failure modes. When new products are being developed there is often a lack of sufficient knowledge of potential failure mode and/or a lack of sufficient experience to identify all failure modes. This gives rise to a situation in which engineers are unable to extract maximum benefits from the above procedures. This work describes a function-based failure identification methodology, which would act as a storehouse of information and experience, providing useful information about the potential failure modes for the design under consideration, as well as enhancing the usefulness of procedures like FMEA. As an example, the method is applied to fifteen products and the benefits are illustrated.

Author

Failure Analysis; Failure Modes; Fault Detection; Mechanical Engineering; Design Optimization; Product Development

20020088731 Florida Space Inst., Cape Canaveral, FL USA

Assessment of Remote Sensing Technologies for Location of Hydrogen and Helium Leaks *Final Report*

Sellar, R. Glenn, Florida Space Inst., USA; Sohn, Yongho, Florida Space Inst., USA; Mathur, Varun, Florida Space Inst., USA; Reardon, Peter, Florida Space Inst., USA; Oct. 31, 2001; 56p; In English

Contract(s)/Grant(s): NAG10-0290; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In Phase 1 of this project, a hierarchy of techniques for H2 and He leak location was developed. A total of twelve specific remote sensing techniques were evaluated; the results are summarized. A basic diffusion model was also developed to predict the concentration and distribution of H2 or He resulting from a leak. The objectives of Phase 2 of the project consisted of the following four tasks: Advance Rayleigh Doppler technique from TRL 1 to TRL 2; Plan to advance Rayleigh Doppler technique from TRL 2 to TRL 3; Advance researchers and resources for further advancement; Extend diffusion model.

Author

Leakage; Hydrogen; Helium; Remote Sensing

20020089452 Pacific-Sierra Research Corp., Santa Monica, CA USA

Preliminary Design of the Portable Thermal Nondestructive Evaluation System

Daniels, A.; May 1997; 29p; In English

Contract(s)/Grant(s): N68335-97-C-0203
Report No.(s): AD-A406782; PSR-2708; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The theoretical and experimental analysis in this Phase I work will be emphasized towards the design of a portable, high speed, TNDE mini-workstation. The specifications and characteristics of this portable thermographic equipment are very important for (TNDT) applications. The difference in temperature between the sound material and the damage areas are usually very small (i.e., tenths of a degree Kelvin), so the IR camera must have an excellent thermal sensitivity to locate and quantify such small contrast in the IR images. High spatial resolution is also required to resolve millimeter sized defects while imaging large areas. Once the required information is obtained, the infrared data must be processed to enhance the image quality and thus increase the probability of detection. The following calculations are performed to evaluate a preliminary design of a high speed IR system. This development specifies the required characteristics needed for the Phase I TNDE laboratory testbed system and examines the feasibility of the thermal technique. This analysis also produces the basis for the design of a portable prototype system that is to be fully developed as part of the Phase II effort.
DTIC
Thermodynamic Properties; Thermography; Portable Equipment; Prototypes

20020089471 NASA Kennedy Space Center, Cocoa Beach, FL USA
Personal Cabin Pressure Monitor and Warning System
Zysko, Jan A., Inventor, NASA Kennedy Space Center, USA; Sep. 17, 2002; 8p; In English; Provisional US-Patent-Appl-SN-214243, filed 14 Jun. 2000
Patent Info.: Filed 8 Mar. 2001; NASA-Case-KSC-12168; US-Patent-6,452,510; US-Patent-Appl-SN-802535; US-Patent-Appl-SN-214243; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A cabin pressure altitude monitor and warning system provides a warning when a detected cabin pressure altitude has reached a predetermined level. The system is preferably embodied in a portable, pager-sized device that can be carried or worn by an individual. A microprocessor calculates the pressure altitude from signals generated by a calibrated pressure transducer and a temperature sensor that compensates for temperature variations in the signals generated by the pressure transducer. The microprocessor is programmed to generate a warning or alarm if a cabin pressure altitude exceeding a predetermined threshold is detected. Preferably, the microprocessor generates two different types of warning or alarm outputs, a first early warning or alert when a first pressure altitude is exceeded. and a second more serious alarm condition when either a second. higher pressure altitude is exceeded, or when the first pressure altitude has been exceeded for a predetermined period of time. Multiple types of alarm condition indicators are preferably provided, including visual, audible and tactile. The system is also preferably designed to detect gas concentrations and other ambient conditions, and thus incorporates other sensors, such as oxygen, relative humidity, carbon dioxide, carbon monoxide and ammonia sensors, to provide a more complete characterization and monitoring of the local environment.
Official Gazette of the U.S. Patent and Trademark Office
Pressure Sensors; Temperature Sensors; Pressurized Cabins; Early Warning Systems; Carbon Dioxide

39
STRUCTURAL MECHANICS

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

20020088720 Stanford Linear Accelerator Center, Stanford, CA USA
Active Vibration Suppression R and D for the NLC
Frisch, J. C.; Dec. 17, 2001; 4p; In English
Report No.(s): DE2002-798941; SLAC-PUB-9097; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The nanometer scale beam sizes at the interaction point in linear colliders limit the allowable motion of the final focus magnets. We have constructed a prototype system to investigate the use of active vibration damping to control magnet motion. Inertial sensors are used to measure the position of a test mass, and a DSP (digital signal processing) based system provides feedback using electrostatic pushers. Simulation and experimental results for the control of a mechanically simple system are presented.
NTIS
Structural Vibration; Vibration Damping; Active Control

42
GEOSCIENCES (GENERAL)

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

20020087819 Pacific Northwest National Lab., Richland, WA USA
Catalog of Geologic Data for the Hanford Site
Horton, D. G.; Last, G. V.; Gilmore, T. J.; Bjornstad, B. N.; Sep. 19, 2001; 118p; In English
Report No.(s): DE2001-786815; PNNL-13653; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report catalogs the existing geologic data that can be found in various databases, published and unpublished reports, and in individuals' technical files. The scope of this catalog is primarily on the 100, 200, and 300 Areas, with a particular emphasis on the 200 Areas. Over 2,922 wells are included in the catalog. Nearly all of these wells (2,459) have some form of driller's or geologist's log. Archived samples are available for 1,742 wells. Particle size data are available from 1,078 wells and moisture data are available from 356 wells. Some form of chemical property data is available from 588 wells. However, this catalog is by no means complete. Numerous individuals have been involved in various geologic-related studies of the Hanford Site. The true extent of unpublished data retained in their technical files is unknown. However, this data catalog is believed to represent the majority (>90%) of the geologic data that is currently retrievable.
NTIS
Geology; Catalogs; Catalogs (Publications); Geological Surveys; Chemical Properties

20020087876 Geological Survey, Las Vegas, NV USA
Hydraulic-property estimates for use with a transient ground-water flow model of the Death Valley regional ground-water flow system, Nevada and California
Belcher, W. R.; Elliott, P. E.; Dec. 31, 2001; 33p; In English
Report No.(s): DE2002-790848; USGS- WRIR 01-4210; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Death Valley regional ground-water flow system encompasses an area of about 43,500 square kilometers in southeastern California and southern Nevada. The study area is underlain by Quaternary to Tertiary basin-fill sediments and mafic-lava flows; Tertiary volcanic, volcaniclastic, and sedimentary rocks; Tertiary to Jurassic granitic rocks; Triassic to Middle Proterozoic carbonate and clastic sedimentary rocks; and Early Proterozoic igneous and metamorphic rocks. The rock assemblage in the Death Valley region is extensively faulted as a result of several episodes of tectonic activity. This study is comprised of published and unpublished estimates of transmissivity, hydraulic conductivity, storage coefficient, and anisotropy ratios for hydrogeologic units within the Death Valley region study area. Hydrogeologic units previously proposed for the Death Valley regional transient ground-water flow model, were recognized for the purpose of studying the distribution of hydraulic properties. Analyses of regression and covariance were used to assess if a relation existed between hydraulic conductivity and depth for most hydrogeologic units. Those analyses showed a weak, quantitatively indeterminate, relation between hydraulic conductivity and depth.
NTIS
Ground Water; Hydrology Models; Metamorphism (Geology); Fluid Flow

20020088659 Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC USA
QTRACER2 Program for Tracer-Breakthrough Curve Analysis for Tracer Tests in Karstic Aquifers and Other Hydrologic Systems
May 2002; 196p; In English
Report No.(s): PB2003-100903; EPA/600/R-02/001; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

Tracer testing is generally regarded as the most reliable and e.cient method of gathering surface and subsurface hydraulic information. This is especially true for karstic and fractured-rock aquifers. Qualitative tracing tests have been conventionally employed in most karst sites in the United States. Quantitative tracing tests are employed sparingly at karstic sites in the USA, although it is widely recognized that they provide a wealth of hydraulic and geometric data and are commonly employed in nonkarstic hydrological systems. Quantitative tracer tests are regarded as more difficult and time-consuming than qualitative tracing tests, which is a fallacy that needs to be overcome. The benefits of quantitative tracing far outweigh any additional expenses incurred for all hydrologic systems. An efficient, reliable, and easy-to-use computer program, QTRACER2, designed to run on PCs running any version of Microsoft Windows.
NTIS
Aquifers; Karst; Hydrology; Marking

20020090261 NASA Goddard Space Flight Center, Greenbelt, MD USA
NASA Center for Computational Sciences: History and Resources
2000; 10p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The NASA Center for Computational Sciences (NCCS) has been a leading capacity computing facility, providing a production environment and support resources to address the challenges facing the Earth and space sciences research community. Author

Research Facilities; Aerodynamics; Earth Sciences

43
EARTH RESOURCES AND REMOTE SENSING

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

20020087658 California Univ., Inst. for Earth System Science, Santa Barbara, CA USA
Monitoring Thermal Status of Ecosystems with MODIS Land-Surface Temperature and Vegetation Index Products
Wan, Zhengming, California Univ., USA; [2002]; 9p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-31370; NAG13-99023; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The global land-surface temperature (LST) and normalized difference vegetation index (NDVI) products retrieved from Moderate Resolution Imaging Spectroradiometer (MODIS) data in 2001 were used in this study. The yearly peak values of NDVI data at 5km grids were used to define six NDVI peak zones from -0.2 to 1 in steps of 0.2, and the monthly NDVI values at each grid were sorted in decreasing order, resulting in 12 layers of NDVI images for each of the NDVI peak zones. The mean and standard deviation of daytime LSTs and day-night LST differences at the grids corresponding to the first layer of NDVI images characterize the thermal status of terrestrial ecosystems in the NDVI peak zones. For the ecosystems in the 0.8-1 NDVI peak zone, daytime LSTs distribute from 0-35 C and day-night LST differences distribute from -2 to 22 C. The daytime LSTs and day-night LST differences corresponding to the remaining layers of NDVI images show that the growth of vegetation is limited at low and high LSTs. LSTs and NDVI may be used to monitor photosynthetic activity and drought, as shown in their applications to a flood-irrigated grassland in California and an unirrigated grassland in Nevada.
Author

Temperature Gradients; Ecosystems; Land Surface Temperature; Normalized Difference Vegetation Index

20020089458 Virginia Commonwealth Univ., Richmond, VA USA
Fluorescence Remote Sensing and Plant Stress ***Final Report, 1 Oct. 2001-31 Mar. 2002***
Young, Donald R.; Dec. 20, 2001; 19p; In English
Contract(s)/Grant(s): DAAD19-01-1-0792
Report No.(s): AD-A406798; 01-1356-01; ARO-42840.1-EV-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The project objective was to determine the degree of plant stress detectable with remote fluorescence measurements in response to application of the stressors: salinity, drought, herbicide, organophosphate-based pesticide, and trampling. All experiments were conducted with Phragmites australis (common reed), a weedy wetland grass common throughout the mid-Atlantic region. The degree of stress was quantified through measured changes in photosynthetic rate, leaf pigment concentrations, stomatal conductance and leaf xylem pressure potential. The trampling pesticide and trampling experiments were inconclusive, there was no evident change in fluorescence. For salinity and herbicide treatment, induced stress was detectable with measurements of fluorescence emission spectra. Stress was evident at 10 ppt salinity and higher, and within 24 hours of herbicide application. Relative to control plants there were significant decreases in fluorescence emission intensity across wavelengths from 678 to 765 nm. Additional preliminary experiments with drought stress revealed significant changes in fluorescence within four days and corresponded to reductions in water relations parameters. For these experiments, fluorescence decreases corresponded to significant decreases in all physiological parameters, except pigment concentrations. For most experiments, decreases in fluorescence were measured before the plants appeared to be visibly stressed. These preliminary results indicate that analysis of fluorescence emission spectra may accurately indicate the onset of stress in plants.
DTIC

Plant Stress; Fluorescence; Remote Sensing; Herbicides; Organic Phosphorus Compounds

20020089477 Army Engineer Research and Development Center, Vicksburg, MS USA
Duration and Frequency of Ponded Water on Arid Southwestern Playas
Lichvar, Robert; Gustina, Greg; Bolus, Robert; Sep. 2002; 11p; In English
Report No.(s): AD-A406732; ERDC-TN-WRAP-02-02; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Playas, "The flat-floored bottom of an undrained desert basin that becomes at times a shallow lake which on evaporation may leave a deposit of salt or gypsum,"1 are regulated by the U.S. Army Corps of Engineers (Corps) under the provisions of the Code of Federal Regulations 33 CFR 328.3 A implementing Section 404 of the Clean Water Act (CWA). The Corps and others perform jurisdictional delineations of playas to determine whether certain areas are subject to Section 404 regulations. However, delineating playas has been found to be problematic (e.g., Doug and Colberg 1996; Lichvar and Sprecher 1996; Brostoff, Lichvar, and Sprecher 2001). Case studies have been performed for several playas in the western Mojave Desert, California, to examine surface hydrology. The purpose of this study was to estimate the duration and frequency of inundation at these playas.
DTIC
Playas; Water; Hydrology

20020089487 California Inst. of Tech., Seismological Lab., Pasadena, CA USA
Wave Generation from Explosions in Cavities in Rock ***Final Report, 16 Jun. 1995-30 Sep. 1997***
Liu, Cangli; Ahrens, Thomas J.; Jun. 30, 1998; 76p; In English
Contract(s)/Grant(s): F19628-95-C-0115; Proj-5101
Report No.(s): AD-A406747; AFRL-VS-HA-TR-98-0078; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

We have developed a measurement method to monitor P- and S-waves generated from laboratory-scale explosions in meter-sized rock media at a series of stations, and invented a unique device to drill spherical cavities with diameters of up to 10 cm in rock. We have also conducted laboratory experiments in which spherical/cylindrical charges of 0.2 to 1.9 g mass were detonated at the center of spherical/cylindrical cavities with radii from 0.6 to 1.5 cm in Bedford limestone and the waves generated by the explosions were recorded in the near field within 250 mm. The records and post-explosion studies clearly demonstrate the P-waves generated from both explosions in cavities and crack propagation in rock. The peak particle displacement induced by P-waves ranges from 9 to 15 um at 150 to 210 mm from the source for the spherical cavity experiment with 1.9 g explosives, and 8 to 4 um at 150 to 220 mm from the source with 0.8 g explosives, 35 to 10 um at 150 to 240 mm for the tamped cylindrical cavity experiment with 1.2 g explosives and 7 to 2 um at 150 to 190 mm from the source for the decoupled cylindrical cavity experiment with 0.24 g explosives.
DTIC
Explosions; Wave Generation; P Waves; S Waves; Rock Mechanics

20020089512 Naval Research Lab., Washington, DC USA
MTADS Geophysical Survey of Potential Burial Pits Along the C&O Canal in Washington, DC ***Final Report, Feb. 2000-Jun. 2002***
Nelson, Herbert H.; Steinhurst, Daniel A.; Khadr, Nagi; Sep. 30, 2002; 21p; In English; Original contains color images; Prepared in collaboration with Nova Research, Inc., Alexandria, VA and AETC Inc., Arlington, VA
Report No.(s): AD-A406696; NRL/MR/6110--02-8640; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Chemistry Division of the Naval Research Laboratory has performed geophysical surveys on three areas adjacent to the C&O Canal towpath near the Chain Bridge in Northwest Washington, DC to characterize the extent and source of a series of magnetic anomalies discovered by personnel from the DC Department of Health. The magnetometer survey results lend themselves to two observations. First, there is no evidence of a series of 14 regularly spaced burial pits as suggested by the anecdotal reports. We have identified, however, 30 magnetic anomalies in and adjacent to the survey site. Many of the anomalies have been identified with ferrous metal objects visible on the surface or arise from shallow trash and scrap. There are eight anomalies that appear to arise from relatively large ferrous metal objects buried at depths greater than 6 to 8 feet. These remalning anomalies may require further investigation.
DTIC
Canals; Ferrous Metals; Magnetic Anomalies; Surveys

20020089987 Naval Research Lab., Bay Saint Louis, MS USA
Digital Mapping, Charting, and Geodesy Analysis Program (DMAP) Technical Review of Tactical Ocean Data (TOD) Levels 0, 1, 2
Breckenridge, John L.; Mesick, Hillary C.; Carter, Susan V.; Shaw, Kevin B.; Sep. 30, 2002; 14p; In English
Contract(s)/Grant(s): Proj-74-7441-B2

Report No.(s): AD-A407045; NRL/MR/7440--02-8281; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Technical reviews of the Tactical Ocean Data Levels 0,1, and 2 Performance Specifications were performed by the Digital Mapping, Charting, and Geodesy Analysis Program (DMAP). Background, discussion, recommendations, and conclusions are presented for each review.

DTIC

Maps; Digital Systems; Data Processing; Oceanography

44
ENERGY PRODUCTION AND CONVERSION

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

20020089479 Massachusetts Univ., North Dartmouth, MA USA

Power and Efficiency Advancements for Low Rate - Long Endurance Semi-Fuel-Cells ***Final Report, Jan.-Sep. 1999***

Bessette, Russell R.; Sep. 30, 2002; 22p; In English

Contract(s)/Grant(s): N66604-99-1-1672

Report No.(s): AD-A406734; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The characterization and use of a palladium and iridium catalyst combination on several cathode substrates (carbon paper, porous nickel, titanium dioxide, carbon fibers) are described. The Pd/Ir combination outperforms palladium alone or iridium alone on all of the substrates as determined by catalyst deposit stability, polarization curve Tafel slope and onset potential. Scanning electron microscopy (SEM), energy dispersive spectrometry (EDS), and transmission electron microscopy (TEM) were used to establish the composition and structure of palladium and iridium clusters on the cathode substrate surfaces. Cyclic voltammetry was employed as the method of choice for deposition; however, constant potential deposition was also investigated. Several deposition parameters were investigated including deposition range, scan rate, and number of cycles. This report describes the optimum deposition conditions and the best catalyzed substrate as tested in a metal-hydrogen peroxide semi-fuel cell.

DTIC

Cathodes; Catalysis; Fuel Cells; Scanning Electron Microscopy; Electrochemical Cells; Spectroscopy

20020090107 Naval Postgraduate School, Monterey, CA USA

A Comparative Study of the Prospective Solar Cells for NPSAT1

Mitchell, Sherri R.; Sep. 27, 2002; 72p; In English; Original contains color images

Report No.(s): AD-A407099; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Naval Postgraduate School's next satellite to be launched will be the technology demonstration experiment NPSAT1 in 2006. This satellite will be laden with some of the school's top research projects including on orbit solar cell I-V curve testing. The designers of this satellite were presented with three types of solar cells with which to power their satellite: silicon, gallium arsenide, and triple junction cells. This thesis evaluates those three types of cells on the merits of their advertised and tested efficiency, cost, performance, and reaction to radiation experiments. Although the triple junction cells have already been selected to provide solar power to the onboard experiments, the background justification for such cells is warranted.

DTIC

Solar Cells; Spacecraft Launching; Spacecraft Performance; Junction Diodes; Heterojunction Devices

45
ENVIRONMENT POLLUTION

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

20020087579 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Comparison of Model- and Satellite-Derived Aerosol Optical Depth and Reflectivity

Penner, Joyce E., Michigan Univ., USA; Zhang, Sophia Y., Michigan Univ., USA; Chin, Mian, NASA Goddard Space Flight Center, USA; Chuang, Catherine C., Lawrence Livermore National Lab., USA; Feichter, Johann, Max-Planck-Inst. fuer Meteorologie, Germany; Feng, Yan, Michigan Univ., USA; Geogdzhayev, Igor V., NASA Goddard Inst. for Space Studies, USA; Ginoux, Paul, NASA Goddard Space Flight Center, USA; Herzog, Michael, Michigan Univ., USA; Higurashi, Akiko, National

Inst. for Environmental Studies, Japan; Journal of the Atmospheric Sciences; Feb. 01, 2002; Volume 59, pp. 441-460; In English; Copyright; Avail: Issuing Activity

The determination of an accurate quantitative understanding of the role of tropospheric aerosols in the earth's radiation budget is extremely important because forcing by anthropogenic aerosols presently represents one of the most uncertain aspects of climate models. Here the authors present a systematic comparison of three different analyses of satellite-retrieved aerosol optical depth based on the Advanced Very High Resolution Radiometer (AVHRR)- measured radiances with optical depths derived from six different models. Also compared are the model-derived clear-sky reflected shortwave radiation with satellite-measured reflectivities derived from the Earth Radiation Budget Experiment (ERBE) satellite. The three different satellite-derived optical depths differ by between -0.10 and 0.07 optical depth units in comparison to the average of the three analyses depending on latitude and month, but the general features of the retrievals are similar. The models differ by between -0.09 and +0.16 optical depth units from the average of the models. Differences between the average of the models and the average of the satellite analyses range over -0.11 to +0.05 optical depth units. These differences are significant since the annual average clear-sky radiative forcing associated with the difference between the average of the models and the average of the satellite analyses ranges between -3.9 and 0.7 W m(exp -2) depending on latitude and is -1.7 W m (exp -2) on a global average annual basis. Variations in the source strengths of dimethylsulfide (DMS)-derived aerosols and sea salt aerosols can explain differences between the models, and between the models and satellite retrievals of up to 0.2 optical depth units. The comparison of model-generated reflected shortwave radiation and ERBE-measured shortwave radiation is similar in character as a function of latitude to the analysis of modeled and satellite-retrieved optical depths, but the differences between the modeled clear-sky reflected flux and the ERBE clear-sky reflected flux is generally larger than that inferred from the difference between the models and the AVHRR optical depths, especially at high latitudes. The difference between the mean of the models and the ERBE-analyzed clear-sky flux is 1.6 W m(exp -2). The overall comparison indicates that the model-generated aerosol optical depth is systematically lower than that inferred from measurements between the latitudes of 10 and 30 deg S. It is not likely that the shortfall is due to small values of the sea salt optical depth because increases in this component would create modeled optical depths that are larger than those from satellites in the region north of 30 deg N and near 50 deg S. Instead, the source strengths for DMS and biomass aerosols in the models may be too low. Firm conclusions, however, will require better retrieval procedures for the satellites, including better cloud screening procedures, further improvement of the model's treatment of aerosol transport and removal, and a better determination of aerosol source strengths.

Author

Aerosols; Satellite Observation; Optical Thickness; Optical Reflection; Climate Models; Remote Sensing

20020087804 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Satellite Total Ozone Data as an Indication of Stratospheric Dynamics: A New Interpretation of Ozone Holes

Kashkin, V. B.; Khlebopros, R. G.; Kolyada, M. N.; Jan. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2003-100587; IHES/M/02/02; Copyright; Avail: National Technical Information Service (NTIS)

Over the past few decades, a great deal of attention has been focused on the problem of ozone holes (OH) and, especially, on the mechanism of OH formation and the anthropogenic effects that influence the ozone lay. Undoubtedly, air flows in the stratosphere have a significant impact on the distribution of ozone around the planet. Modern ground-based probes, however, allow one to obtain only fragmentary information on the dynamics of gases in the stratosphere. This work suggests a method that allows one to produce a global picture of the stratospheric wind flows of either of the Earth's hemispheres, based on readily available measurements of atmospheric phenomena.

NTIS

Ozone Depletion; Stratosphere; Satellite Observation

20020087836 San Diego State Univ., San Diego, CA USA

Response of Mediterranean-Type Ecosystems to Elevated Atmospheric CO2 and Associated Climate Change ***Final Report***

Oechel, W. C.; Aug. 15, 2002; 220p; In English

Report No.(s): DE2002-798783; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This research incorporated an integrated hierarchical approach in space, time, and levels of biological/ecological organization to help understand and predict ecosystem response to elevated CO2 and concomitant environmental change. The research utilized a number of different approaches, and collaboration of both PER and non-PER investigators to arrive at a comprehensive, integrative understanding.

NTIS

Carbon Dioxide; Ecosystems; Climate Change

20020087878 National Energy Technology Lab., Pittsburgh, PA USA

Mercury contaminated material decontamination methods: Investigation and assessment

Ebadian, M. A.; Jan. 01, 2001; 73p; In English

Report No.(s): DE2002-790964; FG21-95EW55094--02; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Over the years mercury has been recognized as having serious impacts on human health and the environment. This recognition has led to numerous studies that deal with the properties of various mercury forms, the development of methods to quantify and speciate the forms, fate and transport, toxicology studies, and the development of site remediation and decontamination technologies. This report reviews several critical areas that will be used in developing technologies for cleaning mercury from mercury-contaminated surfaces of metals and porous materials found in many DOE facilities. The technologies used for decontamination of water and mixed wastes (solid) are specifically discussed. Many technologies that have recently appeared in the literature are included in the report. Current surface decontamination processes have been reviewed, and the limitations of these technologies for mercury decontamination are discussed. Based on the currently available technologies and the processes published recently in the literature, several processes, including strippable coatings, chemical cleaning with iodine/iodide lixiviant, chemisorbing surface wipes with forager sponge and grafted cotton, and surface/pore fixation through amalgamation or stabilization, have been identified as potential techniques for decontamination of mercury-contaminated metal and porous surfaces. Their potential merits and applicability are discussed. Finally, two processes, strippable coatings and chemical cleaning with iodine/iodide lixiviant, were experimentally investigated in Phase II of this project.

NTIS

Chemical Cleaning; Toxicology; Contamination

20020088707 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA

SAGE (version 5.96) Ozone Trends in the Lower Stratosphere

Cunnold, D. M., Georgia Inst. of Tech., USA; Wang, H. J., Georgia Inst. of Tech., USA; Thomason, L. W., NASA Langley Research Center, USA; Zawodny, J. M., NASA Langley Research Center, USA; Logan, J. A., Harvard Univ., USA; Megretkaia, I. A., Harvard Univ., USA; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; Repr. from Journal of Geophysical Research, v. 105, no. D4, 27 Feb. 2000 p 4445-4457; In English

Contract(s)/Grant(s): NAG1-2202; Copyright; Avail: Issuing Activity; Abstract Only

Ozone retrievals from Stratospheric Aerosol and Gas Experiment (SAGE) II version 5.96 (v5.96) below approx. 25 km altitude are discussed. This version of the algorithm includes improved constraints on the wavelength dependence of aerosol extinctions based on the ensemble of aerosol size distribution measurements. This results in a reduction of SAGE ozone errors in the 2 years after the Mount Pinatubo eruption. However, SAGE ozone concentrations are still approx. 10% larger than ozonesonde and Halogen Occultation Experiment (HALOE) measurements below 20 km altitude under nonvolcanic conditions (and by more than this in the tropics). The analysis by Steele and Turco suggests that the SAGE ozone overpredictions are in the wrong direction to be explained by aerosol extinction extrapolation errors. Moreover, preliminary SAGE 11 v6.0a retrievals suggest that they are partially accounted for by geometric difficulties at low altitudes in v5.96 and prior retrievals. SAGE ozone trends for the 1979-1996 and 1984-1996 periods are calculated and compared, and the sources of trend errors are discussed. These calculations are made after filtering out ozone data during periods of high, local aerosol extinctions. In the lower stratosphere, below approx. 28 km altitude, there is shown to be excellent agreement in the altitudinal structure of ozone decreases at 45 deg N between SAGE and ozonesondes with the largest decrease in both between 1979 and 1996 having occurred below 20 km altitude, amounting to 0.9 +/- 0.7% yr (2sigma) at 16 km altitude. However, in contrast to the fairly steady decreases at 45 deg N, both SAGE measurements and Lauder ozonesondes show ozone increases at 45 deg S over the period from the mid-1980s to 1996 of 0.2 +/- 0.5%/yr (2sigma) from 15 to 20 km altitude. The SAGE data suggest that this increase is a wintertime phenomenon which occurs in the 15-20 km height range. Changes in dynamics are suggested as the most likely cause of this increase. These hemispheric differences in ozone trends are supported by ozone column measurements by the Total Ozone Mapping Spectrometer (TOMS).

Author

Aerosols; Gas Composition; Halogen Occultation Experiment; Ozone; Size Distribution

20020088709 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA

Upper-Stratospheric Ozone Trends 1979-1998

Newchurch, M. J., Alabama Univ., USA; Cunnold, Derek, Georgia Inst. of Tech., USA; Bishop, Lane; Flynn, Lawrence E.; Godin, Sophie; Frith, Stacey Hollandsworth; Hood, Lon; Miller, Alvin J.; Oltmans, Sam; Randel, William; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; Repr. from Journal of Geophysical Research, v. 105, no. D11, 16 Jun. 2000 p 14,625-14,636; In English

Contract(s)/Grant(s): NAG1-2202; Copyright; Avail: Issuing Activity; Abstract Only

Extensive analyses of ozone observations between 1978 and 1998 measured by Dobson Umkehr, Stratospheric Aerosol and Gas Experiment (SAGE) I and II, and Solar Backscattered Ultraviolet (SBUV) and (SBUV)/2 indicate continued significant ozone decline throughout the extratropical upper stratosphere from 30-45 km altitude. The maximum annual linear decline of -0.8 +/- 0.2 %/yr(2sigma) occurs at 40 km and is well described in terms of a linear decline modulated by the 11-year solar variation. The minimum decline of -0.110.1% yr-1(2o) occurs at 25 km in midlatitudes, with remarkable symmetry between the Northern and Southern Hemispheres at 40 km altitude. Midlatitude upper-stratospheric zonal trends exhibit significant seasonal variation (+/- 30% in the Northern Hemisphere, +/- 40% in the Southern Hemisphere) with the most negative trends of -1.2%/yr occurring in the winter. Significant seasonal trends of -0.7 to -0.9%/yr occur at 40 km in the tropics between April and September. Subjecting the statistical models used to calculate the ozone trends to intercomparison tests on a variety of common data sets yields results that indicate the standard deviation between trends estimated by 10 different statistical models is less than 0.1%/yr in the annual-mean trend for SAGE data and less than 0.2%/yr in the most demanding conditions (seasons with irregular, sparse data) [World Meteorological Organization (WMO), 1998]. These consistent trend results between statistical models together with extensive consistency between the independent measurement-system trend observations by Dobson Umkehr, SAGE I and II, and SBUV and SBUV/2 provide a high degree of confidence in the accuracy of the declining ozone amounts reported here. Additional details of ozone trend results from 1978 to 1996 (2 years shorter than reported here) along with lower-stratospheric and tropospheric ozone trends, extensive intercomparisons to assess relative instrument drifts, and retrieval algorithm details are given by WMO [1998].
Author
Stratosphere; Upper Atmosphere; Ozone; Trends; Annual Variations; Atmospheric Composition

20020088710 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA
Upper Stratospheric Temperature Climatology Derived from SAGE II Observations: Preliminary Results
Wang, P.-H., Science and Technology Corp., USA; Cunnold, D. M., Georgia Inst. of Tech., USA; Wang, H. J., Georgia Inst. of Tech., USA; Chu, W. P., NASA Langley Research Center, USA; Thomason, L. W., NASA Langley Research Center, USA; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; In English
Contract(s)/Grant(s): NAG1-2202; No Copyright; Avail: Issuing Activity; Abstract Only

This study shows that the temperature information in the upper stratosphere can be derived from the SAGE II 385-mn observations. The preliminary results indicate that the zonal mean temperature increases with altitude below 50 km and decreases above 50 km. At 50 km, a regional maximum of 263 K is located in the tropics, and a minimum of 261 K occurs in the subtropics in both hemispheres. The derived long-term temperature changes from 1985 to 1997 reveal a statistically significant negative trend of -2 to -2.5 K/decade in the tropical upper stratosphere and about -2 K/decade in the subtropics near the stratopause. At latitudes poleward of 50, the results show a statistically significant positive trend of about 1 K/decade in the upper stratosphere. The preliminary results also show large annual temperature oscillations in the extratropics with a maximum amplitude of approx. 8 K located at about 44 km near 50 in both hemispheres during local summer. In addition, the semiannual oscillation is found to be a maximum in the tropics with a peak amplitude of approx. 3.3 K located at about 42 km during the equinox.
Author
Atmospheric Temperature; Stratosphere; Upper Atmosphere; Climatology; Data Acquisition; Data Processing

20020088721 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA
A Discussion of Upper Stratospheric Ozone Asymmetry and Ozone Trend Changes
Li, Jinlong, Georgia Inst. of Tech., USA; Cunnold, Derek M., Georgia Inst. of Tech., USA; Wang, Hsiang-Jui, Georgia Inst. of Tech., USA; Yang, Eun-Su, Georgia Inst. of Tech., USA; Newchurch, Mike J., Alabama Univ., USA; SAGE II Ozone Analysis; Oct. 29, 2002; 2p; In English
Contract(s)/Grant(s): NAG1-2202; No Copyright; Avail: Issuing Activity; Abstract Only

Analyses from SAGE I/II version 6.0 data exhibit upper stratospheric ozone trends which are not significantly different from those in version 5.96 data. Trend calculations show larger downward trends at mid-high latitudes in the Southern Hemisphere than in the Northern Hemisphere, particularly in 1980s. There are also indications of decreasing downward trends with time from 1979 to 1999. We have used a chemical box model and the UARS measurements of long lived gases, CH4, H2O, NO(x), and temperature to show that, with a constant Cl(sub y) trend, a hemispheric ozone trend asymmetry of 1%/decade at 45 deg. around 43 km is expected due to the hemispheric differences of temperature and CH4 during late winter/early. Also ozone trends should have been approximately 1%/decade more negative from 1979-1989 than from 1989-1999 because of the chemical feedbacks. The model

results further indicate that both the reported decrease in CH4 and the increase in H2O in HALOE measurements will result in a larger downward ozone trend and a decrease in the hemispheric ozone trend asymmetry.
Author
Upper Atmosphere; Stratosphere; Ozone; Trends; Computation; Gas Analysis

20020088722 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA
Investigation of N2O Production from 266 and 532 nm Laser Flash Photolysis of O3/N2/O2 Mixtures
Estupinan, E. G., Georgia Inst. of Tech., USA; Nicovich, J. M., Georgia Inst. of Tech., USA; Li, J., Georgia Inst. of Tech., USA; Cunnold, D. M., Georgia Inst. of Tech., USA; Wine, P. H., Georgia Inst. of Tech., USA; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; In English
Contract(s)/Grant(s): NAG1-2202; Copyright; Avail: Issuing Activity; Abstract Only

Tunable diode laser absorption spectroscopy has been employed to measure the amount of N2O produced from laser flash photolysis of O3/N2/O2 mixtures at 266 and 532 nm. In the 532 nm photolysis experiments very little N2O is observed, thus allowing an upper limit yield of 7 x 10(exp -8) to be established for the process O3 + N2 yield N2O + O2, where O3 is nascent O3 that is newly formed via O(3P(sub J)) + O2 recombination (with vibrational excitation near the dissociation energy of O3). The measured upper limit yield is a factor of approx. 600 smaller than a previous literature value and is approximately a factor of 10 below the threshold for atmospheric importance. In the 266 nm photolysis experiments, significant N2O production is observed and the N2O quantum yield is found to increase linearly with pressure over the range 100 - 900 Torr in air bath gas. The source of N2O in the 266 nm photolysis experiments is believed to be the addition reaction O(1D(sub 2)) + N2 + M yields (k(sub sigma)) N2O + M, although reaction of (very short-lived) electronically excited O3 with N2 cannot be ruled out by the available data. Assuming that all observed N2O comes from the O(1D(sub 2)) + N2 + M reaction, the following expression describes the temperature dependence of k(sub sigma) (in its third-order low-pressure limit) that is consistent with the N2O yield data: k(sub sigma) = (2.8 +/- 0.1) x 10(exp -36)(T/300)(sup -(0-88+0.36)) cm(sup 6) molecule(sup -2)/s, where the uncertainties are 2(sigma) and represent precision only. The accuracy of the reported rate coefficients at the 95% confidence level is estimated to be 30 - 40% depending on the temperature. Model calculations suggest that gas phase processes initiated by ozone absorption of a UV photon represent about 1.4% of the currently estimated global source strength of atmospheric N2O. However, these processes could account for a significant fraction of the oxygen mass-independent enrichment observed in atmospheric N2O, and they appear to be the first suggested photochemical mechanism that is capable of explaining the altitude dependence of the observed mass -independent isotopic signature.
Author
Nitrogen Oxides; Photolysis; Ozone; Nitrogen; Vapor Phases; Tunable Lasers; Laser Spectroscopy

20020088727 Dynamac Corp., Cocoa Beach, FL USA
Revised Flora and List of Threatened and Endangered Plants for the John F. Kennedy Space Center Area, Florida
Schmalzer, Paul A., Dynamac Corp., USA; Foster, Tammy E., Dynamac Corp., USA; Duncan, Brean W., Dynamac Corp., USA; June 2002; 77p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS10-02001
Report No.(s): NASA/TM-2002-211175; NAS 1.15:211175; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The vascular flora of the Kennedy Space Center (KSC) area was first studied in the 1970's, and the list was revised in 1990. Nomenclatural and taxonomic changes as well as additional collections required a revision of this list. The revised list includes 1024 taxa of which 803 are native and 221 are introduced. This appears to be a substantial proportion of the regional flora. Fifty taxa are endemic or nearly endemic, a level of endemism that appears high for the east coast of Florida. of the 221 introduced plants, twenty-six are Category I invasive exotics and fifteen are Category II invasive exotics. Thirty-eight taxa are listed as threatened, endangered, or of special concern on state lists. For some of these taxa, populations on KSC appear to be important for their regional and global survival. The bryophyte flora of the KSC area includes 23 mosses and 20 liverworts and hornworts. The lichen flora is currently unknown.
Author
Plants (Botany); Populations; Endangered Species

20020088746 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA

A Reference Model for Middle Atmosphere Ozone in 1992-1993

Wang, H. J., Georgia Inst. of Tech., USA; Cunnold, D. M., Georgia Inst. of Tech., USA; Froidevaux, L., Jet Propulsion Lab., California Inst. of Tech., USA; Russell, J. M., Hampton Univ., USA; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; Repr. from Journal of Geophysical Research, v. 104, no. D17, 20 Sep. 1999 p 21,629-21,643; In English

Contract(s)/Grant(s): NAG1-2202; Copyright; Avail: Issuing Activity; Abstract Only

An ozone climatology for the period April 1992 to March 1993 and covering pressures from 0.1 to 100 hPa and from 80 deg N to 80 deg S is derived from satellite-based measurements by the Stratospheric Aerosol and Gas Experiment (SAGE), the Halogen Occultation Experiment (HALOE), and the Microwave Limb Sounder (MLS). At pressures less than 1 hPa, separate distributions are given for daytime and nighttime conditions. From 0.46 to 32 hPa the accuracy of the distribution is estimated to be 5%, and the precision is also approx. 5%. Estimates of atmospheric variability are provided on the basis of standard deviations of the measurements within months. Distributions of ozone monthly means and standard deviations are also given in a potential temperature, equivalent latitude coordinate system. This data set is included in the UARS reference atmosphere, and it is accessible through that web site.

Author

Middle Atmosphere; Ozone; Climatology; Microwave Sounding; Standard Deviation

20020088747 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA

SAGE II Ozone Analysis ***Final Report, 8 Jul. 1999 - 7 Jul. 2002***

Cunnold, Derek, Georgia Inst. of Tech., USA; Wang, Ray, Georgia Inst. of Tech., USA; Oct. 29, 2002; 3p; In English

Contract(s)/Grant(s): NAG1-2202

Report No.(s): G35-610; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Publications from 1999-2002 describing research funded by the SAGE II contract to Dr. Cunnold and Dr. Wang are listed below. Our most recent accomplishments include a detailed analysis of the quality of SAGE II, v6.1, ozone measurements below 20 km altitude (Wang et al., 2002 and Kar et al., 2002) and an analysis of the consistency between SAGE upper stratospheric ozone trends and model predictions with emphasis on hemispheric asymmetry (Li et al., 2001). Abstracts of the 11 papers are attached.

Author

Ozone; Stratosphere; Asymmetry; Trends

20020088748 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA

Uncertainties in Upper Stratospheric Ozone Trends from 1979 to 1996

Cunnold, D. M., Georgia Inst. of Tech., USA; Wang, H. J., Georgia Inst. of Tech., USA; Russell, J. M., Hampton Univ., USA; Zawodny, J. M., NASA Langley Research Center, USA; Froidevaux, L., Jet Propulsion Lab., California Inst. of Tech., USA; Newchurch, M. J., Alabama Univ., USA; Flynn, L. E.; McPeters, R.; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; Repr. from Journal of Geophysical Research, v. 105, no. D4, 27 Feb. 2000 p 4427-4444; In English

Contract(s)/Grant(s): NAG1-2202; Copyright; Avail: Issuing Activity; Abstract Only

The time series of differences in coincident measurements of ozone by Stratospheric Aerosol and Gas Experiment (SAGE) and by Solar Backscattered Ultraviolet (SBUV), SBUV/2, Umkehr and Microwave Limb Sounder (MLS) are analyzed, and the slopes in the differences are calculated. SAGE ozone measurements are also compared against those by HALOE. The purpose of these comparisons is to look for statistically significant nonzero slopes which could indicate long-term calibration problems in one or more of the measurement systems. It is found that the slopes are remarkably similar between the Northern and Southern Hemisphere midlatitudes, and, apart from a few exceptions, the slopes are also similar in the tropics. Slopes of MLS-SAGE differences and HALOE-SAGE trends from approximately 1992 to 1996 have values of approximately -0.5 +/- 0.4%/yr (95% confidence limits) in Umkehr layers 7-9 (which are centered at approx. 37, 42, and 47 km altitude). Umkehr-SAGE slopes for 1979-1996, however, are almost all positive and in the range -0.1 - 0.41%/yr for Umkehr layers 4 - 8, while SBUV-SAGE slopes for 1979-1989 are essentially zero in layers 4 - 7 and 0.3-0.4%/yr in layers 8 and 9. Averaging all these results with SBUV-SAGE 11 slopes from 1985 to 1989, the other sensors minus SAGE slopes are most likely between 0.2 and -0.2%/yr1 from approx. 20 to 40 km altitude. The results indicate slightly negative slopes in Umkehr layers 5-7 and positive slopes in the other three layers. There thus appears to be no overall drift in the SAGE ozone measurements from 1979 to 1996, but SAGE sunrise/sunset trend differences greater than 40 km altitude, combined with the more accurate SBUV-SAGE slopes for 1979-1989, suggest a most likely slope range of 0.4 to -0.4%/yr between 40 and 50 km altitude. SBUV/2 measurements from 1989 to 1994 have an upward

trend with respect to SAGE measurements of approx. 0.7% /yr with some altitudinal structure; this slope exceeds the estimated 95% uncertainties on the SBUV/2 trends.
Author
Atmospheric Composition; Halogen Occultation Experiment; Microwave Landing Systems; Microwave Sounding; Ozone

20020088749 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA
Trends in the Vertical Distribution of Ozone
Cunnold, Derek M., Georgia Inst. of Tech., USA; Logan, Jennifer A., Harvard Univ., USA; Newchurch, M. J., Alabama Univ., USA; Zawodny, Joseph M., NASA Langley Research Center, USA; Stolarski, Richard S.; Randel, William J.; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; In English
Contract(s)/Grant(s): NAG1-2202; No Copyright; Avail: Issuing Activity; Abstract Only

Analyses of satellite, ground-based, and balloon measurements allow updated estimates of trends in the vertical profile of ozone since 1979. The results show overall consistency among several independent measurement systems, particularly for northern hemisphere midlatitudes where most balloon and ground-based measurements are made. Combined trend estimates over these latitudes for the period 1979-96 show statistically significant negative trends at all attitudes between 10 and 45 km, with two local extremes: -7.4 +/- 2.0% per decade at 40 km and -7.3 +/- 4.6% per decade at 15 km attitude. There is a strong seasonal variation in trends over northern midlatitudes in the attitude range of 10 to 18 km. with the largest ozone loss during winter and spring. The profile trends are in quantitative agreement with independently measured trends in column ozone, the amount of ozone in a column above the surface. The vertical profiles of ozone trends provide a fingerprint for the mechanisms of ozone depletion over the last two decades,
Author
Trends; Ozone; Annual Variations; Satellite Observation; Vertical Distribution

20020088750 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA
A Reference Model for Middle Atmosphere Ozone in 1992/1993: Differences from That of Keating et al (1996)
Wang, H. J., Georgia Inst. of Tech., USA; Cunnold, D. M., Georgia Inst. of Tech., USA; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; In English
Contract(s)/Grant(s): NAG1-2202; No Copyright; Avail: Issuing Activity; Abstract Only

Ozone distributions have been derived from recent satellite-based measurements by the Stratospheric Aerosol and Gas Experiment (SAGE), the Halogen Occultation Experiment (HALOE) and the Microwave Limb Sounder (MLS). An ozone distribution for the period April 1992 to March 1993 and covering pressures from 0.1 to 100 mb and from 80 deg N to 80 deg S is summarized. At pressures less than 1 mb, separate distributions are given for daytime and nighttime conditions. The resulting distributions extend to somewhat higher latitudes and lower altitudes than previous COSPAR reference atmosphere distributions for ozone. Differences versus the most recent COSPAR distribution by Keating et al are illustrated.
Author
Ozone; Halogen Occultation Experiment; Microwave Sounding; Middle Atmosphere; Reference Atmospheres

20020088751 Georgia Inst. of Tech., School of Earth and Atmospheric Sciences, Atlanta, GA USA
Assessment of SAGE Version 6.1 Ozone Data Quality
Wang, Hsiang J., Georgia Inst. of Tech., USA; Cunnold, Derek M., Georgia Inst. of Tech., USA; Thomason, Larry W., NASA Langley Research Center, USA; Zawodny, Joseph M., NASA Langley Research Center, USA; Bodeker, Greg E., National Inst. of Water and Atmospheric Research, New Zealand; SAGE II Ozone Analysis; Oct. 29, 2002; 3p; In English
Contract(s)/Grant(s): NAG1-2202; No Copyright; Avail: Issuing Activity; Abstract Only

The SAGE-II V6.1 ozone retrievals are shown to be of better precision at all levels and to be much more accurate than previous retrievals in the lower stratosphere below 20 km altitude. A filtering procedure for removing anomalous ozone profiles associated with volcanic aerosol/cloud effects and other identified artifacts in V6.1 ozone is described. The agreement between SAGE and ozonesondes in the mean is shown to be approximately 10% down to the tropopause. Relative to the sondes SAGE tends to slightly overestimate ozone (less than 5%) between 15 and 20 km altitude, and systematically underestimates ozone in the troposphere by approximately 30% in the regions between 8 km altitude and 2 km below the tropopause. The precisions (random errors) of SAGE ozone retrievals above 25 km altitude are estimated to be 4% or better; they are a factor of ten worse below 16 km altitude. Linear trends in the differences between coincident SAGE and ozonesondes measurement are generally less than 0.3 %/year and not significantly different from zero in 95% confidence intervals. Compared to V5.96 retrievals, ozone trend differences between 20 and 50 km altitude are approximately 0. 1 %/year, below 20 km altitude the SAGE II trends are more positive by approximately 0.2 %/year. For the 1984-1999 period the SAGE-II shows a localized ozone loss of -0.4(+/- 0.25) %/year (2gigma) in the tropics

at 20 km altitude. In the lower stratosphere between 16 and 22 km altitudes, the SAGE shows significant ozone losses in the mid-latitudes in both Hemispheres during the 1979-1999 periods. The ozone trends range from -0.24(+/- 0.18) to -0.77(+/- 0.46) (2sigma)%/year. However in the 1984-1999 period, the downward trends are smaller (-0.07 to - 0.25 %/year) in this altitude range, and the trends in the integrated column from 12 to 17 km altitude in mid-latitudes (35 deg - 60 deg) are not significantly different from zero (0.1 +?- 0.6 (2sigma)%/year). Averaged over the tropics (20 deg S to 20 deg N) the ozone column above 15 km altitude exhibit a trend of -0.12 +/- 0.08 (2sigma)%/year.
Author
Aerosols; Ozone; Losses; Stratosphere; Trends; Data Acquisition; Data Processing

20020090248 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Finer Details: Climate Modeling
2000 NCCS Highlights: Enabling NASA Earth and Space Science; 2000, pp. 12-17; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

If you want to know whether you will need sunscreen or an umbrella for tomorrow's picnic, you can simply read the local weather report. However, if you are calculating the impact of gas combustion on global temperatures, or anticipating next year's rainfall levels to set water conservation policy, you must conduct a more comprehensive investigation. Such complex matters require long-range modeling techniques that predict broad trends in climate development rather than day-to-day details. Climate models are built from equations that calculate the progression of weather-related conditions over time. Based on the laws of physics, climate model equations have been developed to predict a number of environmental factors, for example: 1. Amount of solar radiation that hits the Earth. 2. Varying proportions of gases that make up the air. 3. Temperature at the Earth's surface. 4. Circulation of ocean and wind currents. 5. Development of cloud cover. Numerical modeling of the climate can improve our understanding of both the past and, the future. A model can confirm the accuracy of environmental measurements taken. in, the past and can even fill in gaps in those records. In addition, by quantifying the relationship between different aspects of climate, scientists can estimate how a future change in one aspect may alter the rest of the world. For example, could an increase in the temperature of the Pacific Ocean somehow set off a drought on the other side of the world? A computer simulation could lead to an answer for this and other questions. Quantifying the chaotic, nonlinear activities that shape our climate is no easy matter. You cannot run these simulations on your desktop computer and expect results by the time you have finished checking your morning e-mail. Efficient and accurate climate modeling requires powerful computers that can process billions of mathematical calculations in a single second. The NCCS exists to provide this degree of vast computing capability.
Author
Accuracy; Air Currents; Combustion Temperature; Computerized Simulation; Ocean Currents; Simulation; Solar Radiation

20020090249 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Near IR Photolysis of HO2NO2: Supplemental Material
[2002]; 8p; In English
Report No.(s): Paper-2002GL015006-Suppl; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

MkIV measurements of the volume mixing ratio (VMR) of HO2NO2 at 35 deg N, sunset on Sept. 25, 1993 are given. Measurements of HO2NO2 made between approx. 65 and 70 deg N, sunrise on May 8, 1997 are listed. The uncertainties given are 1 sigma estimates of the measurement precision. Uncertainty in the HO2NO2 line strengths is estimated to be 20%; this is the dominant contribution to the systematic error of the HO2NO2 measurement. Model inputs for the simulations are given. The albedos were obtained from Total Ozone Mapping Spectrometer reflectively data (raw data at ftp://jwocky.gsfc.nasa.gov) for the time and place of observation. Profiles of sulfate aerosol surface area ("Surf. Area") were obtained from monthly, zonal mean profiles measured by SAGE II [Thomason et al., 1997 updated via private communication]. The profile of Be(y) is based on the Wamsley et al. relation with N2O, using MkIV measurements of N20O. All other model inputs given are based on direct MkIV measurements. Finally, we note the latitude of the MkIV tangent point varied considerably during sunrise on May 8, 1997. The simulations shown here were obtained using different latitudes for each altitude.
Author
Mixing Ratios; Aerosols; Near Infrared Radiation; Nitrogen Oxides

20020090258 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Breath of Planet Earth: Atmospheric Circulation. Assimilation of Surface Wind Observations
Atlas, Robert, NASA Goddard Space Flight Center, USA; Bloom, Stephen, NASA Goddard Space Flight Center, USA; Otterman, Joseph, NASA Goddard Space Flight Center, USA; 2000 NCCS Highlights: Enabling NASA Earth and Space Sciences; 2000, pp. 26-31; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Differences in air pressure are a major cause of atmospheric circulation. Because heat excites the movement of atoms, warm temperatures cause, air molecules to expand. Because those molecules now occupy a larger space, the pressure that their weight exerts is decreased. Air from surrounding high-pressure areas is pushed toward the low-pressure areas, creating circulation. This process causes a major pattern of global atmosphere movement known as meridional circulation. In this form of convection, or vertical air movement, heated equatorial air rises and travels through the upper atmosphere toward higher latitudes. Air just above the equator heads toward the North Pole, and air just below the equator moves southward. This air movement fills the gap created where increased air pressure pushes down cold air. The ,cold air moves along the surface back toward the equator, replacing the air masses that rise there. Another influence on atmospheric. circulation is the Coriolis force. Because of the Earth's rotation, large-scale wind currents move in the direction of this axial spin around low-pressure areas. Wind rotates counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. just as the Earth's rotation affects airflow, so too does its surface. In the phenomenon of orographic lifting, elevated topographic features such as mountain ranges lift air as it moves up their surface.
Author
Atmospheric Circulation; Atmospheric Pressure; Upper Atmosphere

20020090262 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Child's Tantrum: El Nino. The Origin of the El Nino-Southern Oscillation
Picault, Joel, Institute for Research and Development, France; Hackert, Eric, Maryland Univ., USA; Busalacchi, Antonio, Maryland Univ., USA; Murtugudde, Ragu, Maryland Univ., USA; Lagerloef, Gary, Earth and Space Research, USA; 2000 NCCS Highlights: Enabling NASA Earth and Space Sciences; 2000, pp. 18-25; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In 1997, a child's tantrums caught the world's attention. These tantrums took the form not of crying and foot stamping, but of droughts and floods. Obviously, this was no ordinary child. It was, in fact, The Child, or El Nino, as it was, named in the late 1800s by South American observers, who noted that its timing coincided with the Christmas holiday. El Nino is a reversal in sea surface temperature (SST) distributions that occurs once every few years in the tropical Pacific. When it coincides with a cyclical shift in air pressure, known as the Southern Oscillation, normal weather patterns are drastically altered. The combined phenomenon is known as El Nino-Southern Oscillation (ENSO). Although ENSO is a regular phenomenon, it was unusually strong in 1997. It produced heavy rainfall and floods in California and bestowed spring-like temperatures on the Midwest during the winter. These drastic changes in normal weather patterns captured the public imagination, from news reports to jokes on late-night talk shows. Naturally, people wanted to. know as much, about El Nino as possible. Fortunately, scientists had at their disposal new satellites and ocean sensors that provided an unprecedented level of information. Consequently, not only was the 1997 ENSO the strongest in recent memory, but it was also the most thoroughly studied. Prominent groups such as the NASA Seasonalto-Interannual Prediction Project (NSIPP) combined numerous aspects of climate modeling into a single, predictive endeavor.
Author
El Nino; Climate Models; Predictions; Sea Surface Temperature; Southern Oscillation; Temperature Distribution; Tropical Regions

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GEOPHYSICS

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

20020087573 Utah State Univ., Dept. of Electrical and Computer Engineering, Logan, UT USA
An Experiment to Study Sporadic Sodium Layers in the Earth's Mesosphere and Lower Thermosphere *Final Report*
Swenson, Charles M., Utah State Univ., USA; [2002]; 9p; In English
Contract(s)/Grant(s): NAG5-5044; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Utah State University / Space Dynamics Lab was funded under a NASA Grant. This investigation has been part of Rockwell Universities Sudden Atom Layer Investigation (SAL). USU/SDL provided an electron density measurement instrument, the plasma frequency probe, which was launched on the vehicle 21.117 from Puerto-Rico in February of 1998. The instrument successfully measured electron density as designed and measurement techniques included in this version of the Plasma Frequency probe provided valuable insight into the electron density structures associated with sudden sodium layers in a collisional plasma. Electron density data was furnished to Rockwell University but no science meetings were held by Rockwell

Data from the instrument was presented to the scientific community at the URSI General Session in 1999. A paper is in preparation for publication in Geophysical Research Letters. The following document provides a summary of the experiment and data obtained as a final report on this grant.
Author
Experimentation; Sodium; Surface Layers; Density Measurement; Mesosphere

20020088708 NASA Langley Research Center, Hampton, VA USA
On the Tropospheric Measurements of Ozone by the Stratospheric Aerosol and Gas Experiment II (SAGE II, version 6.1) in the Tropics
Kar, J., Arizona Univ., USA; Trepte, C. R., NASA Langley Research Center, USA; Thomason, L. W., NASA Langley Research Center, USA; Zawodny, J. M., NASA Langley Research Center, USA; Cunnold, D. M., Georgia Inst. of Tech., USA; Wang, H. J., Georgia Inst. of Tech., USA; SAGE II Ozone Analysis; Oct. 29, 2002; 1p; In English
Contract(s)/Grant(s): NAG1-2202; No Copyright; Avail: Issuing Activity; Abstract Only
Tropospheric measurements of ozone from SAGE II (version 6.1) in the tropics have been analyzed using 12 years of data (1985-1990, 1994-1999). The seasonally averaged vertical profiles of the ozone mixing ratio in the upper troposphere have been presented for the first time from satellite measurements. These profiles show qualitative similarities with corresponding seasonal mean ozonesonde profiles at northern and southern tropical stations and are about 40-50% less than the sonde values. Despite this systematic offset, the measurements appear to be consistent with a zonal wave one pattern in the upper tropospheric column ozone and with the recently predicted summertime ozone enhancement over the Middle East. These results thus affirm the usefulness of the occultation method in studying tropospheric ozone.
Author
Troposphere; Ozone; Chemical Analysis; Meteorological Parameters; Time Measurement; Data Processing

20020089497 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
Digital Mapping, Charting, and Geodesy Analysis Program (DMAP) Spatial and Temporal Reference Systems and the 4D3 Concept
Mesick, illary; Carter, Susan; Harris, Michael; Sep. 30, 2002; 7p; In English
Contract(s)/Grant(s): Proj-NRL/MR/7440--02-8282
Report No.(s): AD-A406766; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A technical review of the Spatial and Temporal Reference Systems and the 4D3 Concept was performed by the Digital Mapping, Charting, and Geodesy Analysis Program (DMAP). Background, discussion points, and conclusions are presented.
DTIC
Geodesy; Mapping; Computer Programs

20020089563 Naval Postgraduate School, Monterey, CA USA
Variational Retrieval of Eastern Pacific Atmospheric Boundary Layer Parameters Using ATOVS With the COAMPS Mesoscale Forecast System
Cooper, Grant A., IV; Sep. 2002; 272p; In English; Original contains color images
Report No.(s): AD-A406911; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche
A one-dimensional variational (1DVAR) retrieval scheme is used to investigate the ability of the Advanced TIROS Operational Vertical Sounder (ATOVS) to contribute information to a mesoscale NWP system within the summertime Eastern Pacific (EPAC) environment. Tbis system is the Coupled Ocean - Atmosphere Mesoscale Prediction System (COAMPS) and the Naval Research Laboratory (NRL) Atmospheric Variational Data Assimilation System (NAVDAS). Analyses of information content and retrieval performance sbow that, when treated optimally, significant humidity and temperature information can be derived from ATOVS retrievals within the clear and cloudy sky summertime EPAC environment. A study of retrieval error sensitivity to representative background slate vector elements and associated errors was also conducted to establish the a priori elements critical for successful 1DVAR retrievals. 1DVAR profile temperature and humidity retrievals were generated using both simulated and actual ATOVS observations constrained by the COAMPS short-term forecasts and a synoptically relevant background error covariance matrix. The time period of interest coincides with the DYCOMS Phase II field study. The 1DVAR retrieval results indicate that ATOVS observations can provide information that, when used in concert with a COAMPS background field, reduce the retrieval error and adjust the retrieval within the shallow boundary layer toward the designawd 'true' profile.
DTIC
Atmospheric Temperature; Weather Forecasting; Information Retrieval; Atmospheric Sounding; Independent Variables

20020089603 G and A Technical Software, Inc., Newport News, VA USA

Characterization of Polar Mesospheric Clouds Using Infrared Measurements From HALOE ***Monthly Report, 1-31 Oct. 2002***

Hervig, Mark E., G and A Technical Software, Inc., USA; Nov. 20, 2002; 2p; In English

Contract(s)/Grant(s): NASW-02013

Report No.(s): GATS-112002; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Measurements from the Halogen Occultation Experiment (HALOE) revealed the infrared signature of polar mesospheric clouds (PMCs), for the first time, HALOE PMC observations at eight wavelengths (2.45 - 10 microns) show remarkable agreement with model PMC spectra based on ice particle extinction, and thus provide the first confirmation that water ice is the primary component of PMCs. Because PMCs respond to changes in temperature and water vapor, they are considered an indicator of global climate change. We propose to further the understanding of PMCs using a decade of infrared measurements form HALOE. This effort will characterize PMC spectral properties, extinction profiles, and size distributions. Using this information, HALOE measurements will be used to make simultaneous retrievals of H2O, O3, and temperature, in the presence of PMCs. The simultaneous retrievals of particle properties, H2O, O3, and temperature will be used with HALOE NO data to provide a significant step forward in the knowledge of PMC characteristics and formation conditions. We will challenge fundamental theories of PMC formation, and investigate changes in PMC properties and related conditions over the length of the HALOE measurement record. HALOE has been operating without flaw since it was launched on October 11, 1991. Consequently, ten southern and ten northern PMC seasons have been observed thus far, providing a wealth of data for the study of PMCs and related parameters.

Author

Halogen Occultation Experiment; Infrared Radiation; Mesosphere; Clouds (Meteorology); Climate Change; Polar Regions

20020090137 New Brunswick Univ., Planetary and Space Science Centre, Fredericton, New Brunswick Canada

Chemistry and Microtextures of Melt Pockets in the Los Angeles Basaltic Shergottite

Walton, E. L., New Brunswick Univ., Canada; Spray, J. G., New Brunswick Univ., Canada; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 61; In English; Also announced as 20020090114; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Los Angeles is a non-brecciated, highly shocked basaltic shergottite. The shock effects in Los Angeles can be classified into two basic types: (1) mechanical deformations and transformations that take place essentially in the solid state, and (2) localized regions of shock melting forming glassy to microcrystal line enclaves. A brief description of the former type, based largely on optical observations, is given. The complete transformation of plagioclase to maskelynite, mosaicism and planar fracturing of clinopyroxenes, pyrrhotite veins within clinopyroxene, polycrystallinity of some pyrrhotite grains, and a 350 pinlong fault with approximately 15-micrometer displacement is described. These results are in agreement with this study. This work presents a detailed description of the shock-related microtexture and mineralogy of the localized melt pockets which have formed by in situ melting of local mineral phases. The melt pockets range from 3 mm x 3 min 0.07 mm x 1.25 mm, in direct contact with the host matrix. Two polished thin sections of stone 1 (1.3 cm x 1 cm, 2.1 cm x 1.2 cm) have been investigated to determine the mineralogy and microtextures of the shock-induced melt pockets using a JEOL 6400 digital scanning electron microscope equipped with a Link Analytical eXL energy dispersive spectrometer (EDS) fitted with a Si (Li) LZ-4 Pentafet detector, and a FEG-SEM equipped with the In-Lens Thermal FEG which produces high probe current sufficient for EBSP, WDS, and EDS. These instruments are capable of characterizing compositional variations and microtextures of the melt pockets that are unresolvable using optical techniques.

Author

Basalt; Microcrystals; Microstructure; Mineralogy; Shergottites; Melts (Crystal Growth)

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20020087569 NASA Langley Research Center, Hampton, VA USA

Global Surface Solar Energy Anomalies Including El Nino and La Nina Years

Whitlock, C. H., NASA Langley Research Center, USA; Brown, D. E., Science Applications International Corp., USA; Chandler, W. S., Science Applications International Corp., USA; DiPasquale, R. C., Science Applications International Corp., USA; Ritchey, Nancy A., Science Applications International Corp., USA; Gupta, Shashi K., NASA Langley Research Center, USA;

Wilber, Anne C., Analytical Services and Materials, Inc., USA; Kratz, David P., NASA Langley Research Center, USA; Stackhouse, Paul W., NASA Langley Research Center, USA; Journal of Solar Energy Engineering; August 2001; Volume 123, pp. 211-215; In English; Copyright; Avail: Issuing Activity

This paper synthesizes past events in an attempt to define the general magnitude, duration, and location of large surface solar anomalies over the globe. Surface solar energy values are mostly a function of solar zenith angle, cloud conditions, column atmospheric water vapor, aerosols, and surface albedo. For this study, solar and meteorological parameters for the 10-yr period July 1983 through June 1993 are used. These data were generated as part of the Release 3 Surface meteorology and Solar Energy (SSE) activity under the NASA Earth Science Enterprise (ESE) effort. Release 3 SSE uses upgraded input data and methods relative to previous releases. Cloud conditions are based on recent NASA Version-D International Satellite Cloud Climatology Project (ISCCP) global satellite radiation and cloud data. Meteorological inputs are from Version-I Goddard Earth Observing System (GEOS) reanalysis data that uses both weather station and satellite information. Aerosol transmission for different regions and seasons are for an 'average' year based on historic solar energy data from over 1000 ground sites courtesy of Natural Resources Canada (NRCan). These data are input to a new Langley Parameterized Shortwave Algorithm (LPSA) that calculates surface albedo and surface solar energy. That algorithm is an upgraded version of the 'Staylor' algorithm. Calculations are performed for a 280X280 km equal-area grid system over the globe based on 3-hourly input data. A bi-linear interpolation process is used to estimate data output values on a 1 X 1 degree grid system over the globe. Maximum anomalies are examined relative to El Nino and La Nina events in the tropical Pacific Ocean. Maximum year-to-year anomalies over the globe are provided for a 10-year period. The data may assist in the design of systems with increased reliability. It may also allow for better planning for emergency assistance during some atypical events.

Author

Solar Energy; Meteorological Parameters; Annual Variations; Anomalies; Satellite Observation; Cloud Cover; Computer Aided Mapping

20020087894 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Intercomparison and Evaluation of Cumulus Parameterizations under Summertime Midlatitude Continental Conditions

Xie, S.; Cederwall, R. T.; Yio, J. J.; Xu, K. M.; May 17, 2001; 15p; In English

Report No.(s): DE2002-798777; UCRL-JC-142040-REV-1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Parameterization of cumulus convection in general circulation model (GCM) has been recognized as one of the most important and complex issues in the model physical parameterizations. In earlier studies, most cumulus parameterizations were developed and evaluated using data observed over tropical oceans, such as the GATE (the Global Atmospheric Research Programs Atlantic Tropical Experiment) data. This is partly due to inadequate field measurements in the midlatitudes. In this study, we compare and evaluate a total of eight types sf the state-of-the-art cumulus parameterizations used in fifteen Single-Column Models (SCM) under the summertime midlatitude continental conditions using the Atmospheric Radiation Measurement (ARM) Southern Great Plains (SGP) summer 1997 Intensive Operational Period (IOP) data, which covers several continental convection events. The purpose is to systematically compare and evaluate the performance of these cumulus parameterizations under summertime midlatitude continental conditions. Through the study we hope to identify strengths and weaknesses of these cumulus parameterizations that will lead to further improvements.

NTIS

Cumulus Clouds; Parameterization

20020089521 Army Research Lab., Sensors Directorate, Adelphi, MD USA

Coupling Meteorology to Acoustics in Forests ***Final Report, Oct. 2001-Jan. 2002***

Tunick, Arnold; Sep. 2002; 47p; In English

Report No.(s): AD-A406709; ARL/ADELPHI-MR-538; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The U.S. Army has a growing interest in the use of advanced sensors and computer models to retrieve. display and interpret acoustic signals from sound-emitting targets in and around forests. Outdoor sound speed is an essential parameter for determining point-to-point acoustic propagation. The speed of sound is often expressed as a function of air temperature, humidity, and wind velocity. Therefore, we have reviewed selected past research on micrometeorology within and above forests to examine the calculation of the speed of sound through the atmosphere in the forest environment for military acoustic applications. Our objective is to evaluate meteorological models for estimating wind speed and temperature profiles within and above forests to

determine those most applicable in representing mechanical and thermodynamic influences on the speed of sound in the forest environment.
DTIC
Meteorology; Forests; Acoustic Emission

20020089562 Naval Postgraduate School, Monterey, CA USA
Performance of a High Resolution Diagnostic Model for Short Range Mesoscale Wind Forecasts in Complex Terrain
Gallaher, Shawn G.; Sep. 2002; 146p; In English; Original contains color images
Report No.(s): AD-A406908; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This study investigates the feasibility of using a high resolution simple diagnostic model (WOCSS) initialized from a coarser grid full physics prognostic model (COAMPS) to obtain mesoscale winds. This approach using COAMPS 81, 27, and 9 km forecast model soundings to initialize WOCSS at 3 km is compared to COAMPS forecast at 3km horizontal resolution alone. Four case studies were collected during various weather regimes in Central California. Observations were collected from 5 different agencies and were used for verification of the models. The sensitivity of various WOCSS parameters were also explored. The results showed that overall the COAMPS(9km)/WOCSS approach provides winds as good as COAMPS at 3 km at a greatly reduced computation time. The COAMPS/WOCSS methodology performed particularly well during non-frontal situations where low-level inversions were present. Separation of the surface observation data by agency revealed large errors from data networks with low maintenance, monitoring and site specifications standards. The highest flow surface in WOCSS was the only parameter that displayed any significant sensitivity. Further work is needed to test the advantages of this sensitivity. COAMPS/WOCSS mesoscale forecast winds may prove to be very useful as input to emergency response applications such as dispersion and trajectory modeling.
DTIC
Models; Weather Forecasting; Wind (Meteorology)

20020089999 Naval Postgraduate School, Monterey, CA USA
Improving METOC Products and Services by Utilizing Net Centric Concepts
Barnhill, Todd E.; Sep. 2002; 121p; In English; Original contains color images
Report No.(s): AD-A407023; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In order for the METOC community to remain operationally significant and engaged with the war fighters, decision makers and other customers, METOC products and services must be fully integrated into the systems that these various groups depend on for there daily information. This thesis investigates ways to make METOC product and services more interoperable by utilizing net centric concepts to improve the tactical significance of METOC products, accessibility to data, and interoperability between internal command systems. Improvements where made to the Joint METOC Viewer and METCAST systems to improve the ability of the programs to provide tactically significant products and data accessibility. Additionally, developments were made to create an interoperable Electronic Ship F%older Database and Message Parsing Program that allows all Optimum Track Ship Routing (OTSR) data to be organized into one system that can be used to parse, track and disseminate OTSR related information.
DTIC
Command Guidance; Computerized Simulation; Local Area Networks; Data Bases

20020090255 NASA Goddard Space Flight Center, Greenbelt, MD USA
Dust in the Sky: Atmospheric Composition. Modeling of Aerosol Optical Thickness
Chin, Mian, NASA Goddard Space Flight Center, USA; Ginoux, Paul, NASA Goddard Space Flight Center, USA; Kinne, Stefan, NASA Goddard Space Flight Center, USA; Torres, Omar, NASA Goddard Space Flight Center, USA; Holben, Brent, NASA Goddard Space Flight Center, USA; Duncan, Bryan, Harvard Univ., USA; Martin, Randall, Harvard Univ., USA; Logan, Jennifer, Harvard Univ., USA; Higurashi, Akiko, National Inst. for Environmental Studies, Japan; Nakajima, Teruyuki, Tokyo Univ., Japan; 2000 NCCS Highlights: Enabling NASA Earth and Space Science; 2000, pp. 38-45; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Aerosol is any small particle of matter that rests suspended in the atmosphere. Natural sources, such as deserts, create some aerosols; consumption of fossil fuels and industrial activity create other aerosols. All the microscopic aerosol particles add up to a large amount of material floating in the atmosphere. You can see the particles in the haze that floats over polluted cities. Beyond this visible effect, aerosols can actually lower temperatures. They do this by blocking, or scattering, a portion of the sun's energy

from reaching the surface. Because of this influence, scientists study the physical properties of atmospheric aerosols. Reliable numerical models for atmospheric aerosols play an important role in research.
Author
Aerosols; Atmospheric Composition; Dust; Pollution

20020090263 NASA Goddard Space Flight Center, Greenbelt, MD USA
Rainfall Across the Globe: Precipitation. The Role of Landmass in Monsoon Development. The Relationship Between Precipitation and Sea Surface Temperature on Decadal Time Scales
Chao, Winston, NASA Goddard Space Flight Center, USA; Schubert, Siegfried, NASA Goddard Space Flight Center, USA; Suarez, Max, NASA Goddard Space Flight Center, USA; Pegion, Philip, NASA Goddard Space Flight Center, USA; 2000 NCCS Highlights: Enabling NASA Earth and Space Sciences; 2000, pp. 56-65; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The numerical simulation of precipitation helps scientists understand the complex mechanisms that determine how and why rainfall is distributed across the globe. Simulation aids in the development of forecastin,g efforts that inform policies regarding the management of water resources. Precipitation modeling also provides short-term warnings, for emergencies such as flash floods and mudslides. Just as precipitation modeling can warn of an impending abundance of rainfall, it can help anticipate the absence of rainfall in drought. What constitutes a drought? A meteorological drought simply means that an area is getting a significantly lower amount of rain than usual over a prolonged period of time and an agricultural drought is based on the level of soil moisture.
Author
Numerical Analysis; Precipitation (Meteorology); Rain; Floods

20020090286 Air Force Combat Climatology Center, Asheville, NC USA
South Asia: A Climatological Study, Volume 2, Continental South Asia
Higdon, Melody; Lilianstrom, Robert; Killman, Virgil; Carey, Don; Clinton, Gary; May 01, 2002; 286p; In English
Report No.(s): AD-A406961; AFCCC/TN-02/002-VOL-2; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This technical note is a climatological study of Continental South Asia. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each of Continental South Asia's ”five zones of climatic commonality.” Each ”season” is defined and discussed in considerable detail with emphasis on general weather, hazards, clouds, visibility, winds, precipitation, and temperature.
DTIC
Meteorology; Climatology; Weather

20020090287 Air Force Combat Climatology Center, Asheville, NC USA
South Asia: A Climatological Study, Volume 1, Subtropical South Asia
Higdon, Melody; Lilianstrom, Robert; Killman, Virgil H.; Clinton, Gary; Mar. 01, 2002; 284p; In English
Report No.(s): AD-A406962; AFCCC/TN-02/001-VOL-1; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This technical note is a climatological study of Subtopical South Asia. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each of Subtropical South Asia's ”five zones of climatic commonality.” Each ”season” is defined and discussed in considerable detail with emphasis on general weather, hazards, clouds, visibility, winds, precipitation, and temperature.
DTIC
Climatology; Weather; Temperate Regions

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OCEANOGRAPHY

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

20020087890 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Biogeochemical Proxies in Scleractinian Corals used to Reconstruct Ocean Circulation
Guilderson, T. P.; Kashgarian, M.; Schrag, D. P.; Feb. 23, 2001; 14p; In English
Report No.(s): DE2002-798773; UCRL-JC-141557; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We utilize monthly 14C data derived from coral archives in conjunction with ocean circulation models to address two questions: (1) how does the shallow circulation of the tropical Pacific vary on seasonal to decadal time scales and (2) which dynamic processes determine the mean vertical structure of the equatorial Pacific thermocline. Our results directly impact the understanding of global climate events such as the El Nino-Southern Oscillation (ENSO). to study changes in ocean circulation and water mass distribution involved in the genesis and evolution of ENSO and decadal climate variability, it is necessary to have records of climate variables several decades in length. Continuous instrumental records are limited because technology for continuous monitoring of ocean currents has only recently been available, and ships of opportunity archives such as C O S contain large spatial and temporal biases. In addition, temperature and salinity in surface waters are not conservative and thus can not be independently relied upon to trace water masses, reducing the utility of historical observations. Radiocarbon (I4C) in sea water is a quasi-conservative water mass tracer and is incorporated into coral skeletal material, thus coral 14C records can be used to reconstruct changes in shallow circulation that would be difficult to characterize using instrumental data. High resolution A14C timeseries such as these, provide a powerful constraint on the rate of surface ocean mixing and hold great promise to augment onetime surveys such as GEOSECS and WOCE. These data not only provide fundamental information about the shallow circulation of the Pacific, but can be used as a benchmark for the next generation of high resolution ocean models used in prognosticating climate change.
NTIS
Ocean Currents; Coral Reefs

20020089463 Scripps Institution of Oceanography, La Jolla, CA USA
Anomalous Heat Budgets in the Interior Pacific Ocean on Seasonal- to -Timescales and Gyre Spacescales ***Final Report, 1 May 1998 - 30 Sep. 2002***
White, Warren, Scripps Institution of Oceanography, USA; Cayan, Daniel R., Scripps Institution of Oceanography, USA; [2002]; 2p; In English
Contract(s)/Grant(s): NAG5-7096; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This study quantifies uncertainties in closing the seasonal cycle of diabatic heat storage over the Pacific Ocean from 20 degrees S to 60 degrees N through the synthesis of World Ocean Circulation Experiment (WOCE) products over 7 years from 1993-1999. We utilize WOCE reanalysis products from the following sources: diabatic heat storage (DHS) from the Scripps Institution of Oceanography (SIO); near-surface geostrophic and Ekman currents from the Earth and Space Research (ESR); and air-sea heat fluxes from Comprehensive Ocean-Atmosphere Data Set (COADS), National Centers for Environmental Prediction (NCEP), and European Center for Mid-Range Weather Forecasts (ECMWF). We interpolate these products onto a common grid, allowing the seasonal cycle of DHS to be modeled for comparison with that observed. Everywhere latent heat flux residuals dominate sensible heat flux residuals and shortwave heat flux residuals dominate longwave heat flux residuals, both comparable in magnitude to the residual horizontal heat advection. We find the root-mean-square (RMS) of the differences between observed and model residual DHS tendencies to be less than 15 W per square meters everywhere except in the Kuroshio extension. Comparable COADS and NCEP products perform better than ECMWF products in the extra-tropics, while the NCEP product performs best in the tropics. Radiative and turbulent air-sea heat flux residuals computed from ship-born measurements perform better than those computed from satellite cloud and wind measurements. Since the RMS differences derive largely from biases in measured wind speed and cloud fraction, least-squares minimization is used to correct the residual Ekman heat advection and air-sea heat flux. Minimization reduces RMS differences less than 5 W per square meters except in the Kuroshio extension, suggesting how winds, clouds, and exchange coefficients in the NCEP, ECMWF, and ESR products can be improved.
Author
Pacific Ocean; Gyres; Anomalies; Oceanography; Heat Flux; Atmospheric Heat Budget; Annual Variations

20020089475 Naval Research Lab., Bay Saint Louis, MS USA
Wave Model Validation for the Northern Gulf of Mexico Littoral Initiative (NGLI) Project
Hsu, Y. Larry; Allard, Richard A.; Mettlach, Theodore R.; Sep. 06, 2002; 33p; In English; Prepared in collaboration with Neptune Sciences, Inc., Slidell, LA
Report No.(s): AD-A406730; NRL/FR/7322--02-10; 032; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents the wave measurement and modeling efforts supporting the Northern Gulf of Mexico Littoral Initiative (NGLI). Data from three NDBC (National Data Buoy Center) buoys acquired during September 2000 are used to validate COAMPS, WAM, and two shallow water wave models: STWAVE and SWAN. Statistical errors of model estimates of significant wave height, mean wave period, mean wave direction, wind speed, and wind direction are computed. Both COAMPS and WAM produce accurate input conditions for driving the shallow water models. SWAN performance is found to be better than that of STWAVE. STWAVE's poorer performance is caused mainly by its limitation in specifying imput wind and wave conditions.

Various SWAN modeling parameters are evaluated. Based on the evaluation and validation, an operational wave model using SWAN for the NGLI region has been developed.
DTIC
Wave Propagation; Coastal Water; Sediments; Ocean Bottom; Gulf of Mexico; Water Waves; Models

20020090256 NASA Goddard Space Flight Center, Greenbelt, MD USA
Slow and Steady: Ocean Circulation. The Influence of Sea Surface Height on Ocean Currents
Haekkinen, Sirpa, NASA Goddard Space Flight Center, USA; 2000 NCCS Highlights; 2000, pp. 32-37; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The study of ocean circulation is vital to understanding how our climate works. The movement of the ocean is closely linked to the progression of atmospheric motion. Winds close to sea level add momentum to ocean surface currents. At the same time, heat that is stored and transported by the ocean warms the atmosphere above and alters air pressure distribution. Therefore, any attempt to model climate variation accurately must include reliable calculations of ocean circulation. Unlike movement of the atmosphere, movement of the ocean's waters takes place mostly near the surface. The major patterns of surface circulation form gigantic circular cells known as gyres. They are categorized according to their general location-equatorial, subtropical, subpolar, and polar-and may run across an entire ocean. The smaller-scale cell of ocean circulation is known' as an eddy. Eddies are much more common than gyres and much more difficult to track in computer simulations of ocean currents.
Author
Ocean Currents; Air Water Interactions; Atmospheric Circulation; Atmospheric Pressure; Vortices

20020090259 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Ocean's Carbon Factory: Ocean Composition. The Growth Patterns of Phytoplankton Species
Gregg, Watson, NASA Goddard Space Flight Center, USA; 2000 NCCS Highlights: Enabling NASA Earth and Space Sciences; 2000, pp. 46-55; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

According to biological data recorded by the Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) satellite, the ocean contains nearly half of all the Earth's photosynthesis activity. Through photosynthesis, plant life forms use carbon from the atmosphere, and in return, plants produce the oxygen that life requires. In effect, ocean chlorophyll works like a factory, taking carbon and "manufacturing" the air we breathe. Most ocean-bound photosynthesis is performed by single-celled plants called phytoplankton. "These things are so small," according to Michael Behrenfeld, a researcher at NASA Goddard Space Flight Center, "that if you take hundreds of them and stack them end-to-end, the length of that stack is only the thickness of a penny". The humble phytoplankton species plays a vital role in balancing the amounts of oxygen and carbon dioxide in the atmosphere. Therefore, understanding exactly how phytoplankton growth works is important.
Author
Carbon Dioxide; Phytoplankton; Photosynthesis; Ocean Dynamics

51
LIFE SCIENCES (GENERAL)

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

20020087633 Dynamac Corp., Western Ecology Div., Cocoa Beach, FL USA
Functional Groups Based on Leaf Physiology: Are they Spatially and Temporally Robust?
Foster, Tammy E., Dynamac Corp., USA; Brooks, J. Renee, Dynamac Corp., USA; May 2002; 86p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS10-02001
Report No.(s): NASA/TM-2002-211174; NAS 1.15:211174; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The functional grouping hypothesis, which suggests that complexity in function can be simplified by grouping species with similar responses, was tested in the Florida scrub habitat. Functional groups were identified based on how species in fire maintained FL scrub function in terms of carbon, water and nitrogen dynamics. The suite of physiologic parameters measured to determine function included both instantaneous gas exchange measurements obtained from photosynthetic light response curves and integrated measures of function. Using cluster analysis, five distinct physiologically-based functional groups were identified. Using non-parametric multivariate analyses, it was determined that these five groupings were not altered by plot

differences or by the three different management regimes; prescribed burn, mechanically treated and burn, and fire-suppressed. The physiological groupings also remained robust between the two years 1999 and 2000. In order for these groupings to be of use for scaling ecosystem processes, there needs to be an easy-to-measure morphological indicator of function. Life form classifications were able to depict the physiological groupings more adequately than either specific leaf area or leaf thickness. THe ability of life forms to depict the groupings was improved by separating the parasitic Ximenia americana from the shrub category.
Author
Biomass Burning; Leaves; Plants (Botany); Cluster Analysis; Multivariate Statistical Analysis

20020087672 National Defence Research Establishment, Umea, Sweden
Windchill and the Risk of Freezing Unprotected Skin ***Vindkyla och Risken att Foerfrysa Oskyddad Hud***
Danielsson, U.; Mar. 2002; 36p; In Swedish
Report No.(s): PB2003-100472; FOI-R-0405-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Low air temperatures and high winds are associated with an increased risk of freezing exposed skin. Such injuries may result in extensive loss of duty-time and can also require long medical treatment. Cold weather can be expected in many regions where conflicts demand military presence. Hence, tools for predicting the risk of skin frostbite is helpful in order to reduce cold weather casualties. Siple and Passel (1945) exposed bare skin to different climates and observed at what combinations of air speed and temperature skin freezing occurred. In addition, they performed cooling experiments on a water-filled cylinder from which they derived the wind chill index (WCI). They reported that an increased risk of frostbite was prevalent at a WCI above 1400 (kcal/(m2xh)). Finger frostbite at considerably lower WCI values than 1400 has also been reported. These exposures were, however associated with snow in the air or with the skin wetted. Another factor of importance is presence of solar radiation. It has been found that frostbite rarely occurs in intense sunshine in spite of high WCI-values. Though the use of the wind chill index has been widely spread, its foundations have been questioned from time to time. WCI has been re-examined and was found not to describe the convective heat transfer correctly. Based on a corrected heat transfer model, an analysis of finger frostbite data, presented in the literature, revealed that the frequency of tissue freezing was related to the skin surface temperature. Risk curves have been developed that predicts reasonably well both the frequency of experimentally developed finger frostbite and casualty rate among soldiers during field exercise. These risk curves have been extended, now also taking into consideration solar radiation and skin wetness. The effect of acclimation, expressed as time stayed in cold region, can also be included in the prediction of the risk of tissue freezing.
NTIS
Freezing; Skin (Anatomy); Frostbite; Wind Effects; Exposure

20020089434 Naval Academy, Annapolis, MD USA
Biophysical Characterization of an Bifunctional Iron Regulating Enzyme
Mahadevan, Pritha M.; May 2002; 69p; In English; Original contains color images
Report No.(s): AD-A406568; USNA-298 (2002); No Copyright; Avail: CASI; A04, Hardcopy

In recent years, proteins have been discovered that can interchange forms and conduct two distinct functions, one such polypeptide with two specific functions is the mammalian iron responsive element (IRE) binding protein IRP-1. When iron levels within the cell are normal, this protein contains an iron-sulfur cluster and is known as cytoplasmic aconitase, an enzyme that catalyzes a specific chemical reaction. When iron levels fall below normal, however, the iron-sulfur cluster is lost, the protein loses its enzymatic activity and it becomes IRP-1, which binds to certain regions of ribonucleic acid (RNA). This binding action helps restore iron levels to normal, and in the process returns the protein to its cytoplasmic aconitase form. In order to understand the structural features that stabilize this large bifunctional protein, folding studies were performed in the presence and absence of iron on a recombinant version of the human protein. Equilibrium unfolding experiments in urea revealed that human cytoplasmic aconitase undergoes a multi-state transition from the native to denatured form. Comparison of unfolding in the presence and absence of the 4Fe-4S cluster indicate that the cluster does not have a significant effect on the equilibrium unfolding properties as monitored by fluorescence. Monitoring enzymatic activity as a function of urea concentration indicates that activity is lost at ^2M urea, presumably due to disruption of the enzyme active site, which is at the major interdomain cleft. The effect of thermal denaturation on the stability and activity of the IRP-1 was also studied. A preliminary model for the unfolding of aconitase based on its enzyme activity, equilibrium thermal properties, and chemical denaturation data is presented.
DTIC
Biophysics; Enzyme Activity; Iron; Regulatory Mechanisms (Biology); Chemical Reactions

20020089453 Case Western Reserve Univ., Cleveland, OH USA

Investigating the Role of Nuclear Clusterin (nCLU) in Lethality and Genomic Instability in Paclitaxel (Taxol) - Treated Human Breast Cancer Cells ***Annual Report, 4 Jun. 2001-3 Jun 2002***

Criswell, Tracy L.; Boothman, David A.; Jul. 2002; 53p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-01-1-0194

Report No.(s): AD-A406785; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Clusterin is a protein that has been implicated in many normal physiological processes (tissue remodeling, sperm maturation) as well as many pathological processes (Alzheimer disease, atherosclerosis, cancer) . Our laboratory became interested in clusterin when we identified it as an x-ray induced protein/transcript in human melanoma cells. Recently, we have identified two forms of this protein that are derived by alternative splicing of a single message. The secretory form of clusterin (sCLU) has been shown to have cytoprotective effects after cellular stress and injury. In contrast, a nuclear form of clusterin (nCLU) appears to be cytotoxic. Recently, Redondo et. al demonstrated that sCLU was overexpressed in breast cancer. sCLU over expression may provide a selective advantage in malignant cells. The most effective therapies for breast cancer after surgery include chemo- and radiation therapies. These therapies often fail as the tumor develop drug and radiation resistance. Our lab has shown that sCLU is induced by physiological doses of taxol, taxotere and radiation. Understanding the cellular and molecular responses of malignant and normal cells to these chemo- and radiation therapy would allow us to increase the efficacy of these treatments. Insight into the regulation of sCLU will allow us to better understand some of these processes.

DTIC

Deoxyribonucleic Acid; Cancer; Toxins and Antitoxins; Proteins

20020089454 Illinois Univ., Broad of Trustees, Chicago, IL USA

Mechanism of Action of a Novel Analog of Vitamin D, 1 alpha-hydroxy-24-ethyl Cholecalciferol (VD5), in Normal and Transformed Human Breast Epithelial Cells ***Annual Report, 1 May 2001-30 Apr. 2002***

Hussain, Erum A.; Mehta, Rajendra G.; May 2002; 45p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-01-1-0272

Report No.(s): AD-A406786; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Several epidemiological studies had suggested a correlation between increased breast cancer mortality rates and lower serum levels of vitamin D3. The active form of vitamin D (1,25(OH)2 D3) has now been well recognized as an effective suppressing agent for leukemia, breast, colon, and prostate cancers. However, due to its hypercalcemic activity it is toxic at levels that are necessary for its chemopreventive effects. Therefore, much attention has been paid to developing non-toxic analogs of vitamin D. We have been studying an analog of vitamin D, 1-hydroxy-24-ethyl cholecalciferol (D5), for the past three years. This analog has shown antiproliferative and differentiation inducing effects in carcinogen transformed mouse mammary gland organ culture (MMOC) and breast cancer cells in vitro with little or no calcemic activity in vivo. D5 inhibited preneoplastic lesions and growth of carcinogen treated MMOC, but it had no effect on the growth of normal MMOC. Consequently, we proposed to transform a normal breast epithelial cell line MCFl2F and to study the mechanism of action of D5 on the growth of normal versus transformed cell lines. MCF-12F cells were transformed with DMBA and MNU, and resulting cell lines were designated MCF-l2F(DMBA)and MCF-l2F(MNU), respectively. to study the growth effects of D5 on these cell lines, we performed cell count, cell viability MTT assay and FACS cell cycle analysis.

DTIC

Cancer; Calciferol; Carcinogens; Ethyl Compounds

20020089455 New Mexico State Univ., Las Cruces, NM USA

Miniaturized DNA Biosensor for Decentralized Breast-Cancer Screening ***Annual Report, 1 Jun. 2001-31 May 2002***

Wang, Joseph; Jun. 2002; 43p; In English

Contract(s)/Grant(s): DAMD17-00-1-0366

Report No.(s): AD-A406787; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The use of DNA testing as an important component of breast cancer diagnosis has been increasing rapidly over the past decade. The goal of this project is to develop and characterize an electrochemical biosensing microsystem for the rapid point-of-care genetic screening of breast-cancer. During the second year of this project we introduced innovative electrochemical routes for improving the reliability of devices for genetic screening of breast-cancer. In particular, we have successfully combined the unique amplification features of DNA accumulation or metal nanoparticle networks, with an effective magnetic isolation of the duplex, and a powerful label-free electrical detection for achieving the task of sensitive and selective breast-cancer diagnostics. Additional developmental work, particularly further improvements in the sensitivity and selectivity (through the use of dendritic

and PNA probes) along with transforming to a miniaturized flow system, is in progress towards the realization of wide-scale decentralized screening for breast cancer.
DTIC
Electrochemistry; Deoxyribonucleic Acid; Cancer; Bioinstrumentation

20020089461 Virginia Mason Research Center, Seattle, WA USA
Development of a Transgenic Mouse Model for Breast Cancer that is Optimized for the Study of T Cell-Based Therapeutic Strategies ***Annual Report, 15 May 2001-14 May 2002***
Nelson, Brad H.; Jun. 2002; 8p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0486
Report No.(s): AD-A406806; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Our goal is to develop a transgenic mouse model for breast cancer that will allow the in vivo activities of tumor-specific T cell clones to be tracked at all stages of tumorigenesis and after various immune interventions. We proposed to ”tag’ the neu oncogene with two defined T cell epitopes so as to confer recognition by available T cell receptor (TCR) transgenic T cells. When expressed as a transgene in mammary epithelium, epitope-tagged neu (designated neu OT1/OT2) should induce formation of aggressive mammary adenocarcinomas that express the epitope tags and hence are recognizable by adoptively transferred TCR trangenic T cells. This past year, we have obtained five neuOTl/OT2 transgene-positive founders, which have been bred to produce multiple female offspring. Expression of neu in mammary epithelium is being evaluated, and mice are being monitored for mammary tumorigenesis. Meanwhile, we have commenced adoptive T cell transfer experiments using a convenient, transplantable lymphoma model, and have discovered signaling differences between T cells that are responding to antigen-positive tumors versus the same antigen delivered with adjuvant. Thus, Aim I and much of Aim 2 have been successfully completed, and we are beginning to obtain novel insights into T cell responses in the tumor environment.
DTIC
Immune Systems; Cells (Biology); Cancer; Antigens

20020089478 Georgetown Univ., Washington, DC USA
The Regulation of the Angiogenic Factor FGF-Binding Protein (FGF-BP) by the APC/beta-Catenin Signaling Pathway in the Progression of Breast Cancer ***Annual Report, 1 May 2001-30 Apr. 2002***
Ray, Ranjan; May 2002; 14p; In English
Contract(s)/Grant(s): DAMD17-01-1-0253
Report No.(s): AD-A406733; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Angiogenic vessel growth in solid tumors is crucial for the survival of the tumor and provides an avenue for the tumor cells to metastasize to distant sites. Breast cancer tumors are also dependent on angiogenesis for survival. Therefore, understanding the underlying mechanisms of the angiogenic process in breast cancer will enhance our knowledge of the carcinogenic process and provide potential therapeutic targets for the treatment of breast cancer. Our lab has previously shown that FGF-BPl. a binding protein for the angiogenic factor FGF-2, is overexpressed in a certain subset of breast cancers. in the current study we have found that FGF-BP1 is also overexpressed in the mammary tumors of the Min/+ mice, a mouse model that expresses high levels of the oncogene beta-catenin. Using in vitro assays we also show that FGF-BPl is a direct transcriptional target of beta-catenin that may be working through a novel l3bp fragment in the FGF-BPl promoter.
DTIC
Fibroblasts; Metastasis; Cancer; Oncogenes

20020089480 Chicago Univ., Chicago, IL USA
A Micro-Simulation Model of the Benefits and Costs of Prostate Cancer Screening and Treatment ***Final Report, 1 Jul. 1998-31 Dec. 2001***
Meltzer, David O.; Abdalla, Ibrahim; Jan. 2002; 60p; In English
Contract(s)/Grant(s): DAMD17-98-1-8600
Report No.(s): AD-A406735; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This idea development award developed a micro-simulation model of prostate cancer screening and treatment. As described in our initial proposal, we developed a detailed model of the natural history, screening, and treatment of prostate cancer organized around a Markov model that incorporated true stage and grade of tumor, misclassification of tumors that generates discrepancies between clinical and true stage, and other innovative features that had been neglected in prior models. We also extended the model to account for persistent heterogeneity that would not be adequately modeled by usual Markov models. We also did a detailed structured literature review to estimate key parameters of our model and developed new techniques to estimate the parameters

of the natural history model by fitting it to aggregate and individual-level data from the SEER program. Our baseline analysis suggests that screening and treatment will increase life expectancy but decrease quality-adjusted life expectancy. Potential gains are largest in men ages SO-70 and when undiagnosed cancer creates substantial anxiety. We published a paper based on some initial analyses of treatment patterns, have a main cost-effectiveness manuscript in progress, and received ROl funding from the National Cancer Institute to further extend this work.
DTIC
Cost Effectiveness; Prostate Gland; Diagnosis; Cost Analysis; Cancer

20020089481 Howard Univ., Cancer Center, Washington, DC USA
Cladistic Association Analysis of Genetic Effects on Prostate Cancer in African Americans ***Final Report, 15 Feb. 2000-14 Feb 2002***
Kittles, Rick A.; Mar. 2002; 34p; In English
Contract(s)/Grant(s): DAMD17-00-1-0025
Report No.(s): AD-A406736; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals of this project are to (1) provide a formal evaluation of variation at three candidate gene regions for prostate cancer (the androgen receptor gene, 5alpha-reductase type 2 gene, and the chromosome X region Xq27-28) in 2,000 clinically evaluated unrelated men, and (2) exploit the evolutionary history of haplotypes in order to determine if haplotypic differences account for phenotypic variation in prostate cancer, prostate specific antigen (PSA) levels and disease progression. to date we have collected blood and clinical data from about 1700 unrelated men with and without prostate cancer. Molecular genotyping of three polymorphisms within the androgen receptor has been performed in 1700 individuals and three polymorphism within the 5alpha-reductase type 2 gene in about 1100 of the subjects. In addition, five microsatellites have been typed within the candidate gene region in and around Xq27-28 for all subjects. Preliminary analyses reveal significant linkage disequilibrium between the androgen receptor markers in African Americans and suggest a strong correlation between specific androgen receptor haplotypes and prostate cancer. The other two gene regions have yet to be analysed for association with prostate cancer.
DTIC
Genetics; Prostate Gland; Cancer

20020089482 California Univ., Riverside, CA USA
Administration of Additional Phosphorylated Prolactin During Pregnancy Inhibits Mammary Ductal Branching and Promotes Premature Lobuloalveolus Development ***Annual Report, 19 Jun. 2001-18 Jun 2002***
Walker, Ameae M.; Jul. 2002; 38p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0180
Report No.(s): AD-A406737; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Prolactin (PRL) is a hormone recognized as having both proliferative and differentiative activities in the mammary gland. Current theory proposes that it is the coexisting steroidal environment which dictates whether PRL is proliferative or differentiative. Preliminary data, presented as part of the initial proposal and established during year 1, however, suggested that it was the form of PRL released that dictated whether proliferation or differentiation would occur. by form of PRL we mean whether the PRL is released from the pituitary as an unmodified polypeptide or whether it is phosphorylated. to study this issue, we have produced recombinant, unmodified PRL (U-PRL) and a recombinant, molecular mimic of phosphorylated PRL, S179D PRL In the studies conducted during the first and second year, we have demonstrated that U-PRL promotes mammary growth, while S179D PRL inhibits growth and promotes differentiation. Further, we have demonstrated that these effects of U-PRL and S179D PRL are produced directly on the mammary gland. In addition, we have been able to show that U-PRL and S179D PRL exert these very different effects by changing the balance of signaling between the two major pathways in mammary epithelium. Thus U-PRL primarily uses the Jak 2-Stat 5a pathway, while S179D PRL increases use of the MAP kinase pathway.
DTIC
Pregnancy; Mammary Glands; Cancer; Pituitary Hormones

20020089483 Michigan Univ., Ann Arbor, MI USA
The Contributions of 8P Loss and 8Q Gain to the Malignant Phenotype in Human Prostate Tumors ***Annual Report, 1 Sep. 1999-31 Mar. 2002***
Kant, Rajiv; Macoska, Jill A.; Apr. 2002; 33p; In English
Contract(s)/Grant(s): DAMD17-99-1-9520
Report No.(s): AD-A406741; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Prostate cancer research is hampered by the lack of suitable human in vitro models that accurately recapitulate the genetic composition or biological behavior of initiate primary prostate tumors. In order to overcome this limitation, the Nl5C6 epithelial and the Nl fibroblastic cell lines were developed through immortalization of explanted human prostate tissue with the HPV and E6 and E7 proteins. Genotypic characterization revealed that immortalization of the Nl5C6 epithelial cells was associated with a dominant genetic alteration involving the short arm of chromosome 8, a region often deleted or rearranged in primary human prostate tumors. Phenotypic characterization demonstrated that the Nl5C6 epithelial and Nl fibroblastic cell lines expressed cell-type appropriate proteins and gene transcripts. The Nl5C6 cells, but not Nl cells, expressed anchorage independence, consistent with an initially transformed phenotype. Moreover, Nl5C6 epithelial cells proliferated and formed colonies in soft agar at rates 2-3 fold higher when grown in Nl fibroblast conditioned serum free media compared to unconditioned serum free media. These results suggest that factors secreted by Nl fibroblasts augmented expression of the malignant phenotype by Nl5C6 epithelial cells, and show that paracrine interactions defined the malignant potential of transformed epithelial cells in the human prostate.
DTIC
Tissues (Biology); Cancer; In Vitro Methods and Tests; Chromosomes; Genetics

20020089484 Iowa Univ., Iowa City, IA USA
Identification of Prostate Specific Antigens for Immunotherapy Vaccines ***Final Report, 1 Aug. 1998-31 Jan. 2002***
Ratliff, Timothy; Feb. 2002; 13p; In English
Contract(s)/Grant(s): DAMD17-98-1-8494
Report No.(s): AD-A406742; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The limiting step in the development of antigen specific vaccines for the immunotherapy of cancer is the identification of tissue or cancer specific antigens capable of activating a strong immune response. Many antigens with the desired specificity have been identified but their function as target antigens in immunotherapy are unknown. For prostate cancer several antigens with a prostate restricted expression pattern, including prostate specific antigen (PSA), prostate specific membrane antigen (PSMA), prostatic acid phosphatase (PAP), and human kallikrein 2 (hK2), are available for immunotherapy studies; however, their ability to induce strong T cell responses to date has not been demonstrated. The work outlined in this proposal is designed to identify biologically relevant, immunodominant antigens that have prostate restricted expression. The hypothesis is that transgenic mice expressing the human A2. 1 major histocompatibility antigen, the most commonly expressed class I MHC molecule, can be used to screen for immunodominant antigens in vivo from cDNA libraries enriched for prostate cancer genes. The antigen discovery process utilizes known technology in a novel way to streamline the process of identifying immunologically important antigens. Although novel applications of technology are outlined as the primary approach to antigen identification, established alternatives are described to assure the technical success of the project. to accomplish the task of antigen identification, cDNA libraries enriched for expressed prostate tissue genes were developed and formal demonstration of the ability to use mRNA-pulsed dendritic cells as antigen presenting cells to immunize the transgenic A2. 1 mice has been completed.
DTIC
Cancer; Prostate Gland; Vaccines; Antigens; Immunology; Lymphocytes

20020089485 Manchester Univ., UK
A Quantitative MRI Study of Prostate Cancer Before and After Radiation Therapy ***Annual Report, 15 Apr. 2001-14 Apr 2002***
Buckley, David L.; May 2000; 16p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0517
Report No.(s): AD-A406743; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of the study is to examine the influence of external beam radiation on the prostate and prostate cancer using novel quantitative MRI techniques. Twenty-one men, previously diagnosed with prostate cancer, will be studied using T2 relaxation mapping and contrast agent kinetic methods before and after treatment by radiotherapy. The MRI findings will be correlated with biochemical (prostate specific antigen) progression and biopsy results. At the end of year 2 all steps are in place for the assessment and analysis of the clinical data. Ten patients have thus far been studied and a preliminary analysis of their data has been undertaken. The data is both complete and of a high quality. The findings described in year 1 have been published and there is considerable interest from the MR community in the results generated.
DTIC
Magnetic Resonance; Prostate Gland; Radiation Therapy; Imaging Techniques

20020089498 Miami Univ., School of Medicine, FL USA

An Innovative Strategy for the Prevention and Treatment of Metastatic Prostate Cancer: Modified Tetracyclines as Chemotherapeutics ***Annual Report, 1 Apr. 2001-31 Mar. 2002 on Phase 2***

Lokeahwar, Balakrishna L.; Apr. 2002; 35p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-98-1-8526

Report No.(s): AD-A406767; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The overall goal of this funded project is to determine the utility of non-antibiotic forms of chemically modified tetracycline (CMT) against metastatic prostate cancer, with specific emphasis on prostate cancer-metastasis to bone. During the first phase of this project after screening about 10 analogues of CMTs, we identified a non-antimicrobial CMT, 6-deoxy, 6-demethyl, 4--dedimethylamino tetracycline (CMT-3, COL-3) as a potent orally bioavailable anti-neoplastic and anti-metastatic agent. Although we had initially hypothesized OMTs as anti-metastatic agents due to their strong anti-metalloproteinase (anti-collagenase) activity in several systems 1-3, we discovered some of the CMTs have activities similar to cytotoxic chemotherapeutic agents. We found, CMTs inhibit cell proliferation via mitochondrial permeabilization, induction of apoptosis and by arresting cells at GlIS boundary 46. These properties combined with their strong affinity for bone matrix led us to test the efficacy of CMT-3 on bone metastasis. We reported that when tested on a highly aggressive prostate cancer model, induced to form skeletalilumbar bone metastasis, CMT-3 was able to inhibit development of paraplegia and cause a significant delay in development of morbidity associated with lung metastasis .

DTIC

Prostate Gland; Cancer; Regeneration (Physiology); Antiinfectives and Antibacterials

20020089499 Loyola Univ., Chicago, IL USA

Prostate Cancer Immunotherapy Development in Prostate Specific Antigen Transgenic Mice ***Final Report***

Kast, W. M.; Mar. 2002; 17p; In English

Contract(s)/Grant(s): DAMD17-98-1-8480

Report No.(s): AD-A406768; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In Western society, prostate cancer represents the most common non-cutaneous cancer in men and is the second leading cancer related cause of death. The widespread occurrence of the cancer enables it to account for almost forty thousand deaths a year in the U.S. despite the fact that the majority of individuals who contract the disease die of other causes. Early disease can be cured via surgical resection or three dimensional external beam radiation but is frequently avoided since the slow growth of the tumor generally allows the person to die of their other comorbidities without the side effects of the definitive treatments. Unfortunately, if metastatic disease occurs, therapeutic regimens are only capable of delaying the tumor's growth or providing palliation and the person will probably succumb to prostate cancer. Our work attempted to develop an anti- prostate cancer vaccine that specifically induces an immune response against a protein expressed by prostate cancer cells, prostate specific antigen (PSA). We focused on demonstrating the ability of a vaccine to induce an anti-tumor response targeting PSA in a setting where PSA is considered a self antigen and forces of tolerance could confound the vaccine's efficacy. Given the ultimate goal of applying this vaccine to the clinical situation, experiments were also performed to develop a vaccine for human application using components restricted to one haplotype of the human class I MHC system, HLA- A*O2Ol (A2). The previous annual reports detailed our success in both targeting the self-antigen PSA in PSA transgenic mice and identifying and using A2 restricted epitopes of the PSA protein in vaccines that protected transgenic mice containing a quasi-human immune system from PSA expressing tumor cells. These results allow us to continue to develop the vaccine to target PSA that may ultimately lead to phase I clinical trials for use in patients suffering from prostate cancer. Additionally, successful establishment 7

DTIC

Prostate Gland; Physiological Responses; Cancer; Metastasis

20020089502 Vanderbilt Univ., Medical Center, Nashville, TN USA

Role of p120ctn in Cadherin Mediated Suppression of Breast Cancer Invasiveness ***Annual Report, 1 Jul. 2001-30 Jun. 2002***

Thoreson, Molly A.; Reynolds, Albert B.; Jul. 2002; 7p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0485

Report No.(s): AD-A406777; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of our research is to understand the way in which pl20--catenin regulates the function of the cell adhesion molecule E-cadherin. E-cadherin is necessary for inhibiting metastasis of human cancer cells. Previously, we uncoupled pl2O from E-cadherin through small juxtamembrane domain substitutions on E-cadherin. This resulted in a loss of strong adhesion and lack of tight colony formation in cells in which p120 and E-cadherin were uncoupled. In this reporting period, we have created a tool to investigate the role of p120 in cadherin clustering and cadherin-mediated signal transduction. We purified a dimerized form

of the E-cadherin extracellular domain, and showed that this protein facilitates calcium-dependent homotypic interactions. In addition-, we have described a pl20-deficient cell line that requires" p120 transfection for normal cadherin function. Our data suggest a crucial role for p120 in E-cadherin function and stability, and give insight into possible ways to prevent or inhibit tumor metastasis.
DTIC
Cancer; Mammary Glands; Metastasis

20020089509 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Effects of NASAl Saline Spray on Human Neutrophils
Boston, Mark E.; Sep. 2002; 23p; In English
Report No.(s): AD-A406691; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASAl saline spray (NSS) used in the treatment of rhinitis and sinusitis often contains the preservative benzalkonium chloride (BkO). Previous studies have shown that steroid nasal sprays and topical decongestants containing BKO damage respiratory mucosa, decrease mucociliary activity, and inhibit neutrophil functions in vitro. This study evaluates the effects of NSS with BKO on human neutrophils. Design: Prospective, basic science observations. Methods: Human neutrophils were exposed to NSS with BkC or phosphate buffered saline (PBS) at varying times and concentrations. The cells were examined for morphological changes by light microscopy, and for viability as determined by trypan blue exclusion. Lactate dehydrogenase (LDH) levels were measured to quantify neutrophil cell lysis. In vivo morphologic changes were studied in neutrophils obtained from the oral mucosa in human volunteers who rinsed their mouths with either NSS or PBS. Results: Neutrophils exposed to NSS concentrations as low as 15% showed near total cell lysis and neutrophils exposed to 20% NSS demonstrated no cell viability by trypan blue staining. PBS-exposed cells were unaffected. Release of LDH from lysed neutrophils increased sharply at NSS concentrations >10% but remained stable in PBS- exposed cells. All neutrophils isolated from NSS oral rinses were lysed, while neutrophils from PBS rinses showed an average of 78% normal morphology. Conclusions: NSS with BKC is toxic to human neutrophils even at concentrations far lower than those found in commercially available preparations.
DTIC
Paranasal Sinuses; Sprayers; Salinity; Polynuclear Organic Compounds; Toxicity; Morphology; In Vitro Methods and Tests

20020089533 Applied Research Associates, Inc., Albuquerque, NM USA
Bench Scale In Situ Biodegradation o fDNT from Badger Army Ammunition Plant: Final Report ***Final Report***
Fortner, John D.; Zhang, Chunlong; Hughes, Joseph B.; May 21, 2002; 82p; In English
Contract(s)/Grant(s): F08637-98-C-6002; Proj-ARMT0034
Report No.(s): AD-A406722; AFRL-ML-TY-TR-02-4548; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Studies are presented that investigate the ability to stimulate 2,4-DNT and 2,6-DNT mineralization in laboratory-scale vadose zone bioremediation systems. The design and operation of these systems was intended to mimic conditions of full-scale processes at Badger Army Ammunition Plant (BAAP), Baraboo, WI and used soils obtained from the facility. Key findings of this study are: 1) Micronutrient limitations control the ability to stimulate rapid degradation of 2,4-DNT. 2) 2,6-DNT degradation was never observed. 3) Control of pH and buffering capacity are key operational concerns in field operation. 4) Nitrite accumulation may influence rates observed, in particular if system is operated in recycle mode. 5) Recycle operation yielded the poorest removal of DNT isomers. 6) When enriched, biodegradation of 2,4 DNT accelerated the depletion of soil bound DNT by a factor of 14.
DTIC
Biodegradation; Ammunition; Isomers; Nitrobenzenes; Trinitrotoluene

20020089535 Vermont Univ., Burlington, VT USA
Effects of St. John's Wort and Vitamin E on Breast Cancer Chemotherapeutic Agents ***Annual Report, 1 May 2001-30 Apr. 2002***
Branda, Richard F.; May 2002; 15p; In English
Contract(s)/Grant(s): DAMD17-01-1-0440
Report No.(s): AD-A406841; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this research project is to better understand the interaction of dietary supplements with cancer chemotherapeutic drugs. This information may be useful to decrease the toxicity and increase the effectiveness of chemotherapy. The scope of the research involves in vivo assessments in rats of nutritional supplement chemotherapeutic drug interactions and in vitro studies of the mechanisms of nutraceutical-chemotherapeutic drug interactions. High performance liquid chromatography (HPLC) methodology has been adapted/refined for the detection and determination of doxorubicin and vitamin E. Under the conditions used by us, we found that there was no significant effect of vitamin E supplementation on hematologic toxicity or

survival in rats treated with a range of doxorubicin doses. There were no important perturbations of the pharmacokinetics of doxorubicin associated with changes in the vitamin E content of rat diets. Preliminary results indicated that treatment with St. John's wort alters the plasma pharmacokinetics of doxorubicin. Our studies suggest that even relatively high doses of vitamin E do not adversely affect the toxicity of doxorubicin. On the other hand, St. Johns wort may decrease peak levels of doxorubicin. Further studies will help to determine whether important interactions occur between these nutrients and cancer chemotherapeutic agents.
DTIC
Cancer; Chemotherapy; Drugs; Mammary Glands; Tocopherol; Pharmacology

20020089536 Baylor Coll. of Medicine, Houston, TX USA
Identification of Signaling Proteins that Modulate Androgen Receptor Activity ***Annual Report, 23 Apr. 2001-22 Apr 2002***
Songyang, Zhou; May 2002; 6p; In English
Contract(s)/Grant(s): DAMD17-01-1-0022
Report No.(s): AD-A406842; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Androgens and the androgen receptor (AR) play a critical role in the development and progression of prostate cancers. The majority of prostate cancers initially respond to endocrine treatment (androgen dependent) but eventually become androgen independent that prove fatal. It appears that a functionally active AR may contribute to the progression of androgen-independent prostate cancers. Understanding the signaling pathways that regulate androgen-dependent and independent activation of AR mediated transcription would provide valuable information for finding an ultimate cure for this disease. We have proposed to identify the signaling components that regulate AR activity using a novel retrovirus-mediated genetic system, and to understand the mechanism of how the identified factors control AR activity. to this end, we have established and optimized our retrovirus-mediated genetic screen approach. The retroviral vectors to be used have been further modified and improved which should provide high-efficiency mutagenesis as well as ease of manipulation and analysis. We have also made significant progress towards generating a suitable cell line for the genetic screen. With these tools in hand, we will perform a genome wide genetic screen to identify genes that are important for androgen receptor signaling and study how they may contribute to the progression of prostate cancers.
DTIC
Prostate Gland; Cancer; Proteins

20020089537 Air Force Occupational Measurement Center, Occupational Analysis Program, Randolph AFB, TX USA
USA Air Force Training Extract AFSC 4M0X1 Aerospace Physiology (Active Duty)
May 2002; 1074p; In English
Report No.(s): AD-A406843; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

The enclosed Training Extract has been compiled to assist in making training decisions. It is comprised of a series of computer printouts which show data collected from military specialities.
DTIC
Armed Forces; Aerospace Medicine

20020089538 Alabama Univ., Birmingham, AL USA
UAB-Community Breast Cancer Network ***Annual Report, 15 Jun. 2001-14 Jun 2002***
LoBuglio, Albert F.; Saleh, Mansoor; Jul. 2002; 9p; In English
Contract(s)/Grant(s): DAMD17-00-0120
Report No.(s): AD-A406844; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This Clinical Trial Network was aimed at forming a collaborative linkage between the UAB Comprehensive Cancer Center, community-based oncology practices and pharmaceutical sponsors, and providing access to women with breast cancer within the community to high priority clinical trials. To-date three phase III clinical trials and three phase III clinical trials have been activated at the network sites in Georgia (GCS), and a total of 49 patients have been accrued in the past 12 months. In addition, we have recently activated our first network site in Birmingham, AL. Overall, the DOD funded Clinical Trial Network has the unique potential of providing access to women with breast cancer in the community to cutting-edge, novel therapeutic trials previously only available at academic centers. We have been able to demonstrate that the DOD funding mechanism has successfully contributed to the conduct of high quality clinical trials in the community setting by providing funding for the infrastructure and research personnel in conjunction with training, leadership and oversight provided by the academic center.
DTIC
Clinical Medicine; Mammary Glands; Cancer

20020089540 California Univ., San Diego, La Jolla, CA USA

Coactivators and Corepressors in Breast Development and Receptor-Dependent Tumorigenesis ***Annual Report, 14 May 2001-13 May 2002***

Lee, Soo-Kyung; Bassets, Ivan G.; Jun. 2002; 9p; In English

Contract(s)/Grant(s): DAMD17-01-1-0185

Report No.(s): AD-A406847; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Estrogens are important regulators of growth and differentiation in the normal mammary gland and are also important in the development and progression of breast carcinoma. Estrogens regulate gene expression via estrogen receptor (ER) and, because approximately two-thirds of all breast cancers are ER+ at the time of diagnosis, the expression of the receptor has important implications for their biology and therapy. ER binds to the estrogen response element (ERE) found in the promoters of estrogen-regulated genes and activates their transcription. Several ER-associated proteins, coactivators and corepressors, have been identified that are of importance in regulating the ER interaction with the basal transcription machinery. Between the coactivators, a group of proteins of approximately 160 KDa molecular mass were among the first factors identified that interact with nuclear receptors in a highly ligand-dependent manner. On the other hand, in the absence of ligand, several nuclear receptors suppress basal gene transcription by recruiting corepressors. Herein, we will address the role of the ER-associated proteins in ER action.

DTIC

Cancer; Mammary Glands; Estrogens

20020089541 Emory Univ., Atlanta, GA USA

The Emory University Prostate Cancer Center Initiation Program ***Annual Report, 1 Apr. 2001-31 Mar. 2002***

Petros, John A.; Apr. 2002; 37p; In English

Contract(s)/Grant(s): DAMD17-00-1-0080

Report No.(s): AD-A406849; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The project supports 3 separate research projects and one core facility designed to investigate basic science aspects of prostate cancer including mitogenic oxidase expression (Project 1), mitochondrial DNA mutations (Project 2), and the cell adhesion molecule MUC-1 8 (Project 3). In addition, the project is designed to aid in initiating a multi-disciplinary prostate cancer research center and to assist investigators in obtaining other extra-mural finding for these projects. This has largely been accomplished with peer-reviewed publication and presentations at national scientific meetings resulting from each of the three projects. In addition, 2 ROl applications and one POl application are the direct result of work accomplished by this award. A highly collaborative group has been established at Emory and critical resources have been obtained such as laser-capture dissected clinical specimens and novel cell lines.

DTIC

Prostate Gland; Cancer; Gene Expression; Mutations; Deoxyribonucleic Acid; Mitochondria

20020089543 Minnesota Univ., Minneapolis, MN USA

Function of Etk in Growth Factor Receptor Signaling to Integrins in Breast Cancer ***Annual Report, 1 May 2001-30 Apr. 2002***

Shimizu, Yoji; May 2002; 20p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0348

Report No.(s): AD-A406853; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The central hypothesis in this IDEA Award is that increased integrin-mediated adhesiveness and migration of breast cancer cells in response to stimulation by the growth factors heregulin-beta(HRG-beta) or epidermal growth factor is mediated by phosphoinositide 3-OH kinase (PI 3-K)-dependent activation and membrane recruitment of the novel Tec family tyrosine kinase Etk. During the past year, we have made progress in several aspects of the initial Statement of Work, including: 1) establishment of a correlation between Etk expression and several breast tumor cell lines with high migratory capacity; 2) demonstration of HRG-beta-dependent increases in tyrosine phosphorylation of Etk in breast cancer cells; 3) demonstration of binding of the PH domain of Etk to the PI 3-K lipid product PI(3,4,5)-P3; 4) demonstration that HRG-beta stimulation leads to enhanced membrane localization of Etk that requires the PH domain of Etk and PI 3-K activity; and 5) production and establishment of molecular reagents and methodologies critical to completion of the Statement of Work.

DTIC

Cancer; Mammary Glands; Enzymes; Stimulation; Cells (Biology)

20020089544 Albert Einstein Coll. of Medicine, Bronx, NY USA

P16 Axis in Androgen-Dependent Proliferation of Prostate Cancer Cells ***Annual Report, 1 Apr. 2001-31 Mar. 2002***

Zhu, Liang; Apr. 2002; 9p; In English

Contract(s)/Grant(s): DAMD17-00-1-0074

Report No.(s): AD-A406854; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The purpose of this study is to understand the role of the p16 growth control axis in androgen dependent proliferation of prostate cancer cells. The p16 axis contains two tumor suppressors (plGInk4a and pRB), cyclin D-dependent kinases, and transcription factor E2F. We hypothesized that functions of the p16 axis can influence androgen-dependence of prostate cancer cells. to test this hypothesis, we proposed to use controlled expression techniques to determine whether disruption of p16 axis function can lead to androgen- independence in human androgen-dependent prostate cancer cells (LNCaP) and, on the other hand, whether restoration of p16 axis function can restore androgen-dependence in androgen-independent prostate cancer cells (DU-145). During the second year of this study, we have established LNCaP derivative cell lines that can provide inducible expression of exogenously introduced proteins. In DU-145 cells, we have discovered that restoration of protein expression of pRB and the androgen receptor cause cell death. This finding reveals a novel functional relationship between pRB and the AR in prostate cancer biology.

DTIC

Prostate Gland; Cancer; Growth; Cells (Biology)

20020089545 Maryland Univ., Baltimore, MD USA

Undergraduate Training Program in Breast Cancer Research ***Annual Report, 14 May 2001-13 May 2002***

Ostrand-Rosenberg, Suzanne; Jun. 2002; 10p; In English

Contract(s)/Grant(s): DAMD17-01-1-0313

Report No.(s): AD-A406863; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of this Training Program is to direct talented undergraduates into careers in breast cancer research. The program, called Breast Cancer Undergraduate Research Experience (BCURE), is a joint program between The University of Maryland Baltimore County (UMBC) and the University of Maryland, Baltimore Medical School (UM,B). The centerpiece of BCURE is a full-time, 10-week summer research experience in the laboratory of an established investigator (mentor) working in breast cancer research. Ten UMEC and UM,B faculty, whose research programs focus on breast cancer, serve as mentors. The Program Director is a well- respected breast cancer investigator who has personally trained more than 50 undergraduates. Trainees also participate in a Breast Cancer Course and an optional Biomedical Research Ethics course. Trainees present their projects at laboratory meetings, program conferences, UMEC Undergraduate Research Day, as well as at national and international meetings, if appropriate, and in research activities such as journal clubs and seminars. They meet regularly with the Program Director and formally present their research at Breast Cancer Research Day. BCURE trainees include UMBC and non-UMBC undergraduates and represent the diverse population in the Baltimore area. The program includes eight trainees per summer.

DTIC

Mammary Glands; Cancer; Education; Universities; Students

20020089551 Scripps Research Inst., La Jolla, CA USA

The Role of ROS in Breast Cancer Metastasis ***Annual Report, 1 May 2001-30 Apr. 2002***

Knaus, Ulla G.; May 2002; 8p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0426

Report No.(s): AD-A406881; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Certain human carcinoma cell lines produce reactive oxygen species (ROS) constitutively. This affords them potentially with an advantage in cell proliferation, and in migration and invasion of surrounding tissues by degrading the surrounding extracellular matrix and by increasing their motility. The basis for generation or upregulation of ROS in cancer cells is so far unknown. We hypothesized that recently identified, novel ROS-producing enzyme systems may be involved in this phenomenon and proposed to define members of this family in breast cancer cells and to evaluate their role in events leading to metastasis.

DTIC

Mammary Glands; Cancer

20020089554 Albany Medical Coll., NY USA

Breast Cancer Research Undergraduate Summer Training Program ***Annual Report, 14 May 2001-13 May 2002***

Andersen, Thomas T.; Jun. 2002; 10p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-01-1-0121

Report No.(s): AD-A406894; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

It is necessary to have a cadre of talented investigators whose careers are dedicated to studies of prevention, treatment, and early detection of breast cancer. by investing in young people before they make career choices, and by providing them with first-hand experience in modern breast cancer research (BCR) laboratories, we anticipate that many of these talented young people will discover an interest in BCR and new career options that will position them to join the fight against breast cancer. The vision of the Summer Undergraduate Training Program in BCR at the Albany Medical College is to recruit highly talented undergraduates to careers (either PhD or MD) in BCR so that they can make meaningful contributions to the eradication of this disease. That talented students are being recruited is evident from the diversity of undergraduate schools (students from 70 different colleges applied), the quality of the matriculants (average GPA 3.85), and the number of applications (80 applications for 5 positions per year). Students spend 90% of their time in the laboratory of a funded investigator doing authentic, meaningful, mentored BCR. Students also participate in Enrichment Activities: Overview of BCR; sessions to meet Investigators and to meet breast cancer survivors, and career sessions.

DTIC

Education; Cancer; Mammary Glands

20020089559 Baylor Coll. of Medicine, Houston, TX USA

Analysis of the DNA Damage Signaling Network Important for Prevention of Breast Cancer ***Annual Report, 15 May 2001-14 May 2002***

Elledge, Stephen J.; Jun. 2002; 14p; In English

Contract(s)/Grant(s): DAMD17-01-1-0134

Report No.(s): AD-A406905; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Women with germline mutations in the breast and ovarian cancer gene 1 (Brca1) have an approximately 50% lifetime risk of developing ovarian cancer and almost 90% chance of breast cancer. Brca1 mutations account for a significant percentage of all breast cancer cases. It appears that the main role for the Brca1 protein in cells is to prevent the accumulation of mutations in key growth regulatory genes in response to DNA damage. BRCA1 is phosphorylated in response to DNA damage by an elaborate surveillance mechanism, called a checkpoint, that detects DNA damage and prevents the accumulation of mutation. We are investigating the role these phosphorylation events play in the regulation of BRCA1. We have mapped phosphorylation sites and will mutate them to determine their function. We are also planning to investigate the mechanism through which the BRCA1 protein localizes to sites of DNA damage within cells.

DTIC

Cancer; Mammary Glands

20020089587 Baylor Coll. of Medicine, Houston, TX USA

Genetic and Functional Studies of Genes that Regulate DNA-Damage-Induced Cell Death ***Annual Report, 1 May 2001-30 Apr. 2002***

Songyang, Zhou; May 2002; 7p; In English

Contract(s)/Grant(s): DAMD17-01-1-0145

Report No.(s): AD-A406809; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Studies have shown that apoptosis and survival pathways in response to DNA damage play a critical role in breast cancer development and progression. 90% of breast cancer cases are sporadic where mutations of BRCAl/2 have not been detected. Other breast cancer genes must exist. Our group has approached the issue in two ways, to utilize a novel genetic method to screen for genes involved in DNA-damage induced apoptosis; and large-scale identification of factors that interact with BARD 1. We have established and utilized a novel retrovirus-based genetic screen system to search for genes that would confer resistance to DNA damage induced apoptosis. Multiple clones have been isolated from this genetic screen. Among the genes identified is the protein kinase Lyn which is important in DNA-damage responses. Further studies are underway to further identify other genes. to further elucidate the pathways mediated by BARD 1, we employed the RNA interference assay. Furthermore, we are in the process of identifying other factors that may interact with BARD 1. Several factors have emerged from this study and are being examined.

The information obtained from our studies should prove useful for developing new and effective screening strategies, drug targets, and treatment for breast cancer.
DTIC
Deoxyribonucleic Acid; Genetics; Apoptosis; Oncogenes; Cells (Biology)

20020089591 Temple Univ., School of Medicine, Philadelphia, PA USA
Role of c-myb in Breast Development and Cancer ***Annual Report, 15 May 2001-14 May 2002***
Lieu, Yen K.; Jun. 2002; 8p; In English
Contract(s)/Grant(s): DAMD17-00-1-0452
Report No.(s): AD-A406816; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

C-MYB, along with A-myb and B-myb, belongs to the myb gene family which codes for nuclear proteins that bind DNA in a sequence-specific manner and function as regulators of transcription. There is a large body of evidence to suggest a role for c-myb in breast development and cancer c-myb is highly expressed in all estrogen receptor positive breast tumors and cell lines. In addition, our in situ hybridization studies show that c-myb is expressed at high levels in ductal cells from breast tissues of virgin and pregnant mice. To address the role of c-myb in mammary development and cancer, we propose to create c-myb conditional knockout mice where the expression of this gene is interrupted specifically in the mammary gland using the Cre-lox system. We are in the process of generating chimeric mice by injecting our conditional c-myb deletion ES cells into blastocysts of C57 X CBA pseudopregnant mice. Founder mice will be identified and bred to homozygosity for carrying conditional c-myb deletion alleles and, additionally, to bear either a MMTV-cre or a WAP-cre transgene. The generation of breast-specific c-myb conditional knockout mice will afford us the opportunity to dissect the role of c-myb in normal breast development and cancer.
DTIC
Cancer; Mammary Glands; Regulatory Mechanisms (Biology); Tissues (Biology); Transcription (Genetics)

20020089592 University of South Florida, Tampa, FL USA
Robust Detection of Masses in Digitized Mammograms ***Annual Report, 15 May 2001-14 May 2002***
Li, Lihua; Jun. 2002; 41p; In English
Contract(s)/Grant(s): DAMD17-00-1-0245
Report No.(s): AD-A406818; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project is to develop a robust computer aided diagnosis (CAD) system for mass detection with high sensitivity and specificity in digitized mammograms. The research scope in past year is to improve and optimize detection performance and classification generalizability. Several major progresses have been made including (1). A novel graph-based algorithm was proposed to segment stellate masses in mammograms by separating the adjacent regions while keeping the spiculation of masses. It is helpful for the improvement of stellate late mass and distortion detection. (2). A hybrid ”hard”-”soft” classification method was proposed, where the ”hard” decision classifier is cascaded with a ”soft” decision classification with the objective to reduce false-positives (FPs) in the cases with multiple FPs retained after the ”hard” decision classification. It has a much better performance and generalizability of classification. (3). A training database was generated for fine tuning the parameters of CAD system. An FROC curve of CAD mass detection using training database was obtained. It is expected that these processing will be very helpful in improving the robustness of the detection system.
DTIC
Detection; Computer Techniques; Robustness (Mathematics); Cancer; Mammary Glands; Digital Electronics

20020089593 Oregon Univ., Eugene, OR USA
Acquisition of a Magnetic Resonance Imaging System for Research on the Neural Basis of Human Cognition ***Annual Report, 15 Aug. 2001-14 Aug 2002***
Neville, Helen J.; Dassonville, Paul; Sereno, Margaret; Mayr, Ulrich; Wollacott, Marjorie; Sep. 2002; 14p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0750
Report No.(s): AD-A406820; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

From August, 15, 2001 through August 14, 2002 a facility for housing the 3T fMRI unit was constructed, the 3T MRI unit installed and the essential accessory items (stimulus/response computers, digital projection system, eye-tracking system, auditory system) integrated into the MRI system and made operational and initial, high quality human and non-human subject data have been obtained. An image analysis laboratory was equipped and made operational; this lab has six workstation-level computers for data processing and analysis. A large scale server (with 4 TB of tape storage) and local area network were installed to support the image analysis and data processing functions. A radio frequency (RF) coil lab was equipped and is in operation for designing

and building custom MRI coils. A MRI system simulator was installed and modified to give full functionality for acclimating subjects and testing protocols prior to actual FMRI use. The primary support staff for the fMRI facility has been hired. Three workshops on fMRI, RF coil construction and fMRI data processing have been held for training the research staff at the UO in the technology of fMRI. Protocols for cognitive studies with fMRI have been approved and initial human subject studies are now underway.
DTIC
Cognition; Imaging Techniques; Magnetic Resonance; Neural Nets; Data Processing; Computers; Human Beings

20020089595 Colorado Univ., Boulder, CO USA
Moral and Legal Issues Surrounding Terminal Sedation and Physician Assisted Suicide
Bradley, Constance R.; Sep. 23, 2002; 105p; In English
Report No.(s): AD-A406824; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Assisted suicide has been an issue for terminally ill patients for many years. This is because patients who suffer from terminal illnesses are forced to make difficult choices at the end of their lives. Currently, a terminally ill patient has three options in dealing with the extreme physical pain of his or her illness. First, he or she can choose being heavily medicated, which alleviates pain but significantly reduces awareness. Second, the patient can choose to forego, or greatly reduce the dosage, of the pain medication in order to stay alert to their surroundings. The final option most terminally ill patients have to deal with extreme pain is to end their life. Most patients who choose this option are forced to end their life on their own, without the assistance or advice of a physician, and, more often than not, before they are ready to die. This heartbreaking situation occurs because in all but one state, physician-assisted suicide is illegal. Recent Supreme Court decisions have upheld the ban on physician-assisted suicide in the other 49 states. In this paper, I will examine specific Supreme Court cases of physician assisted suicide, analyze why physician assisted suicide is traditionally treated as legally and morally impermissible, and give reasons why physician assisted suicide should be a legal and morally acceptable alternative for terminally ill patients.
DTIC
Ethics; Death; Legal Liability; Sedatives; Physicians

20020089596 California Univ., Berkeley, CA USA
Postpartum Maternal Weight Changes: Implications for Military Women ***Annual Report, 23 Sep. 2000-22 Sep 2001***
Abrams, Barbara; Oct. 2001; 50p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-96-2-6014
Report No.(s): AD-A406829; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have completed recruitment, data collection and data entry for this study group of new mothers attending the well-baby clinic at the Naval Medical Center, San Diego. We enrolled more than 2500 eligible women and obtained essential data from 2433 of them. Approximately 20% of the study participants are active duty women. Results so far suggest some social, demographic and behavioral risk factors that appear related to increased postpartum weight retention in both active duty and dependent mothers. In particular, high weight gain during the first trimester of pregnancy and history of weight cycling appear to be risk factors for high postpartum weight retention. In addition, history of weight cycling contributes to excessive pregnancy weight gain, and may be an important indicator of women at risk for subsequent obesity after pregnancy.
DTIC
Females; Obesity; Pregnancy; Military Operations

20020089597 Vanderbilt Univ., Nashville, TN USA
Insulin Resistance, IGFs and Energy Balance on the Risk of Breast Cancer ***Annual Report, 1 May 2001-30 Apr. 2001***
Malin, Alecia; Zheng, Wei; Yu, Herbert; May 2002; 25p; In English
Contract(s)/Grant(s): DAMD17-01-1-0437
Report No.(s): AD-A406834; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this proposal is to research the association of insulin resistance and its joint effect with insulin like growth factors (IGFs) on breast cancer risk. Many epidemiological studies have investigated the association of body weight, fat distribution, and physical activity with the risk of breast cancer. Some studies have compared levels of C-peptide and IGFs between breast cancer cases and controls. None of these studies, however, has evaluated the potential joint effect of C-peptide, IGFs and energy balance on the etiology of breast cancer. The specific aims of this proposal are 1) To determine blood levels of C-peptide and IGF1, IGF2, and IGFPB3 in a subset of subjects (400 case-control pairs) from the Shanghai Breast Cancer Study (SBCS) (R01CA64277) using pre-treatment blood samples and to evaluate the association of blood C-peptide level and its joint effect with IGFs with the risk of breast cancer. 2) to analyze data collected from the SBCS to evaluate the association of energy

balance with breast cancer risk. There is evidence to suggest that the combined effects of positive energy balance result in increased breast cancer risk and that C-peptide level is potentially related to the risk of breast cancer enhanced by IGF bioavailability.
DTIC
Cancer; Epidemiology; Insulin; Mammary Glands; Peptides

20020089845 Vanderbilt Univ., Medical Center, Nashville, TN USA
The Role of the TGFbeta Pathway in Prostate Cancer Progression to an Androgen-Independent Disease ***Annual Report, 1 Apr. 2001-31 Mar. 2002***
Matusik, Robert J.; Apr. 2002; 27p; In English
Contract(s)/Grant(s): DAMD17-00-1-0105
Report No.(s): AD-A406869; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Project 1: The role of the TGFbeta pathway in prostate cancer progression to an androgen-dependent disease. Two manuscripts are now being written: 1) 'Disruption of the TGF- Pathway in Transgenic Mice Induces Pre-neoplastic Lesions and Delays Castration-Induced Prostatic Regression'; 2) 'Loss of TGFbeta signaling alters gene expression patterns and accelerates prostate tumorigenesis in transgenic mice'. Project 2: Tumorigenic effects of partial versus complete ablation of the TGFbeta type II receptor in prostatic epithelial cells. Project 3: Tumorigenic effect of TGF in mouse prostatic epithelial cells and the therapeutic efficacy of combined blockade of EGF receptor and TGF cleavage in mouse prostate cancer.
CASI
Prostate Gland; Cancer; Growth; Gene Expression

20020089847 Kennedy Krieger Research Inst., Baltimore, MD USA
Magnetic Resonance Spectroscopy Imaging and Functional Magnetic Resonance Imaging of Neurofibromatosis Type 1: In Vivo Pathophysiology, Brain-Behavior Relationships, and Reading Disabilities ***Annual Report, 1 Oct. 2000-30 Sep. 2001***
Cutting, Laurie E.; Barker, Peter; Horska, Alena; Kaufman, Walter; Koth, Christine W.; Oct. 2001; 74p; In English
Contract(s)/Grant(s): DAMD17-00-1-0548
Report No.(s): AD-A406838; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of this research is oriented towards understanding the reading, language, and articulation deficits associated with Neurofibromatosis Type 1 (NF-l) and relating these deficits to the underlying pathophysiology of NF-l as revealed by Magnetic Resonance Spectroscopy Imaging (MRSI). A second goal is to determine how differences in activation, as measured by functional Magnetic Resonance Imaging (fMRI), are linked to the cognitive/academic impairments associated with NF-l. A third goal is to further understand how T-2 weighted hyperintensities on Magnetic Resonance Imaging (MRI) scans are related to cognitive/academic impairments associated with NF-l. Each aim addresses the research in terms of pathophysiology and how cognitive/academic functioning of children with NF-l compares to control groups when examined in both genetic (i. e., sibling) as well as general population (both reading disabled and non-reading disabled) contexts. We hypothesize that abnormalities of NAA, Choline, or their ratios, will exist in the thalamus and will correlate with language, reading, and articulation deficits in NF-l, defined by "lowering" of the cognitive scores of each child with NF-l relative to his/her unaffected sibling. For the second goal, we hypothesize that children with NF-l will activate their brains similarly to reading disabled children during fMRI tasks. For the third goal, we hypothesize that reading, language, and articulation deficits will correlate with the number of brain locations with T2-weighted hyperintensities. Thus, neuroimaging permits the pursuit of furthering our understanding of how the NF-l gene affects the brain in terms of basic neurobiologic factors (ultrastructural, physiological, and localization) as well as their impacts on cognition (reading, language, and articulation) in NF-l.
DTIC
Magnetic Resonance; Neoplasms; Spectroscopy; Imaging Techniques

20020089850 Children's Memorial Hospital, Chicago, IL USA
TRAIL: A Novel Therapeutic Agent for Prostate Cancer ***Annual Report, 15 Apr. 2001-14 Apr 2002***
Li, Honglin; May 2002; 8p; In English
Contract(s)/Grant(s): DAMD17-01-1-0042
Report No.(s): AD-A406826; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This study aims to elucidate the signaling pathway of TRAIL-mediated apoptosis in prostate cancer cells, and to examine the therapeutic effect of TRAIL on prostate cancer cells in vitro and in vivo. We found that most of prostate cancer cells such as androgen-independent PC-3 and DU145 cells are sensitive to TRAIL treatment while normal prostate epithelial cells are resistant. This result indicates that TRAIL may be appropriate agent for treatment of late-stage prostate cancer with no cytotoxicity to normal prostate cells. Further investigation on the molecular mechanism of TRAIL resistance revealed that pro-survival protein

kinase Akt existed in a constitutively active form at high level in LNCaP cells that are resistant to TRAIL. Inhibition of PI 3-kinase sensitized LNCaP cells to TRAIL, suggesting that Akt may play a critical regulatory role in TRAIL signaling. to further understand the working mechanism of Akt, we surveyed its downstream targets, and found that the elevated eNOS activity by Akt phosphorylation may partially contribute to Akt-mediated TRAIL resistance in LNCaP cells. Our preliminary result also indicated that other anti-apoptotic mechanisms may exist in LNCaP cells.
DTIC
Cancer; Prostate Gland; Apoptosis; Enzyme Activity

20020089854 Delaware Univ., Newark, DE USA
Sensitivity of Spores to Hydrostatic Pressure: Mechanisms of Activation, Injury and Repair. Phase 1 ***Final Report, Phase I. Oct. 1995-Feb. 1997***
Hoover, Dallas G.; Stewart, Cynthia M.; Sikes, Anthony; Dunne, C. P.; Sep. 2002; 69p; In English
Contract(s)/Grant(s): DAAK60-95-C-2060
Report No.(s): AD-A406799; NATICK/TR-02/025; NATICK-TR-02/025; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The sensitivity of spores Bacillus subtilis 168 a,id Clostridium sporogenes PA3679 to the effects of pressure (4,000 atmospheres) alone and in combination with nisin, temperature and pH were determined. The results showed that PA3679 spores were more resistant to nisin than B. subtilis 168 but were more sensitive to the combined effects of pressure, elevated temp. and reduced pH. Pressure oscillations of spores' suspensions did not result in a significant log10 reduction in spore count as compared to continuous pressurization. When spores of B. subtilis 168 and PA3679 were examined for sensitivity to pressure (4,000 atm.) in different buffers at pH 7.0 in the presence of food-grade salts, no significant difference was observed, relative to buffers. Sodium acetate (up to 5%) bad no adverse effect on the viability of spores of B. subtilis 168 and PA3679. However, B. subtilis 168 spores were less sensitivity to sodium nitrite (less than 5% caused no inhibition) than spores of PA3679 (0.02% caused inhibition). When spores of B. subtilis 168 and PA3679 were tested for sensitive to sucrose laurate, pressure and temperature, PA3679 was highly sensitive at 25C but B. subtilis was not. However, at 45C spores of PA3679 were equally sensitive to the combo. Inoculated pack studies revealed that when the combination of pressure (4,000 atm.), temp (55C) and risin (0.1 IU/mL) were used spores count (300,000 spores/pouch) was reduced by 3 log10.
DTIC
Hydrostatics; Pressure Effects; Injuries

20020089889 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Marketing Plan for an HMO Diabetic Foot Disease Management Program
Stanton, Brian K.; Mar. 2002; 46p; In English
Report No.(s): AD-A406987; C102-530; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

PacifiCare of Texas operates in an increasingly regulated and ever-changing environment. In order to provide effective and efficient healthcare to its beneficiaries, PacifiCare needs to undertake a marketing approach to the provision of care, including prevention programs. With an increasing diabetic population, and the rising cost of providing diabetic foot care, this market segment needs to be approached is a systematic way. The purpose of this study is to develop a marketing plan to address the needs of the diabetic market and lower the cost of medical care. A review of the literature revealed that a diabetic lower extremity prevention program could save up to 6.8% of total diabetic spending. A strategy to action marketing plan that addresses access, cost, promotion, and service development was developed. Market and internal data reveal that if a successful prevention plan can be implemented, diabetic lower extremity costs can be reduced over 7.5 million dollars in two years in the north Texas market alone. Finally, this marketing approach can be utilized to evaluate any potential project to improve services, reduce the cost of healthcare delivery and improve the overall health and well being of Pacificare's beneficiaries.
DTIC
Infectious Diseases; Medical Services; Metabolic Diseases; Prevention

20020089890 Maryland Univ., Baltimore, MD USA
Evaluation of Radiolabeled Tumor Vessel Targeting Peptides as Novel Agents for the Staging and Therapy of Human Prostate Cancer ***Annual Report, 3 Jan. 2000-2 Jan 2001***
Line, Bruce R.; Passaniti, Antonio; Lambert, Carol; Mease, Ron; Feb. 2002; 11p; In English
Contract(s)/Grant(s): DAMD17-00-1-0004
Report No.(s): AD-A406974; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to develop a new imaging agent to detect prostate cancer. This will be accomplished by using radiolabeled peptides that bind specifically to receptors on tumor blood vessels. The approach will produce a picture of the tumor for determining the spread of prostate cancer or the agent can be modified to help destroy the tumor. It is known that the blood vessels that nourish prostate cancers have unique receptors on their surface. Our research group has the expertise to make these peptides and conjugate different radioactive molecules to them. We also have the expertise to grow human prostate cancers in immune deficient mice and evaluate the uptake of radioactive molecules in these tumors by developing through a special camera an image of where the radioactivity is in the tumor-bearing mouse. This collective expertise enables us to test the hypothesis that radiolabeled tumor vessel targeting peptides (TVTP) will selectively bind to tumors and produce a scintigraphic image which will show where the tumor is in the body. Also, by changing the strength of the radioactive molecule on the TVTP, this method will selectively deliver a destructive dose of radioactivity to the tumor. 14. SUBJECT TERMS 15. NUMBER OF PAGES
DTIC
Cancer; Peptides; Imaging Techniques; Blood Vessels

20020089891 California Univ., Dept. of Biochemistry, Berkeley, CA USA
Rapid PCR Assays That Specifically Identify Anthrax and Anthrax Surrogate Chromosomal Signatures ***Final Report, 1 Jan.-31 Dec. 1999***
Leighton, Terrance; Aug. 30, 2002; 6p; In English
Report No.(s): AD-A406972; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The genetic variation among a set of 175 full-length sspE DNA sequences obtained from representative members of the B. anthracis clade have been examined. Thirty-six sspE genotypes and seventeen protein phylotypes were identified among the B. cereus, B. thuringiensis, B. anthracis and B. mycoides strains analyzed. The most extensive genetic diversity was seen in B. thuringiensis strains representing 78 serovar classes. Computational analysis of the sspE DNA sequence data sets suggests that the B. anthracis dade is more phylogenetically complex than has been inferred by traditional taxonomic methods.
DTIC
Deoxyribonucleic Acid; Proteins; Chromosomes; Biological Diversity

20020089892 Arizona State Univ., Tempe, AZ USA
Assess the Stress: Identifying Psychosocial Risk to Optimize Perinatal Outcomes in Military Gravids
Arabia, Debra L.; May 2002; 67p; In English
Report No.(s): AD-A406967; C102-508; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Pregnancy is a dynamic event that results in physiological, psychological, sociological, and developmental changes (Logsdon, 2000; Norbeck & Tilden, 1983). This can lead to stress, which directly and indirectly affects maternal and fetal well being. Complications occur in approximately 50% of all pregnancies of healthy adult women in North America (DaCosta, Brender, & Larouche, 1998). Despite medical advances, the incidence of pregnancy complications has changed little since the 1960's (DaCosta, Dritsa, Larouche, & Brender, 2000). Preterm birth and low birth weight are the two most recognized complications of maternal stress in pregnancy, and are the number one cause of neonatal mortality and morbidity (Blecher, 2001). Although extensive research has been conducted over the past 30 years validating the link between psychosocial factors and perinatal outcomes, little attention is given to these in the perinatal setting. Obstetrical providers are still relying on biomedical and demographic information alone to determine perinatal risk. Women in the military are a vulnerable population at risk for antepartum, intrapartum, and postpartum complications (Magann & Nolan, 1991; Rosen & Evans, 2000). The lack of social support due to geographic separation from family, friends, and often times, partners, seems to be contributory to their risk. This is significant since studies have shown that social support can buffer the detrimental effects of stress.
DTIC
Birth; Pregnancy; Stress (Psychology)

20020089893 Baylor Coll. of Medicine, Houston, TX USA
Dietary Methionine Restriction: Novel Treatment for Hormone Independent Prostate Cancer ***Annual Report, 23 Apr. 2001-22 Apr 2002***
Epner, Daniel E.; May 2002; 5p; In English
Contract(s)/Grant(s): DAMD17-01-1-0019
Report No.(s): AD-A406966; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Many studies have shown that methionine restriction inhibits growth of a variety of human tumor xenografts, including prostate cancers. In contrast, methionine restriction is relatively well tolerated by normal host tissues. The overall goal of the current project is to clarify the molecular mechanisms by which methionine restriction inhibits tumor growth. During the first year

of support, we focused on Specific Aim 1, which is to determine whether methionine restriction increases oxidative stress in human prostate cancer cells. We used an established biochemical assay to measure intracellular glutathione levels and glutathione export. The assay enabled us to distinguish reduced glutathione (GSH) from glutathione disulfide (GSSG), an oxidized form. We found that methionine restriction had no appreciable affect on total intracellular glutathione content in PC-3 prostate cancer cells, or on the ratio of GSH/GSSG or glutathione export from those cells. We plan to confirm these results with additional control experiments with known inhibitors of glutathione synthesis and normal rat hepatocytes. If confirmed, these results indicate that methionine auxotrophy of tumors is probably not related to the role of methionine in glutathione synthesis and homeostasis, but rather to its role as a methyl donor, as proposed for Specific Aim 3.
DTIC
Methionine; Biochemistry; Methyl Compounds; Cancer

20020089894 Dana Farber Cancer Inst., Boston, MA USA
The Basal Cell Marker p63 and Prostate Stem Cells ***Annual Report, 1 May 2001-30 Apr. 2002***
Signoretti, Sabina; May 2002; 13p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0051
Report No.(s): AD-A406963; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The existence of prostate stem cell capable of giving rise to all the epithelial lineages present in the adult prostate is very controversial. Understanding the stages of cell differentiation in normal prostate epithelium is essential for the identification of the cell type(s) involved in prostate carcinogenesis. The p53-homologue p63 is selectively expressed in the basal cell compartment of a variety of epithelial tissues and p63 deficient mice show severe defects in the development of epithelial organs, including agenesis of the prostate. These findings suggest that p63 is required to maintain a prostate stem cell population. In order to test this hypothesis we will first study p63 expression in the various stages of prostate development in wild type mice by both immunohistochemistry and in situ hybridization (Specific Aim 1). We will also construct chimeric mice by injecting p63+/+ 13-galactosidase positive ES cells into p63-/- blastocysts (Specific Aim 2) and then analyze the relative contribution of p63+/+ and p63-/- cells to the prostatic epithelium. In the event in which both basal and secretory cells require p63 for development, the results will indicate that both compartments originate from a common p63-positive stem cell.
DTIC
Prostate Gland; Epithelium; Carcinogens

20020089943 Clemson Univ., SC USA
Identification of Apoptosis Genes Induced by the Human Prolactin Antagonist, hPRL-G129R, in Several Breast Cancer Cell Lines ***Annual Report, 1 May 2001-30 Apr. 2002***
Peirce, Susan K.; Chen, Wen Y.; May 2002; 24p; In English
Contract(s)/Grant(s): DAMD17-01-1-0207
Report No.(s): AD-A406839; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We compared the differential gene expression profile of 4 human breast cancer cell lines following treatment with hPRL and its antagonist. Among the genes identified of an apoptosis array, the bcl-2 gene was of particular interest, and we found that this gene was upregulated in 3 of the 4 cell lines that were treated with PRL. to further confirm these results, real-time PCR analysis was used to detect bcl-2 mRNA, in 11 human breast cancer cell lines after treatment with hPRL or its antagonist. Our data suggest that Bc 1-2 is upregulated in response to hPRL stimulation & is competively inhibited by the antagonist in the majority of the cell lines tested. We propose that the anti-apoptotic role of hPRL in breast cancer is mediated, at least in part, through regulation of bcl-2.
DTIC
Mammary Glands; Cancer; Gene Expression; Apoptosis

20020089993 Mount Sinai School of Medicine, New York, NY USA
Interferon Gamma and PSA-Restricted Expression of FAS Ligand: A Novel Gene Therapy Strategy for Prostate Cancer ***Annual Report, 1 Mar. 2001-28 Feb. 2002***
Hall, Simon J.; Mar. 2002; 52p; In English
Contract(s)/Grant(s): DAMD17-00-1-0089
Report No.(s): AD-A407038; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Preliminary studies and work during the past 2 years illustrated the ability of IFN-gamma to restore or enhance sensitivity to FAS transactivation in vitro. However, the combination of Ad.FASL and Ad.mIL-12 resulted in a worse survival than for Ad.IL-12 alone. Studies focused first on injection schemes to improve on these results and understand the mechanisms underlying

the reversal of resistance to FAS transactivation by IFN-gamma. Secondly, studies addressed the block in the FAS-apoptotic pathway mediated by IFN-gamma. Based on the serum peaks of IL-12 (Days 2/8) and IFN-gamma (4/11) measured following IL-12 gene therapy, a staggered injection pattern was developed, injecting orthotopic tumors with Ad.mIL-12 on day 6 and Ad.FASL on days 8 and 11. This resulted in a near tripling of apoptosis in combination treated tumors and a doubling of mean survival. In the human prostate cancer cell lines, PC3 and LNCaP, studies with caspase substrates noted that the CPP32 family was activated and not the ICE family following exposure to IFN-gamma and sFASL. Cell death could be blocked by the general caspase inhibitor z-VAD-FMK and the CPP32 inhibitor, z-DEVD-FMK and not the ICE inhibitor, ac-YVAD-CMK. Conclusions: These studies validate the concept of exploiting FAS upregulation for FASL transactivation using a sequential injection scheme of Ad.mIL-12 and Ad.FASL. Thus far, in the FAS sensitive cell line, PC3, and resistant cell line, LNCaP, sFASL activates the CPP32 family of caspases to induce apoptosis following IFN-gamma treatment.
DTIC
Cancer; Genes; Prostate Gland; Gene Therapy; Interferon

20020089996 Arkansas Univ., Little Rock, AR USA
Role of Novel Matrix-Degrading Metalloproteinase in Breast Cancer Invasion ***Annual Report, 1 May 2001-30 Apr. 2002***
Shah, Sudhir V.; May 2002; 7p; In English
Contract(s)/Grant(s): DAMD17-00-1-0131
Report No.(s): AD-A407031; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objectives of the present proposal are to identify and clone the protein recognized by the anti-meprin antibody; to study its functional characteristics relevant to invasion; and to examine its prevalence in breast cancer patients. We hypothesized that breast cancer cells are capable of breaking down the extracellular matrix barrier and this plays an important role in breast cancer invasion and metastasis. This study is based on our previous observation that breast cancer tissue expresses a meprin-like protein, which can be identified by immunostaining of breast cancer tissue using anti-meprin antibody. During the first year, our research was focused on the expression of meprin alpha in bacteria and raising antibody to the recombinant protein in order to have a tool for the identification of the meprin-like protein in tissues and extracted proteins. We also performed immunohistology studies of human breast tumor and kidney tumor tissues, and produced data on experimental tumor growth with and without inhibition of meprin.
DTIC
Proteins; Antibodies; Cloning (Biology); Immunology; Histology; Biodegradation

20020090266 Wake Forest Univ., School of Medicine, Winston-Salem, NC USA
PET Radiotracers for Imaging the Proliferative Status of Breast Tumors ***Annual Report, 15 May 2001-14 May 2002***
Mach, Robert H.; Jun. 2002; 8p; In English
Contract(s)/Grant(s): DAMD17-01-1-0446
Report No.(s): AD-A406848; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of this IDEA grant was to prepare a 18F-labeled radiotracer having a high affinity and selectivity for the sigma-2 receptor that can be used for Positron Emission Computed Tomography (PET) imaging studies of breast cancer. Our choice of this receptor system stems from the observation that there is a high density of sigma2 receptors in both murine and human breast cancer cells in vitro. In addition, we have reported that the density of sigma2 receptors is about 10 times greater in proliferative mouse breast tumor cells than on quiescent mouse breast tumor cells in both cell cultures and in solid breast tumors growing in nude mice. These data suggest that a 18F-labeled sigma2 radiotracer should have the potential to both image breast tumors and assess the proliferative status of these tumors in vivo with PET.
DTIC
Mammary Glands; Computer Aided Tomography; Cancer

20020090267 Walter Reed Army Inst. of Research, Silver Spring, MD USA
Capillary Electrophoresis Determination of Biflavanones from Garcinia Kola in Three Traditional African Medicinal Formulations
Okunji, Chris O.; Ware, Tantalia A.; Hicks, Rickey P.; Iwu, Maurice M.; Skanchy, David J.; Sep. 2002; 8p; In English
Report No.(s): AD-A406859; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A rapid capillary electrophoresis (CE) method for the quantification for four biologically active biflavanones present in three different traditional 'African' medicinal preparations from the seeds of Garcinia kola was developed. The four biflavanones of interest (GBl, GB2 and GBl-glycoside and kolaflavanone) were quantified in a traditional tea preparation and two commercially available ethanolic formulations. The optimum separation conditions consisted of a 100 ug/ml borate, pH 9.5 running buffer,

which gave baseline resolution of all four components in less than 12 minutes. Linear calibration ranges for each component were between 2.5 and 1000 ug/ml. Limits of detection for the biflavanones quantified in this study were between 3 and 6 ug/ml. the 'fingerprint' of the biflavanones in the aqueous tea and two ethanolic formulations was found to be similar, however concentrations of the four biflavanones were up to 50 fold higher in the ethanolic preparations. The major component in all three formulations was GB 1.
DTIC
Clinical Medicine; Tropical Regions

20020090269 Connecticut Univ., Health Center, Farmington, CT USA
The Role of Growth-Regulated Oncogene (GRO) Proteins in Human Breast Cancer Growth ***Annual Report, 15 May 2001-14 May 2002***
Pantschenko, Alexander G.; Kreutzer, Donald L.; Jun. 2002; 36p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0216
Report No.(s): AD-A406862; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Immunohistochemical (IHC) analysis of CXC cytokines (GRO and IL-8) their receptor, CXC-R2, in human breast cancer (HBC) patient samples; 2) IHC analysis of the IL-1 family of cytokines and receptors (potent inducer/regulator of CXC cytokines) in HBC patient samples; 3) Quantitation and correlation of the CXC and IL-1 families in HBC tissue homogenates with estrogen/progesterone receptor expression; 4) Evaluated in vitro bio activity of the CXC and IL-1 families; 5) Developed retrovector transfected HBC cell strains for in vivo studies; and 6) Developed a xenograft ex ova chick embryo model to evaluated the role of CXC and IL-1 in HBC tumor growth in vivo. Conclusions: 1) The CXC and IL-1 families of cytokines and receptors are present within the HBC tumor microenvironment; 2) There exists significant correlations between the expression of CXC/IL-1 families, estrogen receptor status and disease severity; 3) In vitro, IL-1 is a potent inducer of CXC cytokines; 4) CXC receptors are expressed not only in MBC patient tissue, but also on HBC tumor cell lines 5) CXC cytokines do not appear to be universally mitogenic in HBC cell lines, but more likely regulate activities (proliferation, migration) on specific HBC tumor subpopulations; and 6) A novel chick ex ova xenograft model can be used to evaluate HBC tumor growth and invasiveness.
DTIC
Estrogens; Cancer; Mammary Glands; Growth

20020090270 Louisville Univ., KY USA
Unique G-Rich Oligonucleotides Which Inhibit the Growth of Prostate Carcinoma Cells ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Miller, Donald M.; Bates, Paula J.; Trent, John O.; Jul. 2002; 23p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8583
Report No.(s): AD-A406870; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

-RICH OLIGONUCLEOTIDES (GROs) are a novel class of non-antisense nucleic acids that exhibit potent antiproliferative effects against malignant cells, including prostate cancer cells. The mechanism of GRG antiproliferative activity depends on their binding to nucleolin protein. Because they work by a novel mechanism (different from antisense oligonucleotides or traditional chemotherapy agents) and are expected to have few side effects, they have promise as new therapeutic agents for the treatment of prostate cancer. The major aims of this study were to test the efficacy of GROs in inhibiting the growth and metastasis of prostate cancer in rodent models, to investigate the mechanism of GROs, and to develop structural models of nucleolin for the development of new inhibitors. In the first year of this study, we have optimized GRO formulation and delivery in vitro and in vivo, and have been able to demonstrate impressive inhibitory effects against an aggressive hormone-independent tumor (DUl45) in mice We have also examined the effect of combined GRG and chemotherapy treatment on prostate cancer cells, and made considerable progress in developing a structural model of nucleolin. In summary, our results so far strongly support the potential of GROs as novel therapeutic agents for prostate cancer. Our work during this period has resulted in peer-reviewed publication and a patent filing.
DTIC
Oligomers; Prostate Gland; Nucleotides; Cells (Biology); Cancer; Growth

20020090272 Defence Research and Development Canada, Ottawa, Ontario Canada
Empirical Assessment of Lanius et al.s' 'Functional MRI of EMDR in Peacekeepers', a Review of the EMDR Literature and an annotated bibliography
Thompson, Megan M.; Pasto, Luigi; McCreary, Donald R.; Jul. 2002; 35p; In English
Report No.(s): AD-A406888; DRDC-TM-2002-025; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report reviews a research proposal, the major objective of which is to assess the relation between PTSD (Post Traumatic Stress Disorder) and limbic, paralimbic, and prefrontal brain function as assessed with functional MRI (magnetic Resonance Imaging), and to determine whether an Eye Movement Desensitization and Reprocessing (EMDR) intervention causes those structures to return to a normal mode of functioning. The proposed study secondarily explores the effectiveness of EMDR in reducing PTSD symptomatology. While the first and second objectives of the study may have scientific merit, the mandates of other funding agencies would appear to be more appropriate for investigations of basic neuroscience processes associated with brain functioning in PTSD (e.g., NSERC or CIHR). Importantly, a critical review of the EMDR research reveals that a great deal of controversy surrounds the effectiveness of this therapy. EMDR has not been shown to be more effective than presently validated PTSD exposure-based therapies, and the eye movement component of EMDR appears to provide no therapeutic benefit. Finally, there is a lack of clarity around specific items listed in the proposed budget. Given these concerns it is not recommended that this proposal be funded at this time.
DTIC
Eye Movements; Stress (Physiology); Mental Health

20020090273 Nebraska Univ., Medical Center, Omaha, NE USA
Breast Cancer Training Program for Summer Undergraduates ***Annual Report, 15 May 2001- 14 May 2002***
Cowan, Kenneth H.; Lahue, Robert S.; Jun. 2002; 12p; In English
Contract(s)/Grant(s): DAMD17-01-1-0341
Report No.(s): AD-A406890; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Breast Cancer Training Program for Summer Undergraduates (BCTP-SU) has been established within the Eppley Cancer Research Institute of the University of Nebraska Medical Center (UNMC). The purpose of the BCTP-SU is to expand the Eppley's summer research program to add five additional undergraduates to train specifically in breast cancer research. Trainees participated in didactic and academic activities, including: (1) a 10 week, lab-intensive research project, mentored by one of the participating faculty; (2) a weekly seminar series in various aspects of cancer research, including breast cancer projects; and (3) a poster session and research forum at the end of the summer to highlight their research accomplishments. In the first year of the BCTP-SU, five outstanding students were recruited to the Eppley Institute. Three students helped develop new tools for breast cancer research (microarrays, improved gene knockout reagents, telomerase vectors) and the other two students evaluated genes implicated in breast cancer and growth control. Several poster presentations and two published abstracts have already resulted. All five students are continuing on in research and/or medical fields, consistent with the goals of the BCTP-SU. All five BCTP-SU students were women, and one was also a member of an under-represented minority.
DTIC
Medical Services; Cancer; Mammary Glands

20020090274 Defence Research and Development Canada, Ottawa, Ontario Canada
Assessing the Effects of Crew Exposure to Cabin Altitudes of 8,000 ft to 10,000 ft. A Literature Review and Recommendations
Paul, Michel; Gray, Gary; Aug. 2002; 37p; In English
Report No.(s): AD-A406891; DRDC-TR-2002-124; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Introduction. In an effort to prolong airframe life of E model CCl30 aircraft, cabin pressure has been degraded to 10 PSI from the normal 15.3 PSI. This has resulted in higher cabin altitudes at operational altitudes. Whereas at normal operational altitudes, cabin altitudes used to be in the 1,500 ft range, they are now between 8,000 ft and 10,000 ft. Such cabin altitudes have recently provoked 2 physiologic incidents. Acute Mountains Sickness (AMS) has been reported at altitudes as low as 6,500 ft. This report will review the literature on AMS and will address the issue of risk management for aircrews flying at cabin altitudes between 8,000 ft and 10,000 ft. Review of AMS. Essentially, travelling too quickly to altitudes over 8,000 ft often results in symptoms of AMS with nearly 25% of persons affected at 6,500 ft. Incidence and severity of AMS vary with rate of ascent, altitude attained, time at altitude and original altitude. AMS symptoms can start to appear within 5 to 6 hours of exposure to altitude. If ascent is halted, AMS usually resolves within 1-2 days, but substantial discomfort and inconvenience are commonly encountered. Above 13,000 ft, the life threatening high altitude pulmonary (HAPE) and/or cerebral (HACE) edema occurs in about 5% of those afflicted with AMS. While there are several different theories as to the mechanism on onset of AMS, the exact cause remains unclear. Certainly, the hypoxia and hypercapnia that are brought on by unprotected exposure to altitude result in vasodilatation that in turn increases cerebral blood flow. The blood-brain barrier (BBB) may be altered in hypoxia and may facilitate increase cerebral blood volume as well as intracranial pressure and may explain swollen and edematous brains on autopsy. Craniospinal

capacitance (the ability to shunt cerebrospinal fluid from the brain to the spinal canal in response to raised intracranial pressure) may prevent or attenuate AMS symptoms.
DTIC
Altitude Sickness; Stress (Physiology)

20020090276 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
The Prostate Expression Database ***Annual Report, 1 Apr. 2001-31 Mar. 2002***
Nelson, Peter S.; Apr. 2002; 24p; In English
Contract(s)/Grant(s): DAMD17-00-1-0050
Report No.(s): AD-A406900; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This proposal aims to exploit advances in biotechnology and informatics to develop a genetics resource termed the Prostate Expression Database (PEDB). The foundation of PEDB is the identification and characterization of a prostate transcriptome, the intermediary between the genome and the proteome that represents that portion of the human genome actively used or transcribed in the prostate. The research accomplished to date has assembled a working virtual prostate transcriptome that defines the genes used or transcribed in prostate cell types and tissues. This transcriptome has a physical counterpart of 6,500 cDNAs arrayed in cDNA microarray format for large-scale expression studies. This transcriptome has been used as a foundation for studies of the prostate proteome, the working counterpart to the genome and transcriptome. Our results show that these approaches are complementary. Analysis of the virtual transcriptome of LNCaP cells has identified 15 new androgen-regulated genes to date. Characterization of these genes is in progress. We have extended PEDB to include sequence analysis of the murine prostate and constructed a corresponding database, mPEDB to facilitate the dissemination of mouse prostate gene expression information.
DTIC
Data Bases; Prostate Gland

20020090278 Buck Inst. for Age Research, Novato, CA USA
Comprehensive Development Program of Hunter-Killer Peptides for Prostate Cancer ***Annual Report, 1 May 2001-30 Apr. 2002***
Ellerby, H. M.; May 2002; 57p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0029
Report No.(s): AD-A406926; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Prostate cancer is now the most common cancer among men in the United States. Angiogenesis is required for prostate tumor survival, growth, and metastasis. We proposed to design novel Hunter-Killer Peptides (HKPs), each representing a chimeric peptide of an angiogenesis-targeting peptide and a mitochondrial membrane-disrupting peptide. While non-toxic in the circulation, the HKPs will be preferentially toxic to mitochondria once internalized into angiogenic cells, via the targeting domain. As we reported, our prototypes contain only 21 and 26 amino acid residues, are selectively toxic to angiogenic endothelial cells and show strong anti-cancer activity in mice (breast carcinoma xenografts) . In the work described here, we evaluated the HKPs for efficacy and toxicity in a xenograft model of human prostate carcinoma, and in the TRAMP (transgenic adenocarcinoma mouse prostate) model for prostate cancer. The central theme of this research is to develop and appraise this new chemotherapy with the goal of producing both a safer, and more effective, treatment of advanced prostate cancer.
DTIC
Peptides; Cancer

20020090279 Health Research, Inc., Buffalo, NY USA
Analysis of the TACC1 Gene from the 8p11 Chromosome Region Frequently Amplified in Metastasizing Breast Cancer ***Annual Report, 1 Jun. 2001-31 May 2002***
Cowell, John K.; Jun. 2002; 6p; In English
Contract(s)/Grant(s): DAMD17-99-1-9132
Report No.(s): AD-A406929; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This is the second year report for this grant which essentially covers a 4 month period from Mar/02-Jun/02. In November/00 the PI relocated his laboratory from the Cleveland Clinic to Roswell Park Cancer Institute. With delays in providing relinquishing notices from the CCF and delays in effecting the transfer by DOD we have only recently able to assign a replacement scientist to the project.
DTIC
Mammary Glands; Cancer

20020090285 Donald Guthrie Foundation for Medical Research, Sayre, PA USA
Pain Transmission in Humans: The Role of Novel Sensory Ion Channels ***Annual Report, 1 May 2001-30 Apr. 2002***
Noti, John; Aronstam, Robert S.; Ikeda, Stephen R.; Puhl, Henry L., III; May 2002; 35p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0516
Report No.(s): AD-A406960; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The primary accomplishments of the previous funding period were: 1) RACE analysis of the 5' end of Navl.8/Scn10a murine DRG aDNA confirmed the presence of one intron splice site in the 200 bp 5'UTR of the Scn10a transcript; 2) Three BAC clones were isolated from a genomic library. All three contain at least the entire cds containing portion of the Scn10a gene plus the 5'UTR and an additional is greater than 4.0kb of upstream sequence; 3) Homologous recombination (conversion) of all three BAC clones to EGFP containing reporter constructs has been completed; 4) LM-PCR upstream from the putative transcription start site (5'RACE end) produced 4.0kb of sequence that may contain some/all of the elements required for the exquisitely controlled expression of Navl.S, the Scn10a gene product; 5) The putative promoter appears to contain several known consensus binding sequences for transcription factors; 6) Putative neuronal-specific silencer elements may be present. Deletion analysis of the 4 kb promoter fragment indicates activating elements between -3200 and -2500 bp. These latest findings will allow us to extend our analysis of the regulation of the Scn10a gene and efficiently focus our efforts during the final year of this project.
DTIC
Pain; Neurophysiology; Ion Channels (Biology)

20020090288 Mount Sinai Hospital, Toronto, Ontario Canada
Microarray Technology to Study the Role of Genetic Polymorphisms in Breast Cancer Risk ***Annual Report, 1 Jun. 2001-1 Jun 2002***
Ozcelik, Hilmi; Knight, Julia A.; Jul. 2002; 20p; In English; Original contains color images
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Several studies have suggested an association between low penetrant alleles and breast cancer risk. Although the contribution of low penetrant alleles to the individual risk is relatively small, they can contribute to a large proportion of breast cancer case in the population. In this study we took the candidate gene approach to study the association of 32 different genetic polymorphisms with breast cancer risk in a population-based sample using a high-throughput SNParray technology. to date, we have successfully established the SNParrag method. We have evaluated the specificity of individual probes to detect genotypes correctly, and developed a multiplex hybridization procedure. We have also developed a complementary high-throughput genotyping method (TaqMan) to study SNPs which did not agree with SNParray method. We have developed a software to organize and evaluate the raw data obtained from SNParray scans. We have prepared and plated all the breast cancer and population control DNA samples to be studied. We have validated the SNParray method by comparing it to two other genotyping methods. Using the established technologies we are currently in progress of completing the genotyping of the proposed breast cancer cases and population controls.
DTIC
Genetics; Polymorphism; Cancer; Mammary Glands

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

20020087588 National Space Biomedical Research Inst., Houston, TX USA
National Space Biomedical Research Institute ***Annual Report, 1 Oct. 2001 - 30 Sep. 2002***
Sep. 30, 2002; 979p; In English; Also announced as 20020087589 through 20020087591
Contract(s)/Grant(s): NCC9-58; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

This report outlines the activities of the National Space Biomedical Research Institute (NSBRI) during FY 2002, the fifth year of the NSBRI's programs.
Author
Biomedical Data; Research and Development; Aerospace Medicine; NASA Programs

20020087589 National Space Biomedical Research Inst., Houston, TX USA
Strategic Plan, Volume 1
National Space Biomedical Research Institute; Sep. 30, 2002; 37p; In English; Also announced as 20020087588
Contract(s)/Grant(s): NCC9-58; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The purpose of this document is to present the strategic plan and associated organizational structure that the National Space Biomedical Research Institute (NSBRI) will utilize to achieve the defined mission and objectives provided by NASA. Much of the information regarding the background and establishment of the NSBRI by NASA has been provided in other documentation and will not be repeated in this Strategic Plan. This Strategic Plan is presented in two volumes. Volume I (this volume) begins with an Introduction (Section 2) that provides the Institute's NASA-defined mission and objectives, and the organizational structure adopted to implement these through three Strategic Programs: Countermeasure Research; Education, Training and Outreach; and Cooperative Research and Development. These programs are described in Sections 3 to 5. Each program is presented in a similar way, using four subsections: Goals and Objectives; Current Strategies; Gaps and Modifications; and Resource Requirements. Section 6 provides the administrative infrastructure and total budget required to implement the Strategic Programs and assures that they form a single cohesive plan. This plan will ensure continued success of the Institute for the next five years. Volume II of the Strategic Plan provides an in-depth analysis of the current and future strategic programs of the 12 current NSBRI teams, including their goals, objectives, mutual interactions and schedules.
Derived from text
Aerospace Medicine; Research and Development; NASA Programs; Biotechnology; Strategy

20020087590 National Space Biomedical Research Inst., Houston, TX USA
Strategic Plan, Volume 2
National Space Biomedical Research Institute; Sep. 30, 2002; 286p; In English; Also announced as 20020087588
Contract(s)/Grant(s): NCC9-58; No Copyright; Avail: CASI; A13, Hardcopy; A10, Microfiche

The Mission of the NSBRI will be to lead a National effort for accomplishing the integrated, critical path, biomedical research necessary to support the long term human presence, development, and exploration of space and to enhance life on Earth by applying the resultant advances in human knowledge and technology acquired through living and working in space. to carry out this mission, the NSBRI focuses its activities on three Strategic Programs: Strategic Program 1: Countermeasure Research Strategic Program 2: Education, Training and Outreach Strategic Program 3: Cooperative Research and Development. This document contains the detailed Team Strategic Plans for the 11 research teams focused on Strategic Program 1, and the Education and Outreach Team focused on Strategic Program 2. There is overlap and integration among the Programs and Team Strategic Plans, as described in each of the Plans.
Author
Countermeasures; Research and Development; Aerospace Medicine; Biotechnology; NASA Programs

20020087591 National Space Biomedical Research Inst., Houston, TX USA
Core Research Program, Year 5, *FY 2002*
National Space Biomedical Research Institute; Sep. 30, 2002; 629p; In English; Also announced as 20020087588
Contract(s)/Grant(s): NCC9-58; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

Dramatic losses of bone mineral density (BMD) and muscle strength are two of the best documented changes observed in humans after prolonged exposure to microgravity. Recovery of muscle upon return to a 1-G environment is well studied, however, far less is known about the rate and completeness of BMD recovery to pre-flight values. Using the mature tail-suspended adult rat model, this proposal will focus on the temporal course of recovery in tibial bone following a 28-d period of skeletal unloading. Through the study of bone density and muscle strength in the same animal, time-points during recovery from simulated microgravity will be identified when bone is at an elevated risk for fracture. These will occur due to the rapid recovery of muscle strength coupled with a slower recovery of bone, producing a significant mismatch in functional strength of these two tissues. Once the time-point of maximal mismatch is defined, various mechanical and pharmacological interventions will be tested at and around this time-point in attempt to minimize the functional difference of bone and muscle. The outcomes of this research will have high relevance for optimizing the rehabilitation of astronauts upon return to Earth, as well as upon landing on the Martian surface before assuming arduous physical tasks. Further. it will impact significantly on rehabilitation issues common to patients experiencing long periods of limb immobilization or bed rest.
Author
Musculoskeletal System; Research and Development; NASA Programs; Microgravity; Bone Mineral Content; Aerospace Medicine

20020089566 Institute of Space Medico-Engineering, Beijing, China

Effects of Simulated Microgravity on Cardiovascular Function and Counter Effect of Lower Body Negative Pressure

Sun, Xi-qing, Institute of Space Medico-Engineering, China; Jiang, Shi-zhong, Institute of Space Medico-Engineering, China; Yao, Yong-jie, Institute of Space Medico-Engineering, China; Jiang, Chang-lin, Institute of Space Medico-Engineering, China; Hao, Wei-ya, Institute of Space Medico-Engineering, China; Wu, Xing-yu, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 235-240; In Chinese; Copyright; Avail: Issuing Activity

Studies on effect of simulated microgravity on cardiovascular function and counter effect of lower body negative pressure(LBNP) in recent years were summarized. The mechanism of simulated microgravity induced orthostatic intolerance may involve the reduction of cardiovascular function and cerebral blood flow, and endocrine changes. The significance of mathematical model in the study of mechanism of microgravity induced orthostatic intolerance was also discussed. The counter effect of LBNP was emphasized.

Author

Aerospace Medicine; Cardiovascular System; Space Environment Simulation; Lower Body Negative Pressure; Orthostatic Tolerance; Mathematical Models; Human Performance

20020089567 Shanghai Jiao Tong Univ., Inst. of Biomedical Engineering, China

Design of a Cardiac Monitor in Terms of Parameters of QRS Complex

Chen, Zhen-cheng, Shanghai Jiao Tong Univ., China; Ni, Li-li, 533th Hospital of PLA, China; Su, Ke-ping, 533th Hospital of PLA, China; Wang, Hong-yan, 533th Hospital of PLA, China; Jiang, Da-zong, Shanghai Jiao Tong Univ., China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 246-249; In English; Copyright; Avail: Issuing Activity

To design a portable cardiac monitor system based on the available ordinary ECG machine and works on the basis of QRS parameters. The 80196 single chip microcomputer was used as the central microprocessor and real time electrocardiac signal was collected and analysized in the system. Apart from the performance of an ordinary monitor, this machine possesses also the following functions: arrhythmia analysis, HRV analysis, alarm, freeze, and record of automatic papering. Convenient in carrying, the system is powered by AC or DC sources. Stability, low power and low cost are emphasized in the hardware design; and modularization method is applied in software design. Popular in usage and low cost made the portable monitor system suitable for use under simple conditions.

Author

Medical Equipment; Monitors; Electrocardiography; Medical Electronics; Arrhythmia; Product Development

20020089568 Institute of Space Medico-Engineering, Beijing, China

Decrease in Tetanic Tension in 4-week Tail-suspended Rat Soleus and Analysis of Its Underlying Mechanisms

Gao, Fang, Institute of Space Medico-Engineering, China; Yu, Zhi-bin, Institute of Space Medico-Engineering, China; Cheng, Jiu-hua, Institute of Space Medico-Engineering, China; Feng, Han-zhong, Institute of Space Medico-Engineering, China; Zhang, Li-fan, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 255-259; In Chinese; Copyright; Avail: Issuing Activity

To observe the dynamic changes in tetanic tension in 4-week tail-suspended rat soleus (SOL) and extensor digitorum longus muscle (EDL) and to elucidate its underlying mechanisms. After 4 weeks of tail suspension SOL and EDL of the rats were isolated and perfused. Their isometric twitch and tetanic tensions were recorded. Atrophy occurred in the SOL, but not in the EDL. The maximum twitch tension(P (sub tau)) decreased significantly and was more dependent of a stimulation voltage in SOL of tail-suspended rat. Time to maximum twitch tension(TPT) and time from maximum twitch tension to half relaxation (TR(sub 50)) were reduced in the SOL. P(sub tau) also decreased in the EDL, but TPT and TR(sub 50) did not change in the EDL. The maximum tetanic tension reduced in SOL and EDL of tail-suspended rats. The decline rate of tetanic tension in SOL was faster than the control. The profile of tetanic contraction curve in atrophic SOL approached that in EDL. The above results suggested that the underlying mechanisms of reduced maximum twitch and tetanic tension in 4-week tail-suspended rat SOL may involve the reduction in number of cross-bridge per cross-section area or force produced per cross-bridge. The rapid declines rate in atrophic SOL may be related to the shift in myosin heavy chain and troponin I isoforms or to decrease in excitability.

Author

Weightlessness Simulation; Rats; Muscular Function; Atrophy; Muscles

20020089569 Institute of Space Medico-Engineering, Beijing, China

Estimated Cosmic Radiation Doses for Flight Personnel

Feng, Ying-jin, Institute of Space Medico-Engineering, China; Chen, Wei-ru, Institute of Space Medico-Engineering, China; Sun, Tian-ping, Institute of Space Medico-Engineering, China; Duan, Shi-ying, Institute of Space Medico-Engineering, China; Jia, Bao-shan, Institute of Space Medico-Engineering, China; Zhang, Hai-li, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 265-269; In Chinese; Copyright; Avail: Issuing Activity

To calculate individual annual cosmic radiation effective dose for monitored flight personnel. With the help of aircraft flight information from flight performance manual, software CARLO developed by U. S. Federal Aviation Administration was used to calculate the effective dose of galactic cosmic radiation along the air lines, and to calculate the effective dose rate on the ground in Urumuqi, then individual annual cosmic radiation dose on flight personnel was estimated from the data calculated by CARLO. The annual cosmic radiation dose on the ground at Urumuqi was 0.420 mSv a(exp -1). The average effective dose rate of all flights of Xinjiang Airlines from 1997 to 1999 was 2.381 muSv h(exp -1)(0.33 approximately 3.64 muSv h(exp -1)). Average annual cosmic radiation dose on flight personnel was 2.193 muSv a(exp -1(0.887 approximately 4.419 muSv a (exp -1)). Annual individual doses of all monitored flight personnel are well below the limit 20 mSv a(exp -1) recommended by International Commission on Radiological Protection(ICRP).

Author

Flight Crews; Radiation Dosage; Cosmic Rays; Statistical Analysis; Estimates

20020089570 Institute of Space Medico-Engineering, Beijing, China

An Analysis of Plasma Lipid Metabolic Abnormality after a Butter Loading Meal In Pilots

Liu, Ai-bing, Institute of Space Medico-Engineering, China; Cang, Zhong-qi, Institute of Space Medico-Engineering, China; Wang, Li-zhen, Institute of Space Medico-Engineering, China; Li, Peng, Institute of Space Medico-Engineering, China; Zhang, Shu-hai, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 273-275; In Chinese; Copyright; Avail: Issuing Activity

To investigate the incidence of delayed clearance of triglyceride-rich lipoproteins(TRL) by fat tolerance test(FTT) in pilots and its effect on plasma lipids. Twenty five pilots served as test subjects and another 25 as controls. A butter loading meal was taken by the test subjects, but not by the controls. Plasma TG, total cholesterol(CHO) high density lipoprotein-cholesterol(HDL-C) , apolipoprotein Al , B(ApoAI ApoB) and fibrinogen(FIB) were determined at fasting and 3 and 8 hours postprandial. Delayed clearance of TRL was found in 4 out of 25 test subjects, but none in the controlled P less than 0.01). Postprandial high TG response showed negative relationship with HDL-C levels (P less than 0.01). Lower ApoA1 , CHO and higher ApoB, FIB levels were found 3 h postprandial in test subjects. and HDL-C, CHO, ApoB, FIB levels did not return to the fasting levels even 8 h after the meal (P less than 0.01). Delayed clearance of TRL, a criterion for hyperlipidaemia type IV, is related to high fat diet. Postprandial delayed clearance of TRL results in high TG/low HDL-C syndrome, dysbolism of low ApoAl and high ApoB. It may lead to high aggregation status of blood. All of these are the risk factors of forming and developing arteriosclerosis.

Author

Arteriosclerosis; Metabolism; Lipoproteins; Pilots (Personnel)

20020089571 Institute of Space Medico-Engineering, Beijing, China

Study on Thermal Stress in Living Tissues during Cryosurgical Re-warming

Zhang, Yan-ting, Institute of Space Medico-Engineering, China; Liu, Jing, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2001; ISSN 1002-0837; Volume 15, No. 4, pp. 291-295; In Chinese; Copyright; Avail: Issuing Activity

To examine the thermal stress development during cryosurgical three-region re-warming. Several samples such as water, potato and pork liver were utilized to directly observe the crack developed inside them when subjected to a specific freezing or rewarming or a mixed procedure between them. The implicit finite difference method with variable time step was applied to calculate the tissue temperature and the thermal stress fields induced in three-region thawing process. Result The transient thermal stress field over the tissue during re-warming was obtained and results were compared with that in a simple freezing process. It was found that the stress distributions during the thawing stage are in opposite direction with those of the freezing process. Conclusion Quick re-warming immediately following cryosurgical freezing may induce much stronger crack than using only a simple freezing treatment. This may have important value in cryosurgery.

Author

Freezing; Thermal Stresses; Stress Distribution; Surgery; Crack Initiation

20020089572 Institute of Space Medico-Engineering, Beijing, China

A Study on the Adsorbability of Tripeptide Serine-Aspartic-Glutamic Acid for Low Density Lipoprotein

Yu, Xi-xun, Institute of Space Medico-Engineering, China; Yao, Hong-wei, Institute of Space Medico-Engineering, China; Sun, Lu, Institute of Space Medico-Engineering, China; Xu, Ying-xia, Institute of Space Medico-Engineering, China; Wan, Chang-xiu, Institute of Space Medico-Engineering, China; Yue, Yi-lum, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 300-302; In Chinese; Copyright; Avail: Issuing Activity

To study the adsorbability of tripeptide shrine aspartie-glutamic acid (SDE) for low density lipoprotein(LDL). Two methods were used to couple the ligands, SDE, to the solid supports polyacrylamide (PAM) beads. for preparing adsorbents: (1) The SDE legends were immobilized on the solid support through activating amine groups on the aminoethyl derivatives of PAM beads with glutaraldehyde and NaCNBH3; (2) Hexanediamine was grafted onto the carboxyl derivatives of PAM beads by 1-ethyl-3-(3-dimethylaminopropyl) carbodilmide (EDC), and then the SDE ligands were coupled to carboxyl derivatives of PAM beads-graft-hexanediamine by EDC. The adsorbability of adsorbents was determined in vitro. The adsorbents prepared by the two methods mentioned above could adsorb selectively LDL. The adsorbing efficacy was much better in the presence of Ca2(+). The adsorbent whose ligands were immobilized on PAM beads by glutaraldehyde had better adsorbability than by EDC. SDE can adsorb selectively LDL, which provide experimental evidence for developing advanced bionic adsorbent for LDL.
Author

Lipoproteins; Adsorption; Glutamic Acid; Ethyl Compounds

20020089573 Institute of Space Medico-Engineering, Beijing, China

Two Types of Event-related Brain Slow Potentials in Auditory Location Discrimination Task

Zhao, Lun, Institute of Space Medico-Engineering, China; Wei, Jin-he, Institute of Space Medico-Engineering, China; Ren, Wei, Institute of Space Medico-Engineering, China; Tong, Fei-zhou, Institute of Space Medico-Engineering, China; Wang, Mei, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 305-306; In Chinese; Copyright; Avail: Issuing Activity

To study the difference between two types of event-related brain potentials (ERPS) in auditory location discrimination task. Event-related potentials (ERPS) in auditory location discrimination task were recorded in 14 normal subjects and were compared with head-down tilt (HDT) and head-up tilt (HUT) conditions. The subjects could be divided into group I (n = 7 and group II (n = 7) according to the feature of the target ERPS component (P(sub 3)). The difference between the two groups was mainly that there was a negative slow wave after 150 mns in the ERPS of group II subjects, and that the reaction time and error rate in II group was higher than in I group. These data indicated that the psychological load on group II was larger than that on group I; the reduction of mean slow potential amplitude during HDT was more significant in group II than in group 1. The slow potential amplitude of ERPS may reflect the psychological load and the brain function state. Attention should be paid to the feature of auditory ERPS in space medical practice.
Author

Position (Location); Auditory Tasks; Weightlessness Simulation; Brain

20020089574 Institute of Space Medico-Engineering, Beijing, China

Changes in Heart Rate and Blood Pressure under Push Pull Maneuver Simulated on a Tilt Table

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Push-pull maneuver(PPM) was simulated using a tilt table to assess detailed cardiovascular responses and the simulation model. Ten healthy fighter pilots were exposed to 3 times transition of body position of head-up tilt (HUT) for 1 min. head-down tilt (HDT) for 10 seconds, 15 seconds and 20 seconds respectively, HUT for 1 min in randomized sequences. The rate of tilt table rotation was 45 deg per second. Heart-level arterial blood pressure was monitored with 4 second intervals, and MR was continuously monitored by ECG. Result MR and BP fell significantly during HART compared with those during HUT; upon subsequent HUT, HR and BP were, significantly less than those during previous HUT, except BP at 11 approximately 15 seconds. Cardiovascular responses to PPM can be simulated with a tilt table. It is suggested that the tilt table model is valid in simulating the PPM.
Author

Physiological Responses; Blood Pressure; Cardiovascular System; Simulation

20020089575 Institute of Space Medico-Engineering, Beijing, China

Preliminary Study on Protecting Effect of Two Kinds of Chinese Medical Herbs on Changes of Three Physiology Systems in Suspended Rats

Shen, Xian-yun, Institute of Space Medico-Engineering, China; Dong, Qi, Institute of Space Medico-Engineering, China; Ma, Yong-Lie, Institute of Space Medico-Engineering, China; Cui, Wei, Institute of Space Medico-Engineering, China; Yang, Guang-hua, Institute of Space Medico-Engineering, China; Xie, Li-qin, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 250-254; In Chinese; Copyright; Avail: Issuing Activity

To observe the protecting effect of two kinds of Chinese medical herbs on changes of blood circulation, muscle and skeletal systems in tail suspended rates. Changes of blood circulation, muscle and skeletal systems in tail suspended rats(n = 15) , Chinese medical herb group 1 (n = 15) and Chinese medical herb group 2(n = 15) after 30 d tail suspension were compared with those in control group rats(n = 15). Two kinds of Chinese medical herbs have obvious effect on improving the condition of blood circulation, and have some effects on improving the muscle and skeletal systems in tail suspended rats. Chinese medical herbs have a good prospect of being used an space flight,and further studies are needed.

Author

Blood Circulation; Plants (Botany); Weightlessness Simulation; Musculoskeletal System; Muscles

20020089576 Institute of Space Medico-Engineering, Beijing, China

Expression of Myosin Heavy Chain I1x mRNA as a Molecular Marker of Disuse of Soleus Muscle in Rats

Wang, Yun-ying, Institute of Space Medico-Engineering, China; Yu, Zhi-bin, Institute of Space Medico-Engineering, China; Xie, Man-jiang, Institute of Space Medico-Engineering, China; Feng, Han-zhong, Institute of Space Medico-Engineering, China; Gao, Fang, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 260-264; In Chinese; Copyright; Avail: Issuing Activity

To make an Achilles tenotomy rat model to observe the change in soleus weight and expression of myosin heavy chain (MHC) isoform mRNA, and to find some clues for elucidating the mechanisms of soleus disuse. Thirty male Sprangue-Dawley rats were divided into 6 groups. On the 1st, 3rd, 7th, 14th, 21st, and 28th days after Achilles tenotomy, wet weight of soleus(SOL) , plantaris(PC) , gastrocnernius mediates(MG) , and gastrocnernius lateral(LISP) muscles were measured. Expression of MHC 11, mRNA was observed by means of reverse transcriptase-polymerase chain reaction (RT-PCR). Wet weight of SOL, MG, LG, and PL decreased significantly on the 3rd day after the tenotomy. The wet weight of these muscles reduced to the minimum on the 7th or l4th days after the tenotomy, and then recovered slightly on the 21st day after the tenotomy. There was only the expression of MHC I and MHC II(sub alpha)mRNA in normal soleus muscle, but no MHC II(sub chi) or MHC II(sub b)mRNA. The expression of MHC II(sub chi)mRNA occurred in SOL on the 3rd day after tenotomy and still expressed on the 28th day after tenotomy. There was no expression of MHC II(sub b)mRNA in SOL after Achilles tenotomy. The appearance of atrophy of rat soleus induced by Achilles tenotomy is similar in time and extent with that induced by tail-suspension. The expression of MHC II(sub chi),mRNA is shown in rat soleus muscles in Achilles tenotomy and tail-suspension models. The study suggests that expression of MHC II(sub x) mRNA may be used as a molecular marker of solaria muscle disuse in rats.

Author

Rats; Musculoskeletal System; Muscles; Atrophy; Gene Expression

20020089577 Institute of Space Medico-Engineering, Beijing, China

Lipid Peroxidation in Microalgae Cells under Simulated Microgravity

Li, Gen-bao, Institute of Space Medico-Engineering, China; Wang, Gao-hong, Institute of Space Medico-Engineering, China; Song, Li-rong, Institute of Space Medico-Engineering, China; Liu, Yong-ding, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 270-272; In Chinese; Copyright; Avail: Issuing Activity

To provide direct evidences for effects of microgravity on structure and function of plasma membrane. Malondialdehyde (MDA) content was examined on the basis of quantitative reaction of both MDA and thiobarbituric acid (TBA), and electrolyte leaking was determined with conductometer model DDS-11A. Experiments showed that under simulated microgravity, lipid peroxidation became stronger and the content of MCA increased. Meanwhile, the membrane permeability increased in cells of two microalgae: Anabaena sp PCC7120 and Synechococcus 7942. Our results suggest that there is some commonness between microgravity stress and certain other environmental stresses. and cellular membrane might be the site of perception of gravity in unicells without special gravity sensitive structure, such as alga cells.

Author

Weightlessness Simulation; Cell Membranes (Biology); Permeability; Plasmas (Physics); Gravitational Lenses

20020089578 Institute of Space Medico-Engineering, Beijing, China

A Study of Complexity and Power Spectrum of Cortical EEG and Hippocampal Potential in Rats Under Different Behavioral States

Feng, Zhou-yan, Institute of Space Medico-Engineering, China; Zheng, Xiao-xiang, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 276-280; In Chinese; Copyright; Avail: Issuing Activity

To study the complexity and the power spectrum of cortical EEG and hippocampal potential in rats under waking and sleep states. Cortical EEG and hippocampal potential were collected by implanted electrodes in freely moving rats. Algorithmic complexity (Kc), approximate entropy (ApEn), power spectral density (PSD) and gravity frequency of PSD of the potential waves were calculated. The complexity of hippocampal potential was higher than that of cortical EEG under every state. The complexity of cortical EEG was lowest under the state of non rapid eye movement (NREM) sleep. The complexity of hippocampal potential was highest under waking state. The total power of both potentials in 0.5 approximately 30 Hz frequency band showed their highest values under NREM state. The values of Kc and ApEn are closely related to the distributions of PSD. When there are evident peaks in PSD, the complexities of signals will decrease. The complexities may be used to distinguish the difference between cortical EEG and hippocampal potential, or large differences between the same kind of potentials under different behavioral states.

Author

Electroencephalography; Body Measurement (Biology); Medical Electronics; Hippocampus

20020089579 Institute of Space Medico-Engineering, Beijing, China

Fast Automated Finite Element Mesh Generation of Residual Lower Limb for Clinical Application

Jiang, Wen-tao, Institute of Space Medico-Engineering, China; Fan, Yu-bo, Institute of Space Medico-Engineering, China; Zhang, Ming, Institute of Space Medico-Engineering, China; Zheng, Yong-ping, Institute of Space Medico-Engineering, China; Chen, Jun-kai, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 286-290; In Chinese; Copyright; Avail: Issuing Activity

To develop a model of fast automated mesh generation of residual lower limb for clinical application. Actual geometry of the bone was represented as a standard pretreated model of bone, which was auto-located by employing an affine scaling transformation. Tetrahedral or wedge elements were constructed by joining quadrilateral or triangular meshes generated by graph partitioning method and transport-mapping method from successive planar cross sections. A model of fast automated mesh generation of residual lower limb was developed, which can be applied to different amputee and ensure the geometric integrality of bone. Auto-location of the bone was carried out. The mesh refinement can be controlled to adapt to different computational efficiency. The generated elements are hexahedral or wedge elements, both of which are more precise than tetrahedral element. The present method could be applied in finite element analysis method for prosthetic socket designing. Radioactive damage from those techniques such as CT or MRI to the amputee and the difficulty in image processing could be avoided.

Author

Bones; Finite Element Method; Computational Grids; Grid Generation (Mathematics); Limbs (Anatomy)

20020089580 Institute of Space Medico-Engineering, Beijing, China

Brain Processing Component during Face Cognition -N170 Revealed by Event-related Potentials

Peng, Xiao-hu, Institute of Space Medico-Engineering, China; Wei, Jing-han, Institute of Space Medico-Engineering, China; Luo, Yue-jia, Institute of Space Medico-Engineering, China; Zhao, Lun, Institute of Space Medico-Engineering, China; Wang, Guo-feng, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 303-304; In Chinese; Copyright; Avail: Issuing Activity

To observe features of early component N170 during face recognition. Scalp distribution, amplitude, and latency of N170 was recorded during face recognition tasks in 16 normal subjects. N170 was elicited by the face stimuli in only half of the subjects and the amplitude was modulated by cognitive tasks. N170 reflects not only face structure encoding unit but also direct visual processing unit. Whether N170 reflects the specialty in face recognition needs further study, The latency of N170 showed left hemisphere dominance and the amplitude showed right hemisphere dominance, indicating that it is not pure right hemisphere dominance in face recognition.

Author

Brain; Mental Performance; Face (Anatomy); Recognition

20020089581 Institute of Space Medico-Engineering, Beijing, China

Roles of Integrins and Cytoskeleton in Cellular Mechanotransduction

Yang, Fen, Institute of Space Medico-Engineering, China; Li, Ying-hui, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 309-312; In Chinese; Copyright; Avail: Issuing Activity

Integrins and cytoskeleton play important role in the conversion of mechanical signals into intracellular biochemical signals followed by physiological or pathological responses. At the same time, the system of extracellular matrix(ECM) -integrins-cytoskeleton(CSK) axis is in close connection with ion channels and signal transduction, and they interact with each other.

Author

Genetics; Physiological Responses; Ion Channels (Biology); Signal Transmission; Musculoskeletal System

20020089582 Shanghai Jiao Tong Univ., Biomedical Engineering Research Inst., China

Choice of Similarity Measure in Voxel Intensity Based 3D Multi-modal Medical Image Registration

QIN, Bin-jie, Shanghai Jiao Tong Univ., China; Zhuang, Tian-ge, Shanghai Jiao Tong Univ., China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 241-245; In English

Contract(s)/Grant(s): SSDF-985107016; Copyright; Avail: Issuing Activity

To find out the most appropriate similarity measure for clinical use by comparison research on similarity measures commonly used in voxel intensity based multi-modal medical image registration. Under extreme rigid registration condition, correlation coefficient, mutual information and correlation ratio similarity measures were tested as most suitable similarity measures. It was explained why mutual information, but not correlation ratio based medical image registration be easily trapped in the local optimization maximum. At last, using accelerated multi-resolution registration scheme and powell's optimization algorithm, experiments based on clinical medical images were implemented to evaluate the correlation ratio similarity measure for multi-modal medical image registration. Judged by clinical expert, correlation ratio based multi-modal medical image registration method worked well for clinical application, the effect of correlation ratio based, 3D MR/CT and MR/PET, multi-modal medical image registration was promising for clinical use. Compared with other similarity measures, correlation ratio is more appropriate and accurate for 3D multi-modal medical image registration.

Author

Correlation Coefficients; Quality Control; Optical Data Processing; Clinical Medicine; Medical Equipment; Optimization

20020089583 Institute of Space Medico-Engineering, Beijing, China

A Study of Correlation and Signal-to-noise Ratio of Transient Evoked Otoacoustic Emissions

Ye, Wan-xing, Institute of Space Medico-Engineering, China; Ye- Da-tian, Institute of Space Medico-Engineering, China; Cao, Yu, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 181-285; In Chinese; Copyright; Avail: Issuing Activity

To find the relationship between correlation and signal-to-noise ratio of transient evoked otoacoustic emissions (TEOAE). All TEOAE signals of 53 subjects were detected by the new otoacoustic emission detecting instrument TH-OAE developed by ourselves. The correlation and signal-to-noise ratio were evaluated by the algorithm based on frequency coherent spectrum and the algorithm based on cross-spectrum and diff-spectrum. It was found that the correlation of TEOAE was highly related to the signal-to-noise ratio of TEOAE in statistical sense. A statistical relationship between correlation and signal-to-noise ratio of TEOAE was demonstrated for the first time. It is helpful in guiding the effective application of TEOAE in clinical hearing diagnosis and hearing screening.

Author

Correlation Coefficients; Signal to Noise Ratios; Acoustic Emission

20020089609 Institute of Space Medico-Engineering, Beijing, China

Fast 3D Surface Rendering for CT or MR Image on a Personal Computer

Zhuge, Bin, Institute of Space Medico-Engineering, China; Feng, Huan-qing, Institute of Space Medico-Engineering, China; Zhou, He-qin, Institute of Space Medico-Engineering, China; Zhang, Sheng-jian, Institute of Space Medico-Engineering, China; Wu, Duan, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; August 2002; ISSN 1002-0837; Volume 15, No. 4, pp. 296-299; In Chinese; Copyright; Avail: Issuing Activity

To design a 3D surface reconstruction algorithm capable of reconstructing 3D shapes of the organs, bones and tissues rapidly from CT or MR image on a personal computer. by transforming and decomposing the projection of the discrete 3D data field into shear transformation and warp transformation, a Shear-Warp algorithm realizing the 3D reconstruction was established. The algorithm reduce the amount of computation obviously. The 3D surface was reconstructed by using the principle of the parallel

projection, basing on the Shear-Warp algorithm. Shear transformation was performed on the volume data at first. Then the warped 3D surface was obtained by making a threshold in the sheared space. The brightness of the 3D surface was calculated using Phong brightness model, and the final image was generated through the Warp transformation. A direct 3D surface reconstruction algorithm was established basing on a principle of projection from the Shear-Warp algorithm, which was able to display 3D surface on a personal computer rapidly. Compared with other surface reconstruction algorithms, the proposed algorithm has the advantages of no preprocessing, no intermediate data are generated in the reconstruction. With this new algorithm, it is possible to realize fast 3D surface rendering for medical images on a personal computer without the support of any hardware accelerator. Author

Imaging Techniques; Personal Computers; Algorithms; Image Reconstruction; Data Processing

53
BEHAVIORAL SCIENCES

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

20020088679 NASA Johnson Space Center, Houston, TX USA

Training for the Future

Creamer, Timothy J., NASA Johnson Space Center, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 123-126; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Im a bit of a fish out of water because of the lack of experience that I have, but I have been training to fly in space in the future, and the not-too-distant future, I hope. The truth is I stand here today on the shoulders of the giants that have preceded us. I am a space baby. I was born In 1959 and have grown up with this environment. If I go back just a little bit further, I have to ask the question, ”How did we get here?” That takes us back to the literature of the mid-1800s, with Jules Verne, Edgar Rice Burroughs, H. G. Wells, and the other visionaries that put the horizon that we had seen in front of us a little bit closer. The red planet became either the mythical friend or the source of unmentionable horrors that drove science fiction. In 1895, the first science-fiction movie appeared, but things started to really prosper in the 1920s. For instance, there is a story about a guy whose girlfriend is being kidnapped by aliens, and he tracks them down across the galaxy using a device that later became radar. As it turned out, the description of that device was so accurate that the inventor was initially denied the patent for his radar system. The visionaries of the past are allowing us to do what we’re doing in the present and begin to reach a little bit further in the future.
Derived from text

Education; Astronauts; Space Flight

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

20020087677 National Inst. of Standards and Technology, (BFRL), Gaithersburg, MD USA

Thermal Performance of Fire Fighters’ Protective Clothing. 1. Numerical Study of Transient Heat and Water Vapor Transfer

Prasad, K.; Twilley, W.; Lawson, J. R.; Aug. 2002; 46p; In English

Report No.(s): PB2003-100085; NISTIR-6881; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study is the first in a series of reports on understanding the performance of fire fighter clothing, in protecting skin from thermal injury that results from exposure to high intensity thermal radiation. A detailed mathematical model is constructed to study transient heat and moisture transfer through multi-layered fabric assemblies with or without air gaps. The model accounts for changes in thermodynamic and transport properties of the fabric due to the presence of moisture. Numerical simulations are performed to study heat and mass transport through wet thermal liners (used in fire fighter protective clothing) when subjected to a radiative heat flux from a gas fired radiant panel. Results were found to compare well with experimental measurements. The numerical solutions are further analyzed to provide a detailed physical understanding of the governing processes. Moisture in the cloth tends to vaporize upon heating and part of it recondenses in the interior of the cloth. It was observed that the temperature of the fabric layers and total heat flux to the skin is significantly influenced by the amount of moisture and the distribution of

moisture in the protective clothing. Finally, simulations for a wet turnout coat assembly to demonstrate the flexibility of the model for designing fire fighter protective clothing.
NTIS
Protective Clothing; Thermal Radiation; Fires; Numerical Analysis

20020088674 NASA, Washington, DC USA
Making Human Spaceflight as Safe as Possible
Gregory, Frederick D., NASA, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 73-80; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

From the first days of the Mercury program to today's efforts aboard the International Space Station, human safety has always been the primary consideration for human spaceflight. Looking backward, consider NASA's first attempts to reach space without human crews. Rockets tipped over, rockets exploded on lift off, rockets careened off course ... it sure didn't look safe. Before we could put a life at risk, the rockets had to be made safer. How? Mostly through the application of brute-force engineer] ng-essentially the "Fly, Fix, Fly" approach. This approach did eventually lead to safer rockets; however, to produce a spacecraft intended for routine human flight into space, NASA needed to design safety into the vehicle, not just add safety on after a problem was discovered. This need drove NASA to become the home of some of the world's best design engineers and produced some of the best system safety, quality, and reliability engineers. NASA demonstrated through the Mercury program that we could launch a human into orbit around the Earth and recover the astronaut and spacecraft safely. During the Gemini program, we perfected complex rendezvous and docking in space, and performed spacewalks. Both astronauts and equipment operated safely during longer durations in space. by the time the Gemini program ended, NASA was doing what was once thought impossible. Even with increasingly complex equipment and quick turnarounds, between missions, the astronauts always returned home safely. Success was becoming routine and expected.
Derived from text
Aerospace Safety; Extravehicular Activity; Reliability; Risk; Safety Factors

20020089516 Sytronics, Inc., Dayton, OH USA
Civilian American and European Surface Anthropometry Resource (CAESAR), Final Report. Volume 1. Summary ***Interim Report, Dec. 1997-Jun. 2002***
Robinette, Kathleen M.; Blackwell, Sherri; Daanen, Hein; Boehmer, Mark; Fleming, Scott; Jun. 2002; 74p; In English; Prepared in cooperation with The Netherlands Organization for Applied Scientific Research, Soesterberg, Netherlands
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A406704; AFRL-HE-WP-TR-2002-0169; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Civilian Americana and European Surface Anthropometry Resource (CAESAR) project was a survey of the civilian populations of three countries representing the North Atlantic Treaty Organization (NATO) countries: The United States of America (USA), The Netherlands, and Italy. One site in Ottawa, Canada was added to the USA sample and it is henceforth referred to as the North American sample. The survey was carried out by the U.S. Air Force, with: 1) the contractor, Sytronics Inc., 2) the Netherlands Organization for Applied Scientific Research (TNO), 3) the subcontractor D'Appolonia in Italy, and 4) a consortium of companies under the umbrella of the Society of Automotive Engineers (SAB).
DTIC
Anthropometry; Populations; Surveys

20020089519 Science Applications International Corp., Dayton, OH USA
Cognitive Probe Project: Development of a Testbed for Collecting Cognitive Model Parameterization and Validation Data ***Interim Report, May-Oct. 2001***
Martin, Edward A.; Jul. 2002; 75p; In English
Contract(s)/Grant(s): F41624-98-C-6012; Proj-7184
Report No.(s): AD-A406707; AFRL-HE-WP-TR-2002-0156; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Air Force Research Laboratory's Human Performance Model Integration (HPMI) program is exploring the merit and feasibility of combining multiple human performance models possessing dissimilar architectures to create integrated representations of human behavior that address application-specific requirements for model fidelity while controlling cost. The first exploration of HPMI feasibility involves the integration of a task-network model of a strike fighter pilot with an Adaptive Control of Thought-Rational (ACT-R) cognitive model. The ACT-R cognitive model is to replace the strike fighter pilot model's implementation of shootlist management, which is a dynamic and cognitively-intensive target-prioritization task. The Cognitive Probe project described in this report developed a concept and a virtual simulation testbed for obtaining the context-specific

parameterization data needed to populate the ACT-R shootlist management model. One observation based on the data collection was that the earlier validation of the initial implementation of the strike fighter pilot model, which compared mission outcomes and task performance of the model against that of humans, was not sufficiently sensitive to cognitive aspects to pick up differences in shootlist management search strategies. Cognitive testbeds such as this may be beneficial for defining or verifying effective tactics and interface configuration before developing human performance models.
DTIC
Human Factors Engineering; Human Performance

20020089607 NASA Langley Research Center, Hampton, VA USA
Method and Apparatus for Encouraging Physiological Self-Regulation Through Modulation of an Operator's Control Input to a Video Game or Training Simulator
Palsson, Olafur S., Inventor, NASA Langley Research Center, USA; Harris, Randall L., Sr., Inventor, NASA Langley Research Center, USA; Pope, Alan T., Inventor, NASA Langley Research Center, USA; Sep. 17, 2002; 32p; In English; Provisional US-Patent-Appl-SN-143028, filed 9 Jul. 1999
Patent Info.: Filed 3 Jul. 2000; NASA-Case-LAR-15817-1; US-Patent-6,450,820; US-Patent-Appl-SN-612412; US-Patent-Appl-SN-143028; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Apparatus and methods for modulating the control authority (i.e., control function) of a computer simulation or game input device (e.g., joystick, button control) using physiological information so as to affect the user's ability to impact or control the simulation or game with the input device. One aspect is to use the present invention, along with a computer simulation or game, to affect physiological state or physiological self-regulation according to some programmed criterion (e.g., increase, decrease, or maintain) in order to perform better at the game task. When the affected physiological state or physiological self-regulation is the target of self-regulation or biofeedback training, the simulation or game play reinforces therapeutic changes in the physiological signal(s).
Official Gazette of the U.S. Patent and Trademark Office
Automatic Control; Computerized Simulation; Modulation; Physiological Responses; Training Simulators; Video Equipment

20020090277 Hertfordshire Univ., Dept. of Psychology, Hatfield, UK
Comparing Human Concept Acquisition to Models in a Cognitive Architecture ***Final Report, 1 Oct. 2001-1 Jul. 2002***
Young, Richard M.; Cox, Anna L.; Aug. 2002; 33p; In English; Original contains color images
Contract(s)/Grant(s): F61775-01-WE040
Report No.(s): AD-A406924; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study funded by UK DERA at the University of Nottingham in the mid-1990s examined performance on a concept formation task, where subjects had to classify schematic aeroplanes as being either 'USA' or 'Australian'. Subjects displayed poor performance, but more intriguingly exhibited a wide range of variability. A simple model of the same task, constructed in ACT-R, also displayed great variability from run to run. The present project aimed to investigate the reasons for the variability in the model, and if possible also in human subjects; and also to understand better the nature of concept representation in this class of model. This report, (a) explains the model, (b) contents critically on aspects of the original studies, (c) analyses components of the variability, (d) offers an account for the variability in terms of random walk processes within the ACT-R learning mechanism, and (e) outlines a graphical depiction of the representation and gradual acquisition of the concept within the model.
DTIC
Models; Cognition

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see categories 60 through 67.

20020087802 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Explicit Connections between Dynamical and Parameter Spaces
Levin, G.; Feb. 2002; 32p
Report No.(s): PB2003-100585; IHES/M/02/05; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Studying holomorphic dynamical systems, we find some new relations between dynamical and parameter spaces, in particular, between velocity of motions in the parameter space and areas in dynamical ones. Applications to the Mandelbrot sets are given.
NTIS
Dynamical Systems; Independent Variables; Analytic Functions

20020087803 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Isoperimetry of Waists and Concentration of Maps
Gromov, M.; Feb. 2002; 48p
Report No.(s): PB2003-100586; IHES/M/02/04; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Topics discussed in this document are: waist of the sphere theorem; wastes of mm-spaces; Gaussian spaces and log-concavity; concavity classes and convex derivation of measures; spaces of partitions; (CO) homological partition theorems; parametric partitions and Z(sup 2) waists; waists of degree; and isoperimetric recollections.
NTIS
Homology; Theorems; Independent Variables; Spheres; Concavity; Convexity

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20020087663 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
UML Tool for an Automatic Generation of Simulation Programs
Arief, L. B.; Speirs, N. A.; Apr. 2002; 16p; In English
Report No.(s): PB2003-100623; CS-TR-731; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
For sometime now, Unified Modeling Language (UML) has been accepted as a standard for designing new systems. Its array of notations helps system designers to capture their ideas in a way that is expressive yet easy to understand. One thing that UML lacks though is a means for predicting the system's performance directly from its design. Performance prediction is a desirable feature that enables us to evaluate whether a particular design is worth implementing or not. This prediction can frequently be obtained by constructing a simulation program that mimics the characteristics of the new system. The information gathered from running the simulation will then allow use to estimate the performance. In this paper, we present a simulation framework that can be used to generate simulation programs straight from UML notations. We also present a tool which has been built to demonstrate the feasibility of using this framework to perform such a transformation automatically.
NTIS
Computer Programs; Software Engineering

20020087664 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Looking Ahead in Atomic Actions with Exception Handling
Romanovsky, A.; Mar. 2002; In English
Report No.(s): PB2003-100622; CS-TR-732; Copyright; Avail: National Technical Information Service (NTIS), CD-ROM
In this paper a new atomic action scheme is developed that does not impose any participant synchronization on action exit. In order to use cooperative exception handling at the action level as the main fault tolerance mechanism, we develop a distributed protocol that finds, for any exception raised, an action containing all potentially erroneous information, aborts all of its nested actions, resolves multiple concurrent exceptions and involves all the action participants into co-operative handling of the resolved exception. In the scheme, no service messages are sent and no service synchronization is introduced if there are no exceptions raised. This flexible scheme can be applied in a number of emerging areas in which entities of different nature (including software tasks, people, plants, documents, organizations, etc.) participate in cooperative activities.
NTIS
Software Engineering; Distributed Processing

20020087667 National Defence Research Establishment, Linkoeping, Sweden
Usability Requirements- How to Relate Usability to Functionality in Requirements Specification ***Krav pa Anvaendbarhet. Att Relatera Anvaendbarhet till Funktionalitet vid Kravspecificering***
Bosson, E.; Svensson, E.; Dec. 2001; 52p; In Swedish
Report No.(s): PB2003-100490; FOI-R-0252-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The report is a study of usability requirements in requirements engineering and has the purpose to analyze how usability requirements relate to functional requirements in system development processes. The method used is a literature study. Theories that are brought up are: software engineering, usability engineering, object-oriented system development and ISO-standards. A comparison and discussion of the theories result in a model showing how usability requirements relate to functional requirements.
NTIS
Software Engineering; Requirements; Systems Engineering; Functional Design Specifications

20020087669 Swedish Defence Research Establishment, Stockholm, Sweden
User's Guide to Inesma V2.1
Claesson, H.; Mar. 2002; 30p; In English
Report No.(s): PB2003-100480; FOI-R-0452-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the inverse electro- and magneto-static modeling program Inesma V2.1. The inverse problem is formulated as a non-linear least squares problem that is solved with a constrained quasi-Newton like method. The static electric or the static magnetic field is modeled with either monopoles or dipoles in a horizontally stratified three-layer model consisting of air, water and seabed. The reference field is generated from a synthetic model or read from. Worked examples are given for a synthetic electric and a synthetic magnetic signature.
NTIS
User Manuals (Computer Programs); Electrostatics; Magnetostatics

20020087713 Stanford Linear Accelerator Center, Stanford, CA USA
SML Driven Graphical User Interface and Application Management Toolkit
White, G. R.; Jan. 18, 2002; 3p; In English
Report No.(s): DE2002-798994; SLAC-PUB-9121; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In the past, the features of a user interface were limited by those available in the existing graphical widgets it used. Now, improvements in processor speed have fostered the emergence of interpreted languages, in which the appropriate method to render a given data object can be loaded at runtime. XML can be used to precisely describe the association of data types with their graphical handling (beans), and Java provides an especially rich environment for programming the graphics. We present a graphical user interface builder based on Java Beans and XML, in which the graphical screens are described textually (in files or a database) in terms of their screen components. Each component may be a simple text read back, or a complex plot. The programming model provides for dynamic data pertaining to a component to be forwarded synchronously or asynchronously, to the appropriate handler, which may be a built-in method, or a complex applet. This work was initially motivated by the need to move the legacy VMS display interface of the SLAC Control Program to another platform while preserving all of its existing functionality. However the model allows us a powerful and generic system for adding new kinds of graphics, such as Matlab, data sources, such as EPICS, middleware, such as AIDA(1), and transport, such as XML and SOAP. The system will also include a management console, which will be able to report on the present usage of the system, for instance who is running it where and connected to which channels.
NTIS
Computer Graphics; Computer Programs

20020087724 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Introducing Real-Time Interactions
Henderson, N.; Apr. 2002; 56p; In English
Report No.(s): PB2003-100625; CS-TR-734; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This report introduces a new rigorous notation called Real-time Interactions that can be used to model the interactions between a system and its environment. The concept of Real- Time Interactions (RTIs) is introduced, and the Conversation Constraint Language (CCL), an abstract notation that is used to record the interactions that occur in a system and between the system and its environment in a way based on natural language. An Appendix gives details of a set of macros that can be used to translate the CCL constructs into Real-time Logic (RTL). The use of the new notations with the RTT notations previously

developed in the DCSC is illustrated using two case studies, a Railway Crossing and a Cashpoint Transaction. An initial partial abstract syntax of RTIs, and details of the RTI representations of the two case studies are also included as Appendices.
NTIS
Software Engineering; Real Time Operation

20020087790 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Taxonomy of Process Modeling Languages
Zamli, K. Z.; Lee, P. A.; Mar. 2002; 18p; In English
Report No.(s): PB2003-100631; CS-TR-725; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

A software process is defined as a description of various steps that must be carried out by process agents to pursue the goals of software engineering. To support a software process, a model must first be built which specifies how the software engineering activity is to be carried out, the roles and task assignments involved, the resources consumed, the tools used, the input and output needed for the tasks, the product developed, as well as the communication mechanism between tasks and roles. Process Modeling Languages (PMLs) are languages used to express software process models. Process Centered Software Engineering Environments (PSEEs) are the environments used to define, modify, analyze and enact a process model. While both PMLs and PSEEs are important, it is the characteristics of PMLs that are the focus of this article, which leads to a taxonomy different from that presented in other work primarily with the inclusion of important human dimension issues (e.g. awareness support) from Computer Supported Cooperative Work (CSCW).
NTIS
Taxonomy; Software Engineering

20020087791 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Exception Handling in Component-Based System Development
Romanovsky, A.; Mar. 2002; 19p; In English
Report No.(s): PB2003-100632; CS-TR-724; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Designers of component-based software face two problems related to dealing with abnormal events: developing exception handling at the level of the integrated system and accommodating (and adjusting, if necessary) exceptions and exception handling provided by individual components. In this paper our intention is to develop an exception handling framework suitable for component-based system development by applying general exception handling mechanisms which have been proposed and successfully used in concurrent/distributed systems and in programming languages.
NTIS
Software Engineering; Interfaces

20020087869 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
WinGridder: An interactive grid generator for TOUGH. A user's manual, 1.0
Pan, L.; Hinds, J.; Haukwa, C.; Wu, Y.; Bodvarsson, G.; Jul. 18, 2001; 73p; In English
Report No.(s): DE2001-788007; LBNL-42957; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

WinGridder is a Windows-based software package for designing, generating, and visualizing at various spatial scales numerical grids used in reservoir simulations and groundwater modeling studies. Development of this software was motivated by the requirements of the TOUGH (Transport of Unsaturated Groundwater and Heat) family of codes (Pruess 1987, 1991) for simulating subsurface processes related to high-level nuclear waste isolation in partially saturated geological media. Although the TOUGH family of codes has great flexibility in handling the variety of grid information required to describe complex objects, designing and generating a suitable irregular grid can be a tedious and error-prone process, even with the help of existing grid generating programs. This is especially true when the number of cells and connections is very large. The processes of inspecting the quality of the grid or extracting sub-grids or other specific grid information are also complex. The mesh maker embedded within TOUGH2 generates only uniform numerical grids and handles only one set of uniform fracture and matrix properties throughout the model domain. This is not suitable for grid generation in complex flow and transport simulations (such as those of Yucca Mountain, which have heterogeneity in both fracture and matrix media). As a result, the software program Amesh (Haukwa 2000) was developed to generate irregular, effective-continuum (ECM) grids.
NTIS
Ground Water; Computational Grids; Grid Generation (Mathematics)

20020088729 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Termination of String Rewriting Rules that have One Pair of Overlaps ***Final Report***
Geser, Alfons, Institute for Computer Applications in Science and Engineering, USA; October 2002; 18p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211923; NAS 1.26:211923; ICASE-2002-33; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents a partial solution to the long standing open problem of termination of one-rule string rewriting. Overlaps between the two sides of the rule play a central role in existing termination criteria. We characterize termination of all one-rule string rewriting systems that have one such overlap at either end. This both completes a result of Kurth and generalizes a result of Shikishima-Tsuji et al.
Author
Singularity (Mathematics); Optimization; Mathematical Models; Set Theory

20020088745 Stanford Linear Accelerator Center, Stanford, CA USA
Integrating Newer Technology Software Systems into the SLAC Legacy Control System - Two Case Histories and New CMLOG Developments
MacKenzie, R. R.; Dec. 11, 2001; 4p; In English
Report No.(s): DE2002-798940; SLAC-PUB-9095; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

It has been the goal of SLAC (Stanford Linear Accelerator Center) Controls Software to offload processing from the aging Alpha/VMS based control system onto machines that are more widely accepted and used. An additional goal has been to provide more modern software tools to our user community. This paper presents two software products which satisfy those goals.
NTIS
Linear Accelerators; Control Systems Design; Client Server Systems

20020089503 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Discovery Colloquium: Quality Software Development Internet Speed ***Final Report***
Levine, Linda; Baskerville, Richard; Link, Jo Lee; Pries-Heje, Jan; Ramesh, Balasubramaniam; Sep. 2002; 99p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A406781; CMU/SEI-2002-TR-020; ESC-TR-2002-020; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

In October, 2001, the Software Engineering Institute hosted a colloquium to explore issues faced by organizations challenged with developing quality software at Internet speed and to examine the impact of Internet speed on current software development practices. The colloquium was an element of an exploratory study being conducted by a team of researchers from Carnegie Mellon University, Georgia State University, and The IT University of Copenhagen. Team members shared their findings from a previous phase of the study in which they had investigated quality and fast-cycle lnternet-software engineering in nine organizations. Members of those organizations attended the colloquium, along with others who were invited to participate based on their perceived ability to contribute to the discussion of Internet speed development. This report describes the activities of the colloquium and the raw data collected during group discussions and breakout sessions. It also includes a brief description of the field study done by the cross-institutional team. A preliminary analysis of the results of the colloquium is presented in the conclusion of the report.
DTIC
Software Engineering; Internets; Conferences; Computer Programs

20020089507 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Guidelines for Developing a Product Line Production Plan ***Final Report***
Chastek, Gary; McGregor, John D.; Jun. 2002; 63p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A406687; CMU/SEI-2002-TR-006; ESC-TR-2002-006; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A production plan is a description of how core assets are to be used to develop a product in a product line. A product line organization creates such a plan to ensure that the correct core assets are used appropriately to build a specific product in a specific way. The production plans and techniques used to create products vary widely from organization to organization and from one product line to another. Because of this variance, the developers of production plans need some guidance about the plans' form and content. This technical report provides guidance for creating, using, and evaluating a production plan. In addition, this report

presents a classification scheme that describes the characteristics of a product line organization that influence the form and content of the production plan.
DTIC
Models; Management; Software Development Tools; Life (Durability)

20020089508 ECC International Corp., Wayne, PA USA
Harnessing Advanced Technology for C4ISTAR
Fulton, Robert; Sep. 2001; 18p; In English; See Also ADM001419 for whole conference on CD-ROM. These papers are from the Harnessing Advanced Technology for C4ISTAR, The Annual Advanced Technology Conference (2d), held 25-27 September 2001 at The Great Malvern Theatre Complex
Contract(s)/Grant(s): F61775-01-W-F0321
Report No.(s): AD-A406689; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract
Author
Information Systems; Command and Control; Communication

20020089525 Royal United Service Institution, London, UK
ISTAR: The Need for a Capability Approach
Eberle, Peter; Sep. 27, 2001; 16p; In English; See Also ADM001419 for whole conference on CD-ROM. These papers are from the Harnessing Advanced Technology for C4ISTAR, The Annual Advanced Technology Conference (2d), held 25-27 September 2001 at The Great Malvern Theatre Complex
Contract(s)/Grant(s): F61775--01-W-F031
Report No.(s): AD-A406714; No Copyright; Avail: CASI; A03, Hardcopy
No abstract available
Author
Military Technology; Command and Control

20020089526 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA
Materials Process Design Branch. Work Unit Directive (WUD) 54 ***Final Report, 1 Apr. 1990-1 May 1997***
LeClair, Steve R.; Aug. 2002; 30p; In English
Contract(s)/Grant(s): Proj-2418
Report No.(s): AD-A406715; AFRL-ML-WP-TM-2002-4145; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objectives of the Manufacturing Research WUD 54 are to: (1) conduct in-house research to develop advanced materials process design/control technologies to enable more repeatable and affordable manufacturing capabilities and (2) to manage a contractual program to address the maturity of future enabling nano-manufacturing technology in terms of cost, performance, schedule, risk, qualification, and readiness.
DTIC
Neural Nets; Manufacturing

20020089528 Lockheed Martin Corp., Bethesda, MD USA
Capability Integration Framework for Developing C4ISTAR Solutions
Sundstrom, David; Holt, Rick; Sep. 21, 2001; 26p; In English; See Also ADM001419 for whole conference on CD-ROM. These papers are from the Harnessing Advanced Technology for C4ISTAR, The Annual Advanced Technology Conference (2d), held 25-27 September 2001 at The Great Ma
Contract(s)/Grant(s): F61775-01-W-F031
Report No.(s): AD-A406717; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract available.
Author
Military Operations; Telecommunication; Command and Control

20020089550 Army Aeromedical Research Lab., Fort Rucker, AL USA

MFDTool (Version 1.3): A Software Tool for Optimizing Hierarchical Information on Multifunction Displays

Francis, Gregory; Rash, Clarence E.; Aug. 2002; 70p; In English

Contract(s)/Grant(s): Proj-3M162787A879

Report No.(s): AD-A406879; USAARL-2002-22; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report provides the description of an enhanced version (1.3) software program called MFDTool. MFDTool allows human computer interaction experts to optimize the design of multifunction display (MFD) screens. However, the original version of MFDTool was limited to only one type of interaction, and was thereby restricted to only a small subset of possible MFDs. MFDTool, Version 1. 3, provides for multiple types of interactions, greatly enhancing its ability to define appropriate MFD designs. In addition to providing immediate benefit to MFD designers, MFDTool allows for the systematic investigation of which types of interactions are important in human-computer interactions with MFDs. Previously, such studies were limited because there was no means of insuring that an MFD design was appropriately built to accommodate a particular type of interaction. With MFDTool, such designs can be generated easily, and this will allow experimentation on those designs to reveal important aspects of the human-computer interaction.

DTIC

Computer Programs; Cockpits; Software Development Tools; Human-Computer Interface

20020089557 Naval Postgraduate School, Monterey, CA USA

Execution Level Java Software and Hardware for the NPS Autonomous Underwater Vehicle

Ayala, Miguel A.; Sep. 2002; 280p; In English; Original contains color images

Report No.(s): AD-A406903; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Autonomous underwater vehicles (AUVs) have a great potential use for the USA Marine Corps and USA Navy. When performing amphibious operations, underwater mines present a danger for he forces going ashore. The use of underwater vehicles for the detection of this mines and signaling to the Amphibious Ready Group is very attractive. With advancements in hardware and object oriented language technology, more complicated and robust software can be developed. The Naval Postgraduate School Center for AUV Research has been designing, building, operating, and researching AUVs since 1987. Each generation of vehicles has provided substantially increased in operational capabilities and level of sophistication in the hardware and software respectively. With the advancement in real-time computer languages support, object oriented technology, and cost efficient and high performance hardware, this thesis lays the foundations to develop a software system for the execution level using the Java language. We look into the Java Real-Time specifications and extension to familiarize with the capabilities of Java for real-time support, and study Java boards and its application for embedded real-time systems. We developed an object-oriented design for the execution level control software and implemented the design in Java. A testing phase is still under work.

DTIC

Software Engineering; Underwater Vehicles; Autonomous Navigation; Java (Programming Language); Mines (Ordnance)

20020089564 Naval Postgraduate School, Monterey, CA USA

Reasoning by Analogy Using Holographic Conceptual Projection

Degirmenci, Yilmaz; Sep. 2002; 60p; In English

Report No.(s): AD-A406912; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This thesis discusses the designing of an architecture which mimics a human thought mechanism. The architecture is called a Holographic Conceptual Projection, which uses analogy and dynamic pattern matching combined with some natural language understanding. Our main hypothesis is that we project our way of thinking into words and sentences which we manipulate when thinking verbally. This means we can exploit the structure of sentences to build an algorithm that models our thought mechanism. In our Holographic Conceptual Projection Architecture we give examples of every word within the context patterns. The patterns contain sentences that describe the ”condition”, ”desired situation”, ”proposition” and ”outcome” of the concept. The concept’s patterns are then compared with new cases to see analogies. This comparison is done with dynamic generalization and specialization techniques. Finally after building an implementation, we tested it on an intelligent file-management system and an image processing application.

DTIC

Computerized Simulation; Theses; Holography; Logic

20020089844 Naval Postgraduate School, Monterey, CA USA

Enhancement of Learning Process in Web-Based Courses Using Combined Media Components

Georgios, Desypris; Sep. 2002; 103p; In English; Original contains color images

Report No.(s): AD-A406914; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Web-based courses are a popular form for applying distance education today. The development of the educational environment for applying these kind of courses is often considered an art form. Two approaches were studied for the development of a part of a web-based course. The first is the instructional design approach and how an instructor will implement the best course possible applying the more suitable instructional strategies. The second is how these instructional strategies will be adapted to the web for the creation of an educational environment that will enhance the learning process. Combined media components were used, animations and movies, to study the added value of these components to the instructional strategies. The course was delivered to a number of students who evaluated the result. The evaluation assessed the course for both the instructional quality and the web site design and usability. The scope is to study how to develop a high quality web-based course and to determine if the combined media components added value to the educational result. We believe that this study will help us to create the knowledge base for the planning and development of web-based courses br the personnel of the Hellenic Navy.

DTIC

Internet Resources; Education; Internets; Computer Assisted Instruction

20020089846 Illinois Univ., Dept. of Computer Science, Urbana, IL USA

Real-Time Application Performance Steering and Adaptive Control ***Final Report, Jul. 1996-Jun. 1999***

Reed, Daniel A.; Aug. 2002; 9p; In English; Original contains color images

Contract(s)/Grant(s): F30602-96-C-0161; DARPA ORDER-D516; Proj-H767

Report No.(s): AD-A406840; AFRL-IF-RS-TR-2002-185; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

High-performance computing is rapidly expanding from single parallel systems to distributed collections of heterogeneous sequential and parallel systems. The emerging applications are irregular, with complex, data dependent execution behavior, and dynamic, with time varying resource demands. The objective of the Real-time Application Performance Steering and Adaptive Control project is to replace ad hoc, post-mortem performance optimization with an extensible, portable, and distributed software infrastructure for real-time adaptive control that dynamically optimizes the performance of distributed applications. by integrating dynamic performance instrumentation and on-the-fly performance data reduction with configurable, malleable resource management algorithms and a real-time adaptive control mechanism, flexible runtime systems could automatically choose and configure resource management algorithms based on application request patterns and observed system performance. Such an adaptive resource management infrastructure can increase portability by allowing application and runtime libraries to adapt to disparate hardware and software platforms and increases achieved performance by choosing and configuring those resource management algorithms best matched to temporally varying application behavior. The Autopilot real-time adaptive control infrastructure is based on this thesis. Autopilot provides a flexible set of performance sensors, decision procedures, and policy actuators to realize adaptive control of applications and resource management policies on both parallel and wide area distributed systems.

DTIC

Resources Management; Software Development Tools; Applications Programs (Computers); Adaptive Control; Computer Programs; Actuators

20020089848 Secure Computing Corp., Saint Paul, MN USA

Kernel Loadable Wrappers for Information Assurance ***Final Report, May 1999-Mar. 2002***

O'Brien, Richard; Mitchem, Terry; Lu, Raymond; Leonard, Ryan; Sep. 2002; 42p; In English; Original contains color images

Contract(s)/Grant(s): F30602-99-C-0123; Proj-7820

Report No.(s): AD-A406837; 00-0933415A; AFRL-IF-RS-TR-2002-224; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Employing kernel loadable wrappers is an approach for selectively securing operating system functionality to provide robustness and security. Kernel loadable wrappers are loadable kernel modules that hook into system interfaces to perform pre-call and post-call processing. Their key features are that they are unbypassable, since they are in the kernel, and they are easy to install, requiring no modification to the operating system kernel. They can be used to make selected components more robust or to perform various security functions, such as fine-grained mandatory access control and monitoring network connections.

DTIC

Access Control; Robustness (Mathematics); Modules; Operating Systems (Computers)

20020089859 Northrop Grumman Information Technology, Inc., Defense Missions Systems, Reston, VA USA
Joint C4ISR Architecture Planning/Analysis System (JCAPS) ***Final Report, May 1997-Dec. 2001***
Wostbrock, Bill; Aug. 2002; 16p; In English; Original contains color images
Contract(s)/Grant(s): F30602-96-C-0353; F30602-99-D-0264; Proj-R528
Report No.(s): AD-A406771; AFRL-IF-RS-TR-2002-175; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The contractor satisfactorily completed all tasks under both efforts, providing the technology and technical expertise in the development of the Joint C4ISR Architecture Planning/Analysis System (JCAPS) Database Tool. JCAPS is an automated software application designed to support the interoperable, integrated, and cost-effective business practices and capabilities for warfighters and acquirers across DOD particularly with respect to information technology. Using JCAPS, warfighters can plan, execute and manage C4ISR assets in support of military operations. The final report summaries the effort. There are two contract numbers listed in block 5 above. In FY 99, there was a cut in funding associated with the JCAPS effort, contract F30602-96-C-0353. It became apparent that based on the funding cut and the way in which we received funds and the type of vehicle that was in place, the best way to support our customer was to convert the contract vehicle to an IDIQ contract. The prime contractor remained the same, there was no break in service and in Sep 1999, F30602-96-C-0353 was converted to F30602-99-D-0264.
DTIC
Military Operations; Cost Effectiveness; Software Development Tools

20020089888 Naval Postgraduate School, Monterey, CA USA
Automatic Text Categorization Applied to E-Mail
Hall, Scott R.; Sep. 2002; 60p; In English; Original contains color images
Report No.(s): AD-A406989; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The author developed an automatic text categorization approach and investigated its application upon categorizing emails. The categorization approach is derived from an instanced-based learning method that explores conditional probabilities of particular words. The effectiveness of the author's categorization approach using collections from a set of emails is then evaluated and assigned a numerical score based upon precision and recall. Precision was 65% while recall was 17%. The author's experiments indicated automatic categorization of incoming emails at the client level can categorize email, but is difficult when not using a standardized corpus. Word frequency is valuable, but should be used in combination with other methods such as phrase extraction for a higher level of performance.
DTIC
Data Management; Internets; Electronic Mail; Software Development Tools

20020089984 Naval Postgraduate School, Monterey, CA USA
Proposal to Develop Enhancements and Extensions of Formal Models for Risk Assessment In Software Projects
Murrah, Michael R.; Sep. 2002; 143p; In English; Original contains color images
Report No.(s): AD-A407054; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Over the past 40 years limited progress has been made to help practitioners estimate the risk and the required effort necessary to deliver software solutions. Recent developments improve this outlook. Researchers from the Naval Postgraduate School developed a formal model for risk assessment used to estimate software project risk. This model is based on easily obtainable software metrics quantifiable early in the software development process. The risk assessment model was developed on data collected from a series of experiments conducted on the Vite'Project simulation. This unique approach provided a starting point towards a proven formal model for risk assessment, one that can be applied early in the software development lifecycle. Software risk estimation has previously enjoyed minimal success in this manner. This research provides definitive evidence that software risk assessment can be conducted early in software development using quantifiable metrics and simple techniques. Extensions are made possible based on calibrations against post-mortem projects. These enhancements result from many threads of research; extension of input metrics, increased simulations, simulations calibrated on actual projects, and model development. The research proposes an improved risk assessment model, one that has been validated against thousands of post-mortem projects, with applicability on any software development activity.
DTIC
Assessments; Risk; Computer Programming

20020089989 Naval Postgraduate School, Monterey, CA USA
Delaying-Type Responses for Use by Software Decoys
Julian, Donald P.; Sep. 2002; 77p; In English; Original contains color images
Report No.(s): AD-A407043; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Modem intrusion detection systems have become highly reliable in identifying a malicious user on a computer system. Their limitations, though, are increasing the need for an intelligent response to an intrusion. In contrast, intelligent software decoys provide autonomous software-based responses to identified intrusions. In this thesis, we explore conducting military deception, focusing on the use of software-driven simulations to respond to the actions of intruders. In particular, this thesis focuses on a model of a simple deceptive response that is intended to protect a search type program from a buffer-overflow attack. During our study, we found that after identifying an attack attempt, simulating system saturation with processing delays worked well to deceive a prospective attacker. We also experimented with providing confusing reactions to an identified attack attempt, such as simulated network login screens and fake root- shells. The results were successful, simple reactions to intrusions that mimicked intended system interaction, and they proved to be adequate at implementing the deception principles we studied.
DTIC
Computer Programs; Computers; Artificial Intelligence; Decoys; Modems; Simulation

20020089992 Weizmann Inst. of Science, Dept. of Applied Mathematics and Computer Science, Rehovot Israel
Multiscale Computational Methods in Molecular Simulations ***Final Report, 1 Oct. 2000-30 Sep. 2001***
Brandt, Achi; Nov. 2001; 11p; In English
Contract(s)/Grant(s): F61775-00-WE067
Report No.(s): AD-A407040; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking The Weizmann Institute of Science as follows: the contractor will investigate: (1) adjusting and packaging the software for fast electrostatic summations, so that it can be used by other Air Force projects; (2) the improvement of the simple models used for outlining the coarsening methods to more complex bonded molecular systems; and (3) the algorithm for improving the efficiency of Density Functional Theory (DFT) has been demonstrated so far only in one dimension and requires further work for three dimensions, and implementation.
DTIC
Computerized Simulation; Molecules; Packaging; Computation

20020090001 Naval Postgraduate School, Monterey, CA USA
An Event-Trace Language for Software Decoys
Fragkos, Georgios; Sep. 2002; 105p; In English
Report No.(s): AD-A407016; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Cyberspace is becoming the battlespace of the future, and military practices, like deception, seem to be suitable for defending information systems from attacks, In this thesis, we explore the concept of intelligent software decoys, which employ a form of software-based military deception. We developed a prototype of a high-level language for specifying intelligent software decoys. Our approach involves two stages. The specification language is intended to be part of a high-level user interface, making the implementation details of software decoys transparent to the information warrior. We provide a case study in which we demonstrate the utility of our specification language for specifying software decoys to counter a real-word attack program.
DTIC
Prototypes; Procedures; Software Development Tools

20020090004 Aerospace Corp., Lab. Operations, El Segundo, CA USA
Briefing Report: Software Acquisition, A Series of Lectures Prepared for Acquisition/Logistics Excellence Week 2001
Abelson, L. A.; Adams, R. J.; Eslinger, S.; Kerner, J. S.; Owens, K. L.; Jul. 31, 2002; 182p; In English
Report No.(s): AD-A406998; ATR-2002(8550)-4; SMC-TR-02-33; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This report contains five lectures on topics in software acquisition that are critically important to SMC/NRO programs in today's acquisition environment. Software acquisition is always a high risk endeavor for SMC's/NRO's software-intensive systems. This series of lectures provides specific, practical suggestions that can be applied immediately to SMC/NRO programs to mitigate software risks. Topics covered include COTS software lessons learned, object-oriented metrics, the Joint Technical

Architecture (JTA) and Common Operating Environment (COE), human systems integration, and selecting a capable software contractor team.
DTIC
Software Engineering; Object-Oriented Programming

20020090102 Naval Postgraduate School, Monterey, CA USA
A Rendering System Independent High Level Architecture Implementation for Networked Virtual Environments
List, Robert S.; Sep. 2002; 71p; In English; Original contains color images
Report No.(s): AD-A407081; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The High Level Architecture (HLA) is the Department of Defense standard for networking virtual environments. This thesis implements a modular HLA component that can be used independently from the graphics-rendering engine used by the programmer. The modular design of the HLA component allows programmers of virtual environments to rapidly network their existing stand alone virtual environments using the DOD standard networking protocol. The HLA component is being used to build a networked virtual environment compatible with Joint Semi-Automated Forces (JSAF). This networked virtual environment will allow a group of human controlled simulations to interact with JSAF controlled entities over common terrain.
DTIC
Virtual Reality; Architecture (Computers); Networks

20020090257 Department of the Navy, Washington, DC USA
System Operation Test Facilitating Program and Method
Belenger, Kim, Inventor; Sep. 24, 2002; 29p; In English
Patent Info.: Filed 30 Apr. 2002; US-Patent-Appl-SN-10137737
Report No.(s): AD-D020036; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method and system are provided by the present invention for developing functional software element that operates in an environment comprising a plurality of computer programs that are being simultaneously developed. A test facilitating computer program product is utilized to simulate the plurality of computer programs as seen by the functional software element. The functional software element has one or more internal software interfaces that interact with one or more simulated external software interfaces to provide an environment in which the operation of the functional element and the internal software interfaces thereof can be monitored. The test facilitating tool permits creation of files that may be utilized to create an operational scenario during which messages that are received by and sent from said functional software element can be monitored.
DTIC
Computer Programs; Patent Applications

20020090275 SRI International Corp., Computer Science Lab., Menlo Park, CA USA
Maude: A Wide Spectrum Language for Secure Active Networks ***Final Report, Aug. 1997-Dec. 2001***
Meseguer, Jose; Talcott, Carolyn; Aug. 2002; 30p; In English
Contract(s)/Grant(s): F30602-97-C-0312; DARPA ORDER-F321; AF Proj. F321
Report No.(s): AD-A406892; P01683-010; AFRL-IF-RS-TR-2002-197; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Modeling and formally analyzing active network systems and protocols is quite challenging, due to their highly dynamic nature and the need, for new network models. In this report, we propose a wide-spectrum methodology using executable rewriting logic specifications to address this challenge. We also show how, using the Maude rewriting logic language and tools, active network systems, languages, and protocols can be formally specified and analyzed using a wide range of formal methods. Benefits include: precise documentation of designs; early discovery of many bugs and omissions; and higher assurance of correct behavior. In this paper we illustrate these methods and their practical usefulness through two case studies: the AER/NCA protocol suite, and the PLAN active network language.
DTIC
Computer Networks; Computer Information Security; Protocol (Computers)

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see 82 Documentation and Information Science. For computer systems applied to specific applications, see the associated category.

20020089522 National Inst. of Standards and Technology, Gaithersburg, MD USA
Automated Tools for Testing Computer System Vulnerability
Polk, W. T.; Dec. 1992; 33p; In English
Report No.(s): AD-A406710; NIST-SP-800-6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Computer security 'incidents' occur with alarming frequency. The incidents range from direct attacks by both hackers and insiders to automated attacks such as network worms. Weak system controls are frequently cited as the cause, but many of these incidents are the result of improper use of existing control mechanisms. For example, improper access control specifications for key system files could open the entire system to unauthorized access. Moreover, many computer systems are delivered with default settings that, if left unchanged, leave the system exposed. This document discusses automated tools for testing computer system vulnerability. by analyzing factors affecting the security of a computer system, a system manager can identify common vulnerabilities stemming from administrative errors. Using automated tools, this process may examine the content and protections of hundreds of files on a multi-user system and identify subtle vulnerabilities. by acting on this information, system administrators can significantly reduce their systems' security exposure.
DTIC
Vulnerability; Computer Networks

20020089558 Naval Postgraduate School, Monterey, CA USA
Network Survivability Analysis of the Navy and Marine Corps Intranet (NMCI)
Fahrenthold, Alex B.; Sep. 2002; 225p; In English; Original contains color images
Report No.(s): AD-A406904; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

NMCI is a mechanism to transform the Navy and Marine Corps information systems and prepare 21st century warfare. Just as the Internet has transformed business and commerce around the globe, NMCI may transform the U. S. Navy and Marine Corps by harnessing the power of an integrated network. The Navy and Marine Corps Intranet constitutes the first major step into a truly network-centric warfare environment and makes them full participants in the cyber world. This network will handle the data on which an increasing percentage of the Navy and Marine Corps mission essential services will rely. Yet, the hardware and software that make up these systems have demonstrated vulnerabilities that put these mission essential functions at risk. Consequently, the Navy and Marine Corps must consider systems and strategies that address the need for survivability of the mission essential functions in the same manner applied to major weapons systems on the battlefield.
DTIC
Information Systems; Armed Forces (USA); Network Analysis; Internets

20020089602 NASA Kennedy Space Center, Cocoa Beach, FL USA
Advanced Self-Calibrating, Self-Repairing Data Acquisition System
Medelius, Pedro J., Inventor, NASA Kennedy Space Center, USA; Eckhoff, Anthony J., Inventor, NASA Kennedy Space Center, USA; Angel, Lucena R., Inventor, NASA Kennedy Space Center, USA; Perotti, Jose M., Inventor, NASA Kennedy Space Center, USA; Oct. 08, 2002; 12p; In English; Provisional US-Patent-Appl-SN-322845, filed 7 Sep. 2001
Patent Info.: Filed 5 Mar. 2002; NASA-Case-KSC-12301; US-Patent-6,462,684; US-Patent-Appl-SN-095344; US-Patent-Appl-SN-322845; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An improved self-calibrating and self-repairing Data Acquisition System (DAS) for use in inaccessible areas, such as onboard spacecraft, and capable of autonomously performing required system health checks, failure detection. When required, self-repair is implemented utilizing a "spare parts/tool box" system. The available number of spare components primarily depends upon each component's predicted reliability which may be determined using Mean Time Between Failures (MTBF) analysis. Failing or degrading components are electronically removed and disabled to reduce power consumption, before being electronically replaced with spare components.
Official Gazette of the U.S. Patent and Trademark Office
Calibrating; Data Acquisition; Systems Engineering; Autonomy; Self Repairing Devices

20020089843 Naval Postgraduate School, Monterey, CA USA

Exploitation of Existing Voice Over Internet Protocol Technology for Department of the Navy Application

Vegter, Henry M., Jr.; Wallace, David T.; Sep. 2002; 127p; In English; Original contains color images

Report No.(s): AD-A406915; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This thesis documents an investigation into the technology of Voice over Internet Protocol (VoIP) VoIP promises to be a widely accepted technology in the future, The issues of efficient use of bandwidth over network choke points, cost savings gained from a common data and voice infrastructure, reduced cost associated with toll calls and the merger of the telephone with the desktop will keep adoption of this technology on the path to ubiquitous use, Topics explored in the thesis include convergence over IP infrastructure, the status of VoIP technology available and providers in the VoIP industry, A prototypical cost benefit analysis of implementing VoIP is presented using NPS as an example Convergence on bandwidth restricted satellite links offers the most promising application of VoIP in the DoN today, A test network is constructed demonstrating the feasibility of implementing VoIP on the Automated Digital Network System (ADNS), Quality of Service (QoS) features enable further enhancements in throughput.

DTIC

Internets; Voice Communication; Communication Satellites; Digital Systems

20020090252 AMTI, USA

Adventures in Computational Grids

Walatka, Pamela P., AMTI, USA; Feb. 28, 2002; 11p; In English

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; RTOP 704-40-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Sometimes one supercomputer is not enough. Or your local supercomputers are busy, or not configured for your job. Or you don't have any supercomputers. You might be trying to simulate worldwide weather changes in real time, requiring more compute power than you could get from any one machine. Or you might be collecting microbiological samples on an island, and need to examine them with a special microscope located on the other side of the continent. These are the times when you need a computational grid.

Author

Networks; Computation

20020090265 Massachusetts Univ., Dept. of Computer Science, Amherst, MA USA

The Use of End-to-End Multicast Measurements for Characterizing Internal Network Behavior ***Final Report, Jul. 1998-Jan. 2002***

Towsley, Don; Aug. 2002; 241p; In English; Original contains color images

Contract(s)/Grant(s): F30602-98-2-0238; DARPA ORDER-J172; AF Proj. G202

Report No.(s): AD-A406846; AFRL-IF-RS-TR-2002-196; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This is the Final Technical Report for MINC: Multicast-based Inference of Network-internal Characteristics. The primary aim of the MINC project was to develop a statistical foundation on which to develop and evaluate end-to-end based tools for inferring internal network behavior. The project accomplished two goals. First, a series of techniques based on maximum likelihood estimation was developed to infer link-level loss and delay behavior, and internal topological structure based on end-to-end multicast and unicast observations. Briefly, these techniques exploit the correlation inherent in multicast-based measurements to produce accurate estimates. Second, measurement software required to produce the necessary observations and a web-based analysis and visualization tool were developed and made available to the community. The measurement software can be included in any multicast application as well as used on the National Internet Measurement Infrastructure. The analysis/visualization tool allows the user to obtain and visualize time varying loss rate estimates.

DTIC

Maximum Likelihood Estimates; Computer Networks

20020090268 WetStone Technologies, Inc., Freeville, NY USA

Concurrent Information Assurance Architecture ***Final Report, Apr. 2001-Feb. 2002***

Powers, Hampton; Barjaktarovic, Milica; Aug. 2002; 104p; In English

Contract(s)/Grant(s): F30602-01-C-0061; AF Proj. OIAG

Report No.(s): AD-A406860; AFRL-IF-RS-TR-2002-193; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Currently, many tasks in the information security field are accomplished in a sequential manner, often after the fact, which limits the urgency of time response and usefulness of the tools and approaches currently available. The next step toward more

secure networking is taking a Concurrent Information Assurance (C-IA) approach, which executes security-critical functionality concurrently on several different levels. The C-IA Architecture (C-IAA) postulates concurrent information assurance (IA) by providing configurable, coordinated, automated situation analysis, decision assistance, and response. The C-IAA's objective is to create the underpinnings for an architecture that executes security-critical functionality in an automated fashion, distributively, concurrently, and separately from other applications. C-IAA systems exploit the severability of concurrent processing into separate execution environments to achieve a high confidence and minimal impact on information, IA components, and the organizations dependent on that information.
DTIC
Architecture (Computers); Computer Information Security

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

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

20020087676 National Inst. of Standards and Technology, Manufacturing Engineering Lab., Gaithersburg, MD USA
Three Dimensional Data Capture in Indoor Environments for Autonomous Navigation
Evans, J. M.; Chang, T.; Hong, T. H.; Bostelman, R.; Bunch, W. R.; Sep. 2002; 18p; In English
Report No.(s): PB2003-100186; NISTIR-6912; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An innovative use of a low-cost laser range scanner captures three-dimensional features of indoor environments in a manner suitable for mobile robot navigation that is superior to earlier approaches. This three dimensional mapping solves many of the known problems commonly encountered in early commercial service robot products. Examples include overhangs such as tables and water fountains, obstacles on the floor below the height of the scanner, carts with open sides and such items as IV poles in the hospitals. This paper describes the mapping procedure and presents early test results.
NTIS
Autonomous Navigation; Detectors; Lasers; Dimensional Analysis

20020087758 NASA Ames Research Center, Moffett Field, CA USA
IDEA: Planning at the Core of Autonomous Reactive Agents
Muscettola, Nicola, NASA Ames Research Center, USA; Dorais, Gregory A., NASA Ames Research Center, USA; Fry, Chuck, QSS Group, Inc., USA; Levinson, Richard, QSS Group, Inc., USA; Plaunt, Christian, NASA Ames Research Center, USA; [2002]; 7p; In English; Workshop on On-Line Planning and Scheduling, 23-27 Apr. 2002, Toulouse, Toulouse, France, France; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Several successful autonomous systems are separated into technologically diverse functional layers operating at different levels of abstraction. This diversity makes them difficult to implement and validate. In this paper, we present IDEA (Intelligent Distributed Execution Architecture), a unified planning and execution framework. In IDEA a layered system can be implemented as separate agents, one per layer, each representing its interactions with the world in a model. At all levels, the model representation primitives and their semantics is the same. Moreover, each agent relies on a single model, plan database, plan runner and on a variety of planners, both reactive and deliberative. The framework allows the specification of agents that operate, within a guaranteed reaction time and supports flexible specification of reactive vs. deliberative agent behavior. Within the IDEA framework we are working to fully duplicate the functionalities of the DS1 Remote Agent and extend it to domains of higher complexity than autonomous spacecraft control.
Author
Autonomy; Spacecraft Control; Control Systems Design

20020087942 NASA Ames Research Center, Moffett Field, CA USA
The Design of Collectives of Agents to Control Non-Markovian Systems
Lawson, John W., NASA Ames Research Center, USA; Wolpert, David H., NASA Ames Research Center, USA; [2002]; 6p; In English; AAAI 2002, 2002, Edmonton, Alberta, Canada; Sponsored by American Association for Artificial Intelligence, USA; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The 'Collective Intelligence' (COIN) framework concerns the design of collectives of reinforcement-learning agents such that their interaction causes a provided 'world' utility function concerning the entire collective to be maximized. Previously, we applied that framework to scenarios involving Markovian dynamics where no re-evolution of the system from counter-factual initial conditions (an often expensive calculation) is permitted. This approach sets the individual utility function of each agent to be both aligned with the world utility, and at the same time, easy for the associated agents to optimize. Here we extend that approach to systems involving non-Markovian dynamics. In computer simulations, we compare our techniques with each other and with conventional-'team games'. We show whereas in team games performance often degrades badly with time, it steadily improves when our techniques are used. We also investigate situations where the system's dimensionality is effectively reduced. We show that this leads to difficulties in the agents' ability to learn. The implication is that 'learning' is a property only of high-enough dimensional systems.
Author
Computerized Simulation; Artificial Intelligence; Learning

20020088663 NASA Ames Research Center, Moffett Field, CA USA
Universal Quantification in a Constraint-Based Planner
Golden, Keith, NASA Ames Research Center, USA; Frank, Jeremy, NASA Ames Research Center, USA; [2002]; 10p; In English; Artificial Intelligence Planning and Scheduling, 23-27 Apr. 2002, Toulouse, France; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Constraints and universal quantification are both useful in planning, but handling universally quantified constraints presents some novel challenges. We present a general approach to proving the validity of universally quantified constraints. The approach essentially consists of checking that the constraint is not violated for all members of the universe. We show that this approach can sometimes be applied even when variable domains are infinite, and we present some useful special cases where this can be done efficiently.
Author
Computer Programming; Artificial Intelligence

20020089424 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
Control Reconfigurability of Linear Time-Invariant Systems
Wu, N. Eva, Binghamton Univ., USA; Zhou, Kemin, Louisiana State Univ., USA; Salomon, Gregory, Binghamton Univ., USA; Automatica; Jan. 01, 2002; ISSN 0005-1098; Volume 36, pp. 1767-1771; In English
Contract(s)/Grant(s): NCC1-336; NSF ECS-96-15956; F49620-94-1-0415; DAAH04-96-1-0193; DOD/LEQSF(1996-99)-04; Copyright; Avail: Issuing Activity

For any fault-tolerant control method to take effect, sufficient redundancy must exist in the plant (process) to be controlled. This paper is intended to establish a means of measuring the level of redundancy in connection with feedback control by borrowing the notion of the second-order modes. In particular, it is assumed that foreseeable faults of a process are parameterized in the model of the process. The smallest second-order mode is used as a measure of the potentiality of the process to maintain a certain performance through control reconfiguration at the occurrence of the worst faults over a prescribed set in the fault parameter space. This measure is called by the authors a control reconfigurability. The control reconfigurability is calculated for two process models to show its relevance to redundant actuating capabilities in the models.
Author
Feedback Control; Linear Systems; Redundancy

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NUMERICAL ANALYSIS

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

20020087792 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Group Cancellation and Resolution
Carbone, A.; Feb. 2002; 28p; In English
Report No.(s): PB2003-100650; IHES/M/02/07; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

We establish a connection between the geometric methods developed in the combinatorial theory of small cancellation and the propositional resolution calculus. We define a precise correspondence between resolution proofs in logic and diagrams in small

cancellation theory, and as a consequence, we derive that a resolution proof is a 2-dimensional process. The isoperimetric function defined on diagrams corresponds to the length of resolution proofs.
NTIS
Set Theory; Combinatorial Analysis; Applications of Mathematics

20020087805 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Homological Mirror Symmetry, Deformation Quantization and Non-Commutative Geometry
Bressler, P.; Soibelman, Y.; Apr. 2002; 26p
Report No.(s): PB2003-100589; IHES/M/02/23; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Mathematical foundation of mirror symmetry belongs both to geometry and algebra. Present paper deals with some aspects of the latter. Our methods and conjectures have an algebraic (categorical) nature. On the other hand, based on the ideas of (Kol), (KoSol), (KoSol2), we stress the role of non-commutative geometry of mirror symmetry, making an attempt to connect it with deformation quantization. The latter can be thought of generalization of the theory of differential operators (or D-modules) to arbitrary symplectic manifolds.
NTIS
Homology; Symmetry; Algebra; Lagrangian Function

20020087941 NASA Ames Research Center, Moffett Field, CA USA
Two Solvers for Tractable Temporal Constraints with Preferences
Rossi, F., Padua Univ., Italy; Khatib,L., Kestrel Technology, LLC, USA; Morris, P., NASA Ames Research Center, USA; Morris, R., NASA Ames Research Center, USA; [2002]; 6p; In English; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright
A number of reasoning problems involving the manipulation of temporal information can naturally be viewed as implicitly inducing an ordering of potential local decisions involving time on the basis of preferences. Soft temporal constraints problems allow to describe in a natural way scenarios where events happen over time and preferences are associated to event distances and durations. In general, solving soft temporal problems require exponential time in the worst case, but there are interesting subclasses of problems which are polynomially solvable. We describe two solvers based on two different approaches for solving the same tractable subclass. For each solver we present the theoretical results it stands on, a description of the algorithm and some experimental results. The random generator used to build the problems on which tests are performed is also described. Finally, we compare the two solvers highlighting the tradeoff between performance and representational power.
Author
Formalism; Problem Solving

20020088667 George Washington Univ., Joint Inst. for Advancement of Flight Sciences, Hampton, VA USA
Finite Element A Posteriori Error Estimation for Heat Conduction
Lang, Christapher G., George Washington Univ., USA; November 2002; 87p; In English
Contract(s)/Grant(s): NCC1-01017; RTOP 706-85-12-01
Report No.(s): NASA/CR-2002-211958; NAS 1.26:211958; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This research investigates residual-based a posteriori error estimates for finite element approximations of heat conduction in single-layer and multi-layered materials. The finite element approximation, based upon hierarchical modelling combined with p-version finite elements, is described with specific application to a two-dimensional, steady state, heat-conduction problem. Element error indicators are determined by solving an element equation for the error with the element residual as a source, and a global error estimate in the energy norm is computed by collecting the element contributions. Numerical results of the performance of the error estimate are presented by comparisons to the actual error. Two methods are discussed and compared for approximating the element boundary flux. The equilibrated flux method provides more accurate results for estimating the error than the average flux method. The error estimation is applied to multi-layered materials with a modification to the equilibrated flux method to approximate the discontinuous flux along a boundary at the material interfaces. A directional error indicator is developed which distinguishes between the hierarchical modeling error and the finite element error. Numerical results are presented for single-layered materials which show that the directional indicators accurately determine which contribution to the total error dominates.
Author
Finite Element Method; Error Analysis; Conductive Heat Transfer; Equilibrium Flow

20020089450 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA
Finite Extinction Time for Non-Linear Absorption-Diffusion Equations
Goldberg, Jacob B.; Sep. 2002; 70p; In English
Report No.(s): AD-A406681; AFIT/GAM/ENC/02S-02; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this thesis, we develop a numerical method in order to approximate the solutions of one-dimensional, non-linear absorption-diffusion equations. We test our method for accuracy against a linear diffusion equation with a solution that can be written in closed form. We then test various types of diffusion and absorption terms to determine which ones produce extinction in finite time. We also develop a numerical method to computationally solve diffusion-free equations. We compare the numerical solutions of the one-dimensional, non-linear absorption-diffusion equation and the diffusion-free equation and we find that for the cases tested, the numerical absorption-diffusion solutions are always less than the numerical diffusion-free solutions. Furthermore, we find this is true for the cases tested when there is finite and infinite extinction time. We also look at the open problem where we have slow diffusion and weak absorption but, their combined effect is strong. Our results provide some insight into the answer of this problem.
DTIC
Approximation; Numerical Analysis; Diffusion

20020089489 Wisconsin Univ., Madison, WI USA
Mathematical Methods in Combating Terrorism
Harris, Bernard; Jun. 2002; 8p; In English
Contract(s)/Grant(s): DAAD19-99-1-0185
Report No.(s): AD-A406750; ARO-40017.3-MA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This document is a preliminary report on the role that mathematical and statistical methods might play in the defense against terrorist attacks. In no way does this replace the efforts of law enforcement agencies or intelligence activities. The hope is that mathematical techniques can make their efforts more efficient. The ideas enumerated here utilize the notion of Probabilistic Risk Analysis, which was developed for the purpose of assessing the safety of nuclear reactors, as well as randomization and game theory. More extensive work in these directions is contemplated for the future. The author is planning workshops to evaluate the ideas presented here and to elicit additional methodologies which may prove useful in this endeavor.
DTIC
Applications of Mathematics; Risk; Terrorism; Security; Probability Theory

20020089505 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Simplifying Partitioning Complexities by Using a Common Data Hub
Clarke, Jerry A.; Namburu, Raju R.; Aug. 2002; 18p; In English; Original contains color images
Report No.(s): AD-A406684; ARL-TR-2799; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Most scalable, high-performance simulations of interest to the Department of Defense involve calculations on a geometric structure. These topologies (unconnected points, unstructured meshes, rectilinear grids, etc.) are then partitioned across many processors. The simulation proceeds in parallel with information being communicated between processors as necessary. If the topology of the mesh changes (crack propagation, adaptive mesh refinement, etc.), the mesh must be repartitioned before efficient computation may continue. In addition, if data must be shared between various topologies (Coupled Eulerian-Lagrangian simulation), the complexities of transferring data between meshes, in parallel, can be significant. The Interdisciplinary Computing Environment has defined a common data model and format that can efficiently consolidate large quantities of computed data during runtime. Initially used for runtime visualization of parallel simulations, this data hub is now being applied to the computational simulations themselves in order to alleviate the complexities of communicating data between different topologies and the repartitioning of evolving topologies. Data can be written to the data hub using one partitioning scheme and read back with a totally different scheme. In the situation of different topologies, programs need only be cognizant of their partitioning and the ”overall” topology of the opposing mesh.
DTIC
Unstructured Grids (Mathematics); Grid Generation (Mathematics); Computational Grids; Lagrangian Function

20020089510 Rutgers - The State Univ., Dept. of Mathematics, New Brunswick, NJ USA
Input to State Stability and Related Notions ***Final Report, 1 Apr. 1998-31 Jan. 2002***
Sontag, Eduardo D.; Apr. 30, 2001; 6p; In English
Contract(s)/Grant(s): F49620-98-1-0421; AF Proj. 2304
Report No.(s): AD-A406692; AFRL-SR-AR-TR-02-0327; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This AASERT grant provided graduate student support to complement the research carried out under grant F49620-98-1-0242. The main emphasis of this subproject was the complete characterization of loss, which is a notion of well-posed detectability, and related concepts, resulting in necessary and sufficient characterizations in terms of dissipation inequalities, as well as the construction of norm-observers for finite-dimensional nonlinear systems.
DTIC
Control Theory; Nonlinear Systems; Stability; Inequalities

20020089520 Nebraska Univ., Dept. of Mathematics and Statistics, Lincoln, NE USA
The Second-Order Self-Adjoint Equation With Mixed Derivatives
Messer, Kirsten R.; Aug. 14, 2002; 68p; In English
Report No.(s): AD-A406708; AFIT-CI-02-125; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this chapter, we are concerned with the second-order, self-adjoint dynamic equation P(T)X(SUB TRIANGLE UP)(T)(sup triangle down) + q(t)x(t) = 0 on a time scale. Since this equation combines both A and V derivatives in the same equation, we will begin by examining how these two types of derivatives interact. We will then study some basic results concerning this equation, specifically the Lagrange Identity and Abel's Formula. The remainder of the chapter will cover zeros of solutions and disconjugacy, including factorizations and Riccati techniques. The material in this chapter has been previously published in 8 and 7.
DTIC
Riccati Equation; Numerical Analysis

20020089549 NASA Langley Research Center, Langley Research Center, Hampton, VA USA
P1 Nonconforming Finite Element Method for the Solution of Radiation Transport Problems
Kang, Kab S.; Aug. 2002; 24p; In English
Contract(s)/Grant(s): NASA1-97046
Report No.(s): AD-A406878; ICASE-2002-28; NASA-CR-2002-211762; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The simulation of radiation transport in the optically thick flux-limited diffusion regime has been identified as one of the most time-consuming tasks within large simulation codes. Due to multimaterial complex geometry, the radiation transport system must often be solved on unstructured grids. In this paper, we investigate the behavior and the benefits of the unstructured P(sub 1) nonconforming finite element method, which has proven to be flexible and effective on related transport problems, in solving unsteady implicit nonlinear radiation diffusion problems using Newton and Picard linearization methods. Key words. nonconforrning finite elements, radiation transport, inexact Newton linearization, multigrid preconditioning
DTIC
Finite Element Method; Radiative Transfer; Computerized Simulation

20020089585 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Pattern Search Algorithms for Mixed Variable General Constrained Optimization Problems
Abramson, Mark A.; Sep. 09, 2002; 193p; In English
Report No.(s): AD-A406807; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

A new class of algorithms for solving nonlinearly constrained mixed variable optimization problems is presented. The Audet-Dennis Generalized Pattern Search (GPS) algorithm for bound constrained mixed variable optimization problems is extended to problems with general nonlinear constraints by incorporating a filter in which new iterates are accepted whenever they decrease the incumbent objective function value or constraint violation function value. Additionally, the algorithm can exploit any available derivative information (or rough approximation thereof) to speed convergence without sacrificing the flexibility often employed by GPS methods to find better local optima. In generalizing existing GPS algorithms, the new theoretical convergence results presented here reduce seamlessly to existing results for more specific classes of problems. While no local continuity or smoothness assumptions are made, a hierarchy of theoretical convergence results is given, in which the assumptions dictate what can be proved about certain limit points of the algorithm. A new Matlab software package was developed to implement these algorithms. Numerical results are provided for several nonlinear optimization problems from the CUTE test set.
DTIC
Algorithms; Optimization; Problem Solving; Nonlinearity; Patterns; Complex Variables

20020090103 Naval Postgraduate School, Monterey, CA USA
Gauge Integration
McInnis, Erik O.; Sep. 2002; 63p; In English
Report No.(s): AD-A407084; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

It is generally accepted that the Riemann integral is more useful as a pedagogical device for introductory analysis than for advanced mathematics. This is simple because there are many meaningful functions that ale not Riemann integrable and the theory of Riemann integration does not contain sufficiently strong convenience theorems. Lebesgue developed his theory of measure and integration to address these shortcomings. His integral is more powerful in the sense that it integrates more functions and possesses more general convergence theorems. However, his techniques are significantly more complicated and require a considerable foundation in measure theory. There is not an impetus to accept the gauge integral as a possible new standard in mathematics. This relatively recent integral possesses the intuitive description of the Rienmann integral, with the power of the Lebesgue integral. The purpose of this thesis is to explore the basis of gauge integration theory through its associated preliminary convergence theorems, and to contrast it with other integration techniques through explicit examples.
DTIC
Mathematical Models; Integrated Circuits; Measure and Integration; Gauge Theory

65
STATISTICS AND PROBABILITY

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

20020087810 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Transfer Operators and Dynamical Zeta Functions for a Class of Lattice Spin Models
Hilgert, J.; Mayer, D.; Mar. 2002; 44p
Report No.(s): PB2003-100603; IHES/M/02/15; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The transfer matrix method has played an important role in statistical mechanics ever since E. Ising for the first time used this method to solve his 1-dimensional lattice spin model with nearest neighbor interaction. The method was extended later to treat higher dimensional models with arbitrary finite range interactions. The most satisfying theory for this method from the mathematical point of view goes back to D. Ruelle who introduced the so called transfer operator for 1-dimensional lattice spin systems with arbitrary long range interactions. Continued interest in such systems is related to the fact that these systems show in a rather natural way within the so called thermodynamic formalism for dynamical systems. Thereby the transfer operator ca be used for instance to construct invariant measures for such systems and to characterize their ergodic properties.
NTIS
Transfer Functions; Magnons; Dimensions; Matrices (Mathematics)

20020089495 California Univ., Dept. of Statistics, Berkeley, CA USA
Multiterminal Estimation - Extensions and a Geometric Interpretation
Jornsten, Rebecka; Yu, Bin; Jan. 2002; 6p; In English
Report No.(s): AD-A406764; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In multiterminal estimation the basic theoretical question is to prove the existence of encoding and decoding schemes that can achieve a certain rate of compression, while resulting in a particular statistical estimation efficiency. This is by comparison a much less studied field than multiterminal source coding. Essentially, only two approaches have been reported. Zhang and Berger established an upper bound on the asymptotic estimation efficiency under certain rate-compatibility constraints, and a test channel constraint referred to as the solvability condition. Han and Amari tightened the upper bound under weaker constraints on both the rates and the test channel distributions. However, their bound is in most cases prohibitively complex to compute. Here we unify the two approaches. We are able to construct an upper bound that is asymptotically equal to Han and Amari's bound, under the same rate compatibility conditions. Our bound is valid under weaker constraints on the test channels than those of Zhang and Berger. Moreover, the bound is easily computed for most source distributions. We also present a new geometric interpretation of the upper bound on asymptotic estimation efficiency.
DTIC
Estimates; Statistical Distributions; Coding

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20020089474 Naval Postgraduate School, Graduate School of Business and Public Policy, Monterey, CA USA
Understanding "Understanding" Flow for Network-Centric Warfare: Military Knowledge-Flow Mechanics
Nissen, Mark E.; Jun. 2002; 50p; In English
Contract(s)/Grant(s): N00014-01-WR-20304
Report No.(s): AD-A406729; NPS-GSBPP-02-001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Network-centric warfare (NCW) emphasizes information superiority for battlespace efficacy, but it is clear that the mechanics of how knowledge flows are just as important as those pertaining to the networks and communication systems used to transmit data and information. Unfortunately, with the strong presumption that knowledge is distinct from data and information, knowledge-flow mechanics in the warfare context are not well understood; even the term knowledge is used in conflicting ways (e.g., to describe information flows) by NCW experts, operational personnel and developers of military doctrine. Mapping key concepts from technologically enabled business models in which NCW is based in large part to the military, we substitute the term understanding flow when discussing the mechanics of how knowledge flows in the NCW context. In one respect, this mapping and terminological substitution enable us to move forward and model knowledge-flow mechanics in a manner that is consistent with the operational Navy's lexicon; in another respect, however, it is clear that Navy lexicon does not yet include the term understanding flow. Hence, naval conceptualization of NCW may be missing a vital element. Informed by recent advances in knowledge-flow theory, the research described in this technical report develops a four-dimensional model of understanding-flow mechanics. This multidimensional model enables a novel capability to recognize a variety of understanding-flow patterns found in the military enterprise, to distinguish such patterns from their counterparts pertaining to information and data, and to enhance the speed and efficiency of NCW understanding flows. Just as understanding the mechanics of electrical flow is critical to developing useful electronic devices, understanding the mechanics of understanding flow is critical to conceiving useful NCW systems.
DTIC
Information Transfer; Information Flow; Fluid Mechanics; Flow Distribution

20020089523 Klein Associates, Inc., Fairborn, OH USA
Cognitive Task Analysis and Work-Centered Support System Recommendations for a Deployed Network Operations Support Center (NOSC-D) ***Final Report, Oct. 2000-Aug. 2001***
Stanard, Terry; Thordsen, Marvin L.; McCloseky, Michael J.; Vincent, Patrick J.; Aug. 2001; 45p; In English; Prepared in cooperation with TASC, Inc., Fairborn, OH
Contract(s)/Grant(s): F33615-99-D-6001; Proj-1710
Report No.(s): AD-A406712; AFRL-HE-WP-TR-2002-0165; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the results of a preliminary Cognitive Task Analysis (CTA) of the deployed Network Operations Support Center (NOSC-D), and the implications of the NOSC-D current state of practice for the development of Work-Centered Support Systems (WCSS). The NOSC-D organization is a new addition to the Air Force (AF) enterprise network, and is tasked with the information assurance of a number of deployed Network Control Centers (NCC-D). Klein Associates studied the NOSC-D through a single data collection trip to the l2AF NOSC-D at Davis-Monthan AFB. During their trip, Klein Associates conducted Cognitive Task Analysis interviews with four (4) NOSC-D personnel. Because of the preliminary nature of the finding, the analysis is presented in conjunction with recommended future research objectives. This report is structured into three major sections. The first section addresses the responsibilities and challenges of the position within the NOSC-D. The second section addresses the coordination issues of the NOSC-D with other levels of the AF enterprise network. The third section suggests a detailed research plan for investigating the events and parameters of a distributed information attack that could be used in the table-top exercise.
DTIC
Networks; Command and Control

20020089590 Georgia Inst. of Tech., School of Aerospace Engineering, Atlanta, GA USA
Design Methodology Development and Education for Naval System Affordability ***Annual Report, 15 Oct. 2001-14 Oct 2002***
Mavris, Dimitri N.; Oct. 07, 2002; 7p; In English
Contract(s)/Grant(s): N00014-02-01-0051
Report No.(s): AD-A406812; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

There is a growing need in the Navy for the ability to discern between whether to invest in evolutionary" or "disruptive" solutions. The ultimate motivation of this research task is to understand the nature of technology transition dynamics, from an engineering and S&T investment point of view in order to maximize the probability of success of S&T investments. The approach is study rise/run analysis and techniques for linking business strategy and technology dynamics.
DTIC
Education; Navy; Technology Assessment; Military Operations

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

20020087794 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Liouville Property for Groups and Manifolds
Erschler, A.; Apr. 2002; 24p; In English
Report No.(s): PB2003-100652; IHES/M/02/25; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
We introduce a new criterion for non-triviality of the Poisson boundary. Using this criterion we prove the existence of compact manifolds with amenable fundamental groups such that the universal cover is not Louiville. This gives a positive answer to a question from. We prove that a finitely generated solvable group admits a symmetric measure with non-trivial Poisson boundary if and only if this group is not virtually nilpotent. This gives a partial answer to a conjecture of Vershik and Kaimanovich. Also we give a series of examples of amenable groups such that any non-degenerate measure has non-zero entropy of the random walk. In other words, any non-degenerate measure with trivial Poisson boundary on these groups has infinite entropy.
NTIS
Random Walk; Manifolds (Mathematics)

20020087806 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Variations on the Bloch-Ogus Theorem
Panin, I.; Zainoulline, K.; Mar. 2002; 26p
Report No.(s): PB2003-100590; IHES/M/02/16; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
In the present paper we discuss questions concerning the arithmetic resolution for etale cohomology.
NTIS
Homology; Theorems

20020090105 Naval Postgraduate School, Monterey, CA USA
Randomized Ensemble Methods for Classification Trees
Kobayashi, Izumi; Sep. 2002; 141p; In English
Report No.(s): AD-A407091; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
We propose two methods of constructing ensembles of classifiers. One method directly injects randomness into classification tree algorithms by choosing a split randomly at each node with probabilities proportional to the measure of goodness for a split. We combine this method with a stopping rule which uses permutation of the outputs. The other method perturbs the output and constructs a classifier using the perturbed data. In both methods, the final classifier is given by an unweighted vote of the individual classifiers. These methods are compared with bagging, Adaboost, and random forests on thirteen commonly used data sets. The results show that our methods perform better than bagging, and comparably to Adaboost and random forests on average. Additional computation shows that our perturbation method could improve its performance by perturbing both the inputs and with the outputs, and combining a sufficiently large number of trees. Plots of strength and correlation show an interesting relationship. We also explore combining sampling subsets of the training set with our proposed methods. The results of a few trials show that the performance of our proposed methods could be improved by combining sampling subsets of the training set.
DTIC
Trees (Mathematics); Algorithms; Classifications; Permutations; Random Variables

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see categories 71 through 77. For related instrumentation see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

20020087877 Stanford Linear Accelerator Center, Stanford, CA USA
Beam Line: 100 years of elementary particles, Volume 27
Pais, A.; Weinberg, S.; Quigg, C.; Riordan, M.; Panofsky, W. K. H.; Apr. 01, 1997; 55p; In English
Report No.(s): DE2002-790903; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This issue of Beam Line commemorates the 100th anniversary of the April 30, 1897 report of the discovery of the electron by J.J. Thomson and the ensuing discovery of other subatomic particles. In the first three articles, theorists Abraham Pais, Steven Weinberg, and Chris Quigg provide their perspectives on the discoveries of elementary particles as well as the implications and future directions resulting from these discoveries. In the following three articles, Michael Riordan, Wolfgang Panofsky, and Virginia Trimble apply our knowledge about elementary particles to high-energy research, electronics technology, and understanding the origin and evolution of our Universe.
NTIS
Electrons; Evolution; Elementary Particles

20020087883 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Gas discharge switch evaluation for RHIC beam abort kicker application
Zhang,; Sandberg,; Sheldrake,; Pirrie,; Jun. 30, 2002; 4p; In English
Report No.(s): DE2002-798572; BNL-69306; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A gas discharge switch EEV HX3002 is being evaluated at Brookhaven National Laboratory as a possible candidate of RHIC Beam Abort Kicker modulator main switch. At higher beam energy and higher beam intensity, the switch stability becomes very crucial. The hollow anode thyratron used in the existing system is not rated for long reverse current conduction. The reverse voltage arcing caused thyratron hold-off voltage de-rating has been the main limitation of the system operation. to improve the system reliability, a new type of gas discharge switch has been suggested by Marconi Applied Technology for its reverse conducting capability.
NTIS
Beam Switching; Electric Potential; Thyratrons

20020087884 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Overview of high voltage dielectric material for traveling wave kicker magnet application
Zhang,; Sandberg,; Tuozzolo,; Cassel,; Jun. 30, 2002; 5p; In English
Report No.(s): DE2002-798573; BNL-69307; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Pulsed high power fast kickers are being used to change beam trajectories in particle accelerators. The fast rise and fall time of pulse waveform demands a transmission line structure for the kicker deflector design. The ideal design will be parallel metal plates. However, it uses very long straight sections to achieve the required deflection. In accelerators with constrained straight sections, high permeability materials such as ferrite have to be used to gain deflection efficiency. The transmission line kicker magnet is also referred as traveling wave kicker magnet. Its construction is based on distributed 1-C cells along the longitudinal direction. The magnetic cells and capacitive cells are interleaved to simulate the characteristic impedance of a transmission line to minimize pulse reflection, and provide adequate frequency bandwidth to transmit the kicker pulse with fast rise and fall time. The magnetic cells are usually made of ferrite ceramics, but the capacitive cells have been made with different materials. For traveling wave kickers with higher impedance, the parallel plate vacuum capacitor has been used in CERN and KEK design. Others have used ceramic capacitors, printed circuit boards, and high permittivity ceramics as the capacitive cell. The high dielectric material has the advantage of compactness for low impedance kicker magnet construction. It continues to be very attractive for future kicker magnet applications. The high voltage phenomena associated with high dielectric ceramic materials have been widely reported in many industrial application areas.
NTIS
Bandwidth; Electrical Impedance; Dielectrics

20020087885 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
High energy nuclear interactions and QCD: An introduction
Kharzeev, E.; Raufeisen,; Jan. 07, 2002; 43p; In English
Report No.(s): DE2002-798574; BNL-69310; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The goal of these lectures, oriented towards the students just entering the field, is to provide an elementary introduction to QCD and the physics of nuclear interactions at high energies. We first introduce the general structure of QCD and discuss its main properties. Then we proceed to Glauber multiple scattering theory which lays the foundation for the theoretical treatment of nuclear interactions at high energies. We introduce the concept of Gribov's inelastic shadowing, crucial for the understanding of quantum formation effects. We outline the problems facing Glauber approach at high energies, and discuss how asymptotic freedom of QCD helps to resolve them, introducing the concepts of parton saturation and color glass condensate.
NTIS
Quantum Chromodynamics; High Energy Interactions; Condensates; Glauber Theory

20020089491 Nebraska Univ., Lincoln, NE USA
Advanced Magnets for Power Systems ***Final Report, 1 May 1998-30 Jan. 2002***
Sellmyer, David J.; Jaswal, Sitaram S.; Leslie-Pelecky, Diandra; Liu, J. P.; Shield, Jeffrey; May 01, 2002; 17p; In English
Contract(s)/Grant(s): DAAG55-98-1-0268
Report No.(s): AD-A406752; ARO-P-38935-MS.1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research is focused on (1) design of novel nanocomposite structures for high energy-product permanent magnets, (2) design of enhanced high-temperature Co-based alloys by compound-alloy modifications, and (3) development of enhanced hard and soft magnets via novel processing methods including mechanical alloying, cluster-assembled materials, and rolling techniques. Model nanocomposite hard-soft combinations have been developed with energy products of about 50 MGOe and coercivities of about 40 kOe. A theoretical understanding has been achieved of the structural characteristics needed to produce high energy products in the exchange-coupled nanocomposites. A variety of 2:17, 1:7, 5:17 and modified compounds have been investigated both experimentally and theoretical. It has been shown that transition-metal additions such as Ti, Cu, and Zr, are capable of stabilizing the disordered hexagonal Sm(CoM)7 phase with beneficial increases in anisotropy. Considerable development work on processing methods has been performed in this period.
DTIC
Permanent Magnets; Nanocomposites; Nanostructures (Devices); Heat Resistant Alloys; Cobalt

71
ACOUSTICS

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

20020087614 Virginia Polytechnic Inst. and State Univ., Vibration and Acoustics Labs., Blacksburg, VA USA
Hybrid Active-Passive Systems for Control of Aircraft Interior Noise ***Final Report, 1 Jan. 1999 - 31 Mar. 2002***
Fuller, Chris R., Virginia Polytechnic Inst. and State Univ., USA; [2002]; 22p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG1-2158; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It was proposed to continue with development and application in the two active-passive areas of Active Tuned Vibration Absorbers (ATVA) and smart foam applied to the reduction of interior noise in aircraft. In general the work was focused on making both techniques more efficient, practical and robust thus increasing their application potential. The work was also concerned with demonstrating the potential of these two technologies under realistic implementations as well as understanding the fundamental physics of the systems. The proposed work consisted of a three-year program and was tightly coordinated with related work being carried out in the Structural Acoustics Branch at NASA LaRC. The work was supervised and coordinated through all phases by Prof Chris Fuller of Va Tech.
Author
Aircraft Noise; Vibration Isolators; Foams; Aeroacoustics; Noise Reduction

20020087943 NASA Glenn Research Center, Cleveland, OH USA
Prediction of the Acoustic Field Associated with Instability Wave Source Model for a Compressible Jet
Golubev, Vladimir, Embry-Riddle Aeronautical Univ., USA; Mankbadi, Reda R., Embry-Riddle Aeronautical Univ., USA; Dahl, Milo D., NASA Glenn Research Center, USA; [2002]; 8p; In English; 8th AIAA/CEAS Aeroacoustics Conference, 17-19 Jun.

2002, Breckenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 708-90-33; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

This paper provides preliminary results of the study of the acoustic radiation from the source model representing spatially-growing instability waves in a round jet at high speeds. The source model is briefly discussed first followed by the analysis of the produced acoustic directivity pattern. Two integral surface techniques are discussed and compared for prediction of the jet acoustic radiation field.
Author
Aeroacoustics; Jet Flow; Sound Waves; Sound Fields

20020088704 NASA Langley Research Center, Hampton, VA USA
Acoustic Analogy and Alternative Theories for Jet Noise Prediction
Morris, Philip J., Pennsylvania State Univ., USA; Farassat, F., NASA Langley Research Center, USA; AIAA Journal; April 2002; Volume 40, No. 4, pp. 671- 680; In English; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright; Avail: Issuing Activity

Several methods for the prediction of jet noise are described. All but one of the noise prediction schemes are based on Lighthill's or Lilley's acoustic analogy, whereas the other is the jet noise generation model recently proposed by Tam and Auriault. In all of the approaches, some assumptions must be made concerning the statistical properties of the turbulent sources. In each case the characteristic scales of the turbulence are obtained from a solution of the Reynolds-averaged Navier-Stokes equation using a kappa-sigma turbulence model. It is shown that, for the same level of empiricism, Tam and Auriault's model yields better agreement with experimental noise measurements than the acoustic analogy. It is then shown that this result is not because of some fundamental flaw in the acoustic analogy approach, but instead is associated with the assumptions made in the approximation of the turbulent source statistics. If consistent assumptions are made, both the acoustic analogy and Tam and Auriault's model yield identical noise predictions. In conclusion, a proposal is presented for an acoustic analogy that provides a clearer identification of the equivalent source mechanisms, as is a discussion of noise prediction issues that remain to be resolved.
Author
Jet Aircraft Noise; Noise Measurement; Noise Prediction (Aircraft); Forecasting; Aeroacoustics; Turbulence Models; Navier-Stokes Equation; Statistical Distributions

20020089496 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
Environmental Data Collection from the AQS-20
Harris, Michael M.; Avera, William E.; Bibee, Leonard D.; Null, J. M.; Jun. 11, 2002; 14p; In English; Original contains color images
Report No.(s): AD-A406765; NRL/JA/7440-02-1009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Naval Research Laboratory (NRL) under the technical direction of SPAWAR PMW-155 and the sponsorship of the Oceanographer of the Navy, N096, examined the technical feasibility of extracting environmental data from the AQS-20 Mine Hunting Sonar towed from both the MH-60 helicopter and the AN/WLD- I Remote Mine Hunting System. Multibeam bathymetry and sediment information can be extracted from the AQS-20 and used in near real- time in tactical decision aids like the Mine Warfare Environmental Decision Aids Library (MEDAL). These conclusions are based on AQS-20 experiments conducted in June 1998, July 1999 and June 2001. This paper discusses the advantages of near real-time environmental data in MCM and describes a proposed Environmental Data Collection (EDC) Mode of operation for the AQS-20.
DTIC
Mine Detectors; Sonar; Data Mining

20020089515 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Sound Exposure Calculations for Transient Events and Other Improvements to an Acoustical Tactical Decision Aid ***Final Report, 1 Aug. 2001-15 Jan. 2002***
Wilson, D. K.; Nguyen, V. A.; Srour, Nassy; Noble, John; Aug. 2002; 44p; In English
Report No.(s): AD-A406703; ARL-TR-2757; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent enhancements to an acoustical tactical decision aid, called the Acoustic Battlefield Aid (ABFA), are described. ABFA predicts the effects of the atmosphere and local terrain on the performance of acoustical sensors, using advanced sound propagation models. Among the enhancements are: (1) sound-exposure and detection calculations for moving and transient sources, (2) new display capabilities including loading of vector-map features from CDs, (3) an interactive menu for entering and managing acoustical and meteorological ground properties, (4) initialization of runs from field trials stored in the U.S. Army

Research Laboratory's Automatic Target Recognition Acoustic Database, (5) a Java-based interface to numerical weather forecast data over the Internet, and (6) creation of a Windows executable version using the MATLAB compiler.
DTIC
Sound Transmission; Computation; Decision Support Systems; Signal Detectors; Acoustics

20020089532 Naval Research Lab., Bay Saint Louis, MS USA
Multibeam Bathymetry from a Mine-Hunting Military Sonar
Avera, William E.; Harris, Michael M.; Bibee, Leonard D.; Lingsch, S.; Sample, John T.; Jun. 11, 2002; 17p; In English; Original contains color images
Report No.(s): AD-A406721; NRL/JA/7440-02-1010; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Multibeam bathymetry is obtained from the AN/AQS-20 mine-hunting sonar system. The AN/AQS-20 Volume Search Sonar uses a swath of beams directed downward and perpendicular to the direction of motion to cover more than 180 degrees around the sensor. This coverage creates a coarse-sampling, multibeam sonar that can measure the bottom depth. Raw beamformed data are available from a dedicated experiment to demonstrate the feasibility for using this system to update existing bathymetric databases during mine hunting operations. Data processing uses a weighted-mean-time technique to determine the bottom reflection return from the downward directed beams within +45 degrees of the nadir beam (producing 90 degree swath). Data are compared with a recent multibeam survey covering the same location to determine the accuracy and optimize the data processing. The recent multibeam survey was obtained as a ground truth' using a conventional EM-1002 multibeam system. Comparison of the AN/AQS-20 data with the ground truth demonstrated good agreement for bathymetry and is within the requirements for mine warfare operations. Limitations on the bathymetry accuracy are related to the pressure sensor that measures tow-body depth.
DTIC
Mine Detectors; Sonar; Bathymeters

20020090106 Naval Postgraduate School, Monterey, CA USA
An Audio Architecture Integrating Sound and Live Voice for Virtual Environments
Krebs, Eric M.; Sep. 2002; 197p; In English; Original contains color images
Report No.(s): AD-A407096; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
The purpose behind this thesis was to design and implement audio system architecture, both in hardware and in software, for use in virtual environments The hardware and software design requirements were aimed at implementing acoustical models, such as reverberation and occlusion, and live audio streaming to any simulation employing this architecture, Several free or open-source sound APIs were evaluated, and DirectSound3DTM was selected as the core component of the audio architecture, Creative Technology Ltd, Environmental Audio Extensions (EAXTM 3,0) were integrated into the architecture to provide environmental effects such as reverberation, occlusion, obstruction, and exclusion, Voice over IP (VoIP) technology was evaluated to provide live, streaming voice to any virtual environment DirectVoice was selected as the voice component of the VoIP architecture due to its integration with DirectSound3DTM, However, extremely high latency considerations with DirectVoice, and any other VoIP application or software, required further research into alternative live voice architectures for inclusion in virtual environments Ausim3D's GoldServe Audio System was evaluated and integrated into the hardware component of the audio architecture to provide an extremely low-latency, live, streaming voice capability.
DTIC
Architecture (Computers); Software Engineering; Voice Communication; Audio Signals; Applications Programs (Computers)

72
ATOMIC AND MOLECULAR PHYSICS

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

20020087683 Stanford Linear Accelerator Center, Stanford, CA USA
Charmonium Decays: J/psi to e+e- and eta c to Gamma Gamma
Melnikov, K.; Oct. 01, 2001; 6p; In English
Report No.(s): DE2002-798875; SLAC-PUB-8986; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Charm (Particle Physics); Mesons; Particle Production

20020087685 Stanford Linear Accelerator Center, Stanford, CA USA
Study of Inclusive and Semi-Inclusive Production of eta prime in B Decays
Hicheur, A.; Sep. 24, 2001; 16p; In English
Report No.(s): DE2002-798873; SLAC-PUB-8979; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Center of Mass; Decay; Particle Production

20020087699 Stanford Linear Accelerator Center, Stanford, CA USA
Effect of the Electron Cloud and CSR on the Upgrade of the PEP-II
Heifets, S. A.; Nov. 8, 2001; 14p; In English
Report No.(s): DE2002-798920; SLAC-PUB-9050; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Effects of the electron cloud and of the coherent synchrotron radiation (CSR) on the possible upgrade of the PEP-II B-factory are studied.
NTIS
Coherent Radiation; Electron Clouds; Synchrotron Radiation

20020087809 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Implications of a Solar-System Population of Massive 4th Generation Neutrinos for Underground Searches of Monochromatic Neutrino-Annihilation Signals
Belotsky, K. M.; Damour, T.; Khlopov, M. Y.; Feb. 2002; 20p
Report No.(s): PB2003-100596; IHES/M/02/08; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
It has been recently pointed out that any primary galactic population of Weakly Interacting Massive Particles (WIMP) generates, through collisions with solar matter, a secondary population of 'slow' WIMPs trapped in the inner solar system. We show that taking into account this 'slow' solar-system population dramatically enhances the possibility to probe the existence of stable massive neutrinos (of a 4th generation) in underground neutrino experiments. Though neutrinos, with mass in the 45-90 GeV range, can only represent a sparse subdominant component of galactic cold dark matter, a combination of enhancement factors makes it possible to discriminate their contribution to WIMP annihilation effects in the Earth. Our work suggests that a reanalysis of existing underground neutrino data should be able to bring extremely tight constraints on the possible existence of a stable massive 4th neutrino.
NTIS
Neutrinos; Solar System; Weakly Interacting Massive Particles

20020087815 Stanford Linear Accelerator Center, Stanford, CA USA
Production of Charged Pi-plus-minus, K-plus-minus and p/anti-p in Hadronic Z0 Decays
Muller, D.; Sep. 27, 2001; 22p; In English
Report No.(s): DE2002-798866; SLAC-PUB-8899; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present improved measurements of identifed charged hadron production over a wide momentum range at SLD, using the Cherenkov Ring Imaging Detector to identify clean samples of charged pions, kaons and protons. In addition to studying flavor-inclusive Z0 decays, we compare the production in light, c and b flavor events, and present a new comparison of light-quark and gluon jets, selected using the SLD vertex detector. Also, we update our comparison of hadron and antihadron production in light quark (rather than antiquark) jets, selected using the high SLC electron beamerences between hadron and antihadron production at high momentum fraction provide precise measurements of leading particle production and new, stringent tests of fragmentation models.
NTIS
Hadrons; Pions

20020087833 Stanford Linear Accelerator Center, Stanford, CA USA
Wake Field of the e-Cloud
Heifets, S. A.; Nov. 8, 2001; 12p; In English
Report No.(s): DE2002-798910; SLAC-PUB-9025; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The wake field of the cloud is derived analytically taking into account the finite size of the cloud and nonlinearity of the electron motion.
NTIS
Nonlinearity; Particle Motion; Wakes; Electron Clouds

20020087839 Stanford Linear Accelerator Center, Stanford, CA USA
Improved Study of the Structure of e+e--greater than b-anti-b-g Events and Limits on the Anomalous Chromomagnetic Coupling of the b-Quark
Burrows, P.; Sep. 27, 2001; 22p; In English
Report No.(s): DE2002-798863; SLAC-PUB-8891; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The structure of three-jet e+e--greater than b-anti-b-g events has been studied using hadronic Z0 decays recorded in the SLD experiment at SLAC. Three-jet nal states were selected and the CCD-based vertex detector was used to identify two of the jets as b or b; the remaining jet in each event was tagged as the gluon jet. Distributions of the gluon energy and polar angle with respect to the electron beam were measured over the full kinematic range, and used to test the predictions of perturbative QCD. The energy distribution is potentially sensitive to an anomalous b chromomagnetic moment at the b bg vertex. We measured to be consistent with zero and set 95% C.L. limits on its value.
NTIS
Quantum Chromodynamics; Gluons; Jet Aircraft

20020087840 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of the b Quark Fragmentation Function in Z0 Decays and First Measurement of B-Bbar Energy Correlations
Burrows, P.; Sep. 27, 2001; 33p; In English
Report No.(s): DE2002-798864; SLAC-PUB-8892; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present preliminary results of a new measurement of the inclusive b quark fragmentation function in Z0 decays using a novel kinematic B hadron energy reconstruction technique. The measurement is performed using 350,000 hadronic Z0 events recorded in the SLD experiment at SLAC between 1997 and 1998. The small and stable SLC beam spot and the CCD-based vertex detector are used to reconstruct topological B- decay vertices with high eciency and purity, and to provide precise measurements of the kinematic quantities used in this technique. We measure the B energy with good eciency and resolution over the full kinematic range. We compare the measured scaled B hadron energy distribution with several functional forms of the B hadron energy distribution and predictions of several models of b quark fragmentation. Several functions are excluded by the data. The average scaled energy of the weakly decaying B hadron is measured to be xB = 0.710 0.003 (stat) 0.005 (syst) 0.004 (model) (preliminary). In addition, we reconstruct the decay vertices of both the leading B and hadrons in a large sample of events, and measure their energies. We present the rst (preliminary) measurement of the correlation between the B and energies in Z0 b events, and compare with the leading order QCD prediction.
NTIS
Quarks; Fragmentation

20020087841 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of the B --> J/psi K*(892) Decay Amplitudes
Bernard, D.; Oct. 04, 2001; 8p; In English
Report No.(s): DE2002-798865; SLAC-PUB-8898; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Measurement; Amplitudes

20020087842 Stanford Linear Accelerator Center, Stanford, CA USA
Study of Correlations Between Identified Charged Hadrons in Hadronic Z0 Decays
Muller, D.; Sep. 27, 2001; 26p; In English
Report No.(s): DE2002-798867; SLAC-PUB-8900; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We present a preliminary study of correlations in rapidity between pairs of identified charged pions, kaons and protons in the SLD data. Details of short-range charge correlations between all combinations of these hadron species are used to study the locality of quantum number conservation, and suggest local charge ordering along the entire hadronization chain.
NTIS
Hadrons; Correlation

20020087845 Stanford Linear Accelerator Center, Stanford, CA USA
Study of Charmonium Production and Electroweak Penguins with BABAR
Brigljevic, V.; Sep. 28, 2001; 5p; In English
Report No.(s): DE2002-798882; SLAC-PUB-9008; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Charm (Particle Physics); Mesons; Electroweak Interactions (Field Theory)

20020087851 Stanford Linear Accelerator Center, Stanford, CA USA
PEP-N Interaction Region
Sullivan, M. K.; Oct. 11, 2001; 3p; In English
Report No.(s): DE2002-798888; SLAC-PUB-9017; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The PEP-N project consists of a small, very low-energy e- storage ring (VLER) located in one of the interaction-straight regions of PEP-II. The small ring is brought into collision with the low-energy (3.1 GeV) e+ beam (LER). The center-of-mass energies from this collision are between the Phi and J/psi resonances. We achieve a head-on collision through the use of a central magnetic dipole field that generates a large horizontal bending field. This field is also the central field of the detector. The large energy range of the VLER, in order to maximize the center-of-mass energy range, complicates the collision point geometry. In order to maintain the beam orbits near the collision point two techniques are used. The first is to scale the central dipole field up and down with the energy of the VLER and the second is to use passive shielding to decrease the integral B.dl of the dipole field seen by the VLER. Changes in the orbit of the LER are corrected with local bending magnets. Further details of the interaction region geometry as well as design issues that include synchrotron radiation from the high-current positron beam are discussed.
NTIS
Synchrotrons; Particle Collisions; Particle Beams; Magnetic Dipoles; Magnetic Fields

20020087853 Stanford Linear Accelerator Center, Stanford, CA USA
Low-Energy Ring Lattice Design for the PEP-N Project
Sullivan, M. K.; Oct. 11, 2001; 3p; In English
Report No.(s): DE2002-798890; SLAC-PUB-9019; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The PEP-N project at SLAC consists of a Very Low Energy small electron Ring (VLER) that will collide with the low-energy 3.1 GeV positron beam (LER) of PEP-II, producing center-of-mass energies between 1.1 GeV and the J/psi. The beams will collide head-on and will be separated in the detector magnetic field which is part of the Interaction Region (IR). The IP beta functions were chosen such as to optimize both luminosity and beam-beam tune shifts, while keeping the LER tune shifts small. This paper describes the lattice of the VLER for the ’baseline’ design at 500 MeV.
NTIS
Particle Accelerators; Particle Beams

20020087857 Stanford Linear Accelerator Center, Stanford, CA USA
Methods and Issues in Beam-Beam Simulation
Cai, Y.; Oct. 12, 2001; 4p; In English
Report No.(s): DE2002-798894; SLAC-PUB-9024; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We will review the recent developments of the beam-beam simulation using the method of particle-in-cell (PIC). The simulation results are compared with both experimental measurements and the analytical theory. Finally the numerical noise in the PIC simulation is discussed.
NTIS
Beams (Radiation); Simulation

20020087858 Stanford Linear Accelerator Center, Stanford, CA USA

Novel Dendrimer-Like Star Copolymer Architectures Investigated with Scattering Techniques

Pople, J. A.; Oct. 17, 2001; 3p; In English

Report No.(s): DE2002-798895; SLAC-PUB-9027; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Hyperbranched dendrimer molecules emanating from a central core were successfully synthesized just over a decade ago and have been gaining the interest of polymer scientists due to their unique properties and promising applications. Several groups have sought structural and dynamic information on dendrimeric molecules with some degree of success. Most of the studies thus far have focused on dendrimeric structures having relatively short links between branching points and having a uniform distribution of branches throughout the molecule. We are interested in dendrimer-star molecules where polymer chains connect the branch points and the length and placement of these chains can be varied systematically. We have taken one approach to such systems by investigating a series of constitutional isomers having the same molecular weight and number of branch points and surface functionalities, but varied branch placement to alter the architecture. In this way, we can study the influence of the architecture on the structure, interactions, and dynamics of these molecules.

NTIS

Copolymers; Scattering; Dendrimers; Synthesis (Chemistry)

20020087861 Stanford Linear Accelerator Center, Stanford, CA USA

LCDROOT Analysis Package

Abe, T.; Oct. 18, 2001; 4p; In English

Report No.(s): DE2002-798898; SLAC-PUB-9033; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The North American Linear Collider Detector group has developed simulation and analysis program packages. LCDROOT is one of the packages, and is based on ROOT and the C++ programing language to maximally benefit from object oriented programming techniques. LCDROOT is constantly improved and now has a new topological vertex finder, ZVTOP3. In this proceeding, the features of the LCDROOT simulation are briefly described.

NTIS

Linear Accelerators; Object-Oriented Programming; Computerized Simulation

20020087863 Stanford Linear Accelerator Center, Stanford, CA USA

BaBar Helium Liquefier and Superconducting Magnet Control System

Craddock, W. W.; Nov. 8, 2001; 10p; In English

Report No.(s): DE2002-798902; SLAC-PUB-8918; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The BaBar 27 MJ superconducting solenoid and 1000 W helium liquefier at the Stanford Linear Accelerator Center (SLAC) have been operating with high reliability since October 1998. The control system consists of two Allen Bradley SLC 500/4 PLC controllers and two Windows NT PCs running BridgeView as the Graphical User Interface (GUI) all connected via a common Data Highway Plus network. A third 500/4 PLC and PC have been recently added to the network, integrating control of a second compressor system that is used with another helium liquefier. Separate hardwired protection systems for both the solenoid and liquefier are provided. All GUI screens are viewable over the Web. Operating, upgrading and commissioning experience of this control system is discussed. Control system hardware, software technical performance, and instrumentation and wiring issues are detailed. Operator interaction issues are also included.

NTIS

Solenoids; Linear Accelerators; Controllers; Graphical User Interface; Liquefaction

20020087875 Oak Ridge National Lab., TN USA

Evidence of Collisional Coherences in the Transport of Hydrogenic Krypton through Amorphous Carbon Foils

Minami, T.; Aug. 24, 2001; 15p; In English

Report No.(s): DE2002-786479; P01-111677; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We study theoretically and experimentally the population dynamics of the internal state of 60MeV/u Kr35+ ions traversing amorphous carbon foils. A quantum transport theory is developed that incorporates the state mixing induced by the wake field of the ion as well as all the coherences generated by the collisional and radiative redistribution of states. We show that the internal state of the ion is sensitive to collisional coherences and the wake field. The results of the full simulations are found to be in good agreement with experimental data.

NTIS

Carbon; Amorphous Materials; Foils (Materials); Quantum Theory

20020087882 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Strange goings on in quark matter
Schafer,; Jun. 05, 2001; 7p; In English
Report No.(s): DE2002-798571; BNL-69303; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We review recent work on how the superfluid state of three flavor quark matter is affected by non-zero quark masses and chemical potentials.
NTIS
Quarks; Superfluidity

20020087889 Fermi National Accelerator Lab., Batavia, IL USA
Analytic semi-classical quantization of a QCD string with light quarks
Allen, T. J.; Aug. 14, 2002; 5p; In English
Report No.(s): DE2002-798750; FERMILAB-CONF-01/397-T; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We perform an analytic semi-classical quantization of the straight QCD string with one end fixed and a massless quark on the other, in the limits of orbital and radial dominant motion. Our results well approximate those of the exact numerical semi-classical quantization as well as our exact numerical canonical quantization.
NTIS
Quantum Chromodynamics; Strings; Quarks

20020087952 Stanford Linear Accelerator Center, Stanford, CA USA
Time Dependent B(carat)0 - bar-B(carat)0 Mixing at SLD
Thom, J.; Oct. 29, 2001; 7p; In English
Report No.(s): DE2002-798914; SLAC-PUB-9035; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Radiation Detectors; Linear Accelerators

20020087957 Stanford Linear Accelerator Center, Stanford, CA USA
Vlasov equation with Coherent Synchrotron Radiation
Heifets, S. A.; Nov. 14, 2001; 9p; In English
Report No.(s): DE2002-798923; SLAC-PUB-9054; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The coherent synchrotron radiation (CSR) can cause a bunch instability leading to the short wave length density modulation as it was considered in the previous publication. Here, consideration of the problem is refined. The Vlasov equation for the instability is corrected in two respects taking into account the energy spread in a bunch and the delay time. Parameters defining the corrections are established and effects are estimated for two examples of PEP-II and LCLS chicane.
NTIS
Synchrotron Radiation; Modulation

20020088652 Stanford Linear Accelerator Center, Stanford, CA USA
Helicity-Correlated Systematics for SLAC Experiment E158
Mastromarino, P.; Dec. 10, 2001; 9p; In English
Report No.(s): DE2002-798932; SLAC-PUB-9071; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Helices; Elastic Scattering; Electron Beams; Beam Currents

20020088655 Stanford Linear Accelerator Center, Stanford, CA USA
Numerical Calculations of Short-Range Wakefields of Collimators
Ng, C. K.; Dec. 7, 2001; 4p; In English
Report No.(s): DE2002-798935; SLAC-PUB-9078; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The performance of future linear colliders are limited by the effect of short-range collimator wakefields on the beam. The beam quality is sensitive to the positioning of collimators at the end of the linac. The determination of collimator wakefields has been difficult, largely because of the scarcity of measurement data, and of the limitation of applicability of analytical results to

realistic structures. In this paper, numerical methods using codes such as MAFIA are used to determine a series of tapered collimators with rectangular apertures that have been built for studies at SLAC (Stanford Linear Accelerator Center). We will study the dependences of the wakefield on the collimator taper angle, the collimator gap as well as the bunch length. Calculations are also compared with measurements.
NTIS
Linear Accelerators; Collimators; Wakes; Particle Collisions

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see 93 Space Radiation. For atomic and molecular physics see 72 Atomic and Molecular Physics. For elementary particle physics see 77 Physics of Elementary Particles and Fields. For nuclear astrophysics see 90 Astrophysics.

20020087611 Stanford Linear Accelerator Center, Stanford, CA USA
CP Puzzle in the Strong Interactions Dirac Medal Lecture
Quinn, H. R.; Oct. 03, 2001; 12p; In English
Report No.(s): DE2002-798868; SLAC-PUB-8964; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This lecture, directed to a broad audience including non-specialists, presents a short review of the problem of strong CP symmetry maintenance. The problem is defined and the possible solutions briefly reviewed. I discuss the way in which Roberto Peccei and I came up with one solution, generally known as Peccei-Quinn symmetry.
NTIS
Symmetry; Strong Interactions (Field Theory); Elementary Particles; Lectures

20020087682 Stanford Linear Accelerator Center, Stanford, CA USA
Identification of Randall-Sundrum Graviton Resonances at Linear Colliders
Rizzo, T. G.; Oct. 15, 2001; 4p; In English
Report No.(s): DE2002-798876; SLAC-PUB-8992; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We discuss several methods which can be used to distinguish the graviton resonances of the Randall-Sundrum model from the graviton-like resonances which may occur in other theories. The Breit-Wigner line shape of the RS graviton is found to be particularly useful. In particulective graviton resonance present in the model of Dvali et al. can be distinguished from those of the Randall-Sundrum scenario for a reasonably wide range of model parameters.
NTIS
Gravitons; Particle Collisions; Resonance

20020087686 Stanford Linear Accelerator Center, Stanford, CA USA
Observation of Plasma Focusing of a 28.5 GeV Positron Beam
Field, C.; Sep. 24, 2001; 11p; In English
Report No.(s): DE2002-798871; SLAC-PUB-8975; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The observation of plasma focusing of a 28.5 GeV positron beam is reported. The plasma was formed by ionizing a nitrogen jet only 3 mm thick, active focusing strengths of order Tesla per micron. The minimum area of the beam spot was reduced by a factor of 2:0 0:3 by the plasma. The longitudinal beam envelope was measured and compared with numerical calculations.
NTIS
Ion Beams; Beamforming; Focusing

20020087691 Stanford Linear Accelerator Center, Stanford, CA USA
Two-Loop Amplitudes for Gluon Fusion into Two Photons
Dixon, L.; Sep. 28, 2001; 24p; In English
Report No.(s): DE2002-798872; SLAC-PUB-8976; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present the two-loop matrix elements for the scattering of two gluons into two photons in QCD (Quantum Chromodynamics). These matrix elements will enter into improved estimates of the QCD background to Higgs production at the LHC (Large Hadron Collider) when the Higgs decays into two photons.
NTIS
Gluons; Photons; Amplitudes

20020087754 General Atomics Co., San Diego, CA USA

Advanced Fusion Power Plant Studies. Annual Report for 1999

Chan, V. S.; Chu, M. S.; Greenfield, C. M.; Kinsey, J. E.; Jan. 01, 2000; 45p

Report No.(s): DE2001-761597; GA-C23336; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Significant progress in physics understanding of the reversed shear advanced tokamak regime has been made since the last ARIES-RS study was completed in 1996. The 1999 study aimed at updating the physics design of ARIES-RS, which has been renamed ARIES-AT, using the improved understanding achieved in the last few years. The new study focused on: Improvement of beta-limit stability calculations to include important non-ideal effects such as resistive wall modes and neo-classical tearing modes; Use of physics based transport model for internal transport barrier (ITB) formation and sustainment; Comparison of current drive and rotational flow drive using fast wave, electron cyclotron wave and neutral particle beam; Improvement in heat and particle control; Integrated modeling of the optimized scenario with self-consistent current and transport profiles to study the robustness of the bootstrap alignment, ITB sustainment, and stable path to high beta and high boostrap fraction operation.

NTIS

Tokamak Devices; Cyclotron Radiation; Neutral Particles; Particle Beams; Vortices

20020087817 Fermi National Accelerator Lab., Batavia, IL USA

Update of Run 1 b results at CDF

Tseng, J.; Aug. 13, 2002; 10p; In English

Report No.(s): DE2002-798730; FERMILAB-CONF-02-169-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Collider Detector at Fermilab (CDF) has pursued a vigorous research program into physics of the b quark since accumulating its first significant data sample in 1988-89. This program has yielded a rich harvest in Run 1, which extended from 1992 to 1996 and accumulated about 100 pb(sup 1), including measurements of cross sections of both b hadrons and bottomonium, lifetimes, masses, polarizations, and mixing asymmetries.

NTIS

Quarks; Asymmetry; Accumulations

20020087818 General Atomics Co., San Diego, CA USA

Evolution of 2D Visible and VUV Divertor Emission Profiles During DIII-D H-MODE Detachment Transitions

Fenstermacher, M. E.; Jalufka, N.; Meyer, W. H.; Nilson, D. G.; Gafert, J.; Jul. 01, 1999; 7p; In English

Report No.(s): DE2001-767006; GA-A23165; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The peak heat flux to divertor target surfaces (P(sub div)) must be reduced, compared with present experimental levels, before a tokamak operating in the high confinement regime (H-mode) can be extrapolated to a reactor. Partially Detached Divertor (PDD) operation (1), in which deuterium gas is injected into an H-mode plasma, reduces P(sub div) by factors of 3-5 in DIII-D. A key element in the physics model of PDD operation is that carbon radiation near the X-point dissipates the energy flowing in the scrape-off-layer (SOL) before it enters the divertor (2). This allows the divertor temperature to be low, density to be high and thereby reduces the heat flux and ion particle flux to the targets both by reduced recycling and increased recombination. Previous line integrated SPRED measurements (3) and computer simulations indicated that the 155 nm (Delta)n = 0 transition of C(sup 3+) was the main power radiator from carbon during PDD operation. This paper presents the first 2D profiles of 155 nm CIV emission in any tokamak divertor. The images were obtained on DIII-D with a new tangentially viewing VUV camera (4) and established image reconstruction techniques (5). The discharges were lower single null configurations with, I (sub p) = 1.75 MA, B(sub T) = 2.1 (Tau), q(sub 95) = 3.2, P(sub inj) = 9 MW, (kappa) = 1.9 and the (nabla)B drift toward the lower divertor. After establishing an ELMing H-mode with neutral beam injection, deuterium gas was injected at 17 Pa m(sup 3)/s (130 T (ell)/s) to increase the divertor density and produce a transition to PDD operation. A practical discharge scenario is given in Ref. (2).

NTIS

Heat Flux; Flux (Rate); Plasmas (Physics); Diverters

20020087837 Stanford Linear Accelerator Center, Stanford, CA USA

Convolution Method for Determining Temperature Rise in Targets Struck by Beams of Various Size

Nelson, W. R.; Oct. 19, 2001; 12p; In English

Report No.(s): DE2002-798861; SLAC-PUB-8624; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The temperature rise in targets struck by high-energy electrons can be calculated using the EGS4 code simply by scoring the energy-deposition density in small cylindrical volumes centered upon, and divided along, the direction of the beam. The temperature rise per pulse is then obtained for each volume using the specic heat of the material, and the time dependence of the

heat flow can be calculated using conventional heat-transfer principles. Most typically the beam size is accounted for in a straight-forward way by sampling the incident coordinates, but this involves yet another statistical process that can result in a significant increase in computation time in order to reduce the variance, particularly for thick targets at very high energies. In this paper an off-line convolution method is presented in which the symmetry of the geometry and the Gaussian shape of the beam is used, along with a set of EGS4 runs made with a delta-function (i.e., pencil) beam, to quickly obtain the temperature rise on the pulse for beams of any size. Examples are given for studies that have recently been performed at SLAC in the design of the Next Linear Collider.
NTIS
Electron Beams; Temperature Effects

20020087838 Stanford Linear Accelerator Center, Stanford, CA USA
Adjustable Permanent Quadrupoles for the Next Linear Collider
Spencer, C. M.; Oct. 02, 2001; 4p; In English
Report No.(s): DE2002-798862; SLAC-PUB-8859; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The proposed Next Linear Collider (NLC) will require over 1400 adjustable quadrupoles between the main linacs accelerator structures. These 12.7 mm bore quadrupoles will have a range of integrated strength from 0.6 to 138 Tesla, with a maximum gradient of 141 Tesla per meter, an adjustment range of +0 to 20% and effective lengths from 324 mm to 972 mm. The magnetic center must remain stable to within 1 micron during the 20% adjustment. In an effort to reduce costs and increase reliability, several designs using hybrid permanent magnets have been developed. Four different prototypes have been built. All magnets have iron poles and use Samarium Cobalt to provide the magnetic fields. Two use rotating permanent magnetic material to vary the gradient, one uses a sliding shunt to vary the gradient and the fourth uses counter rotating magnets. Preliminary data on gradient strength, temperature stability, and magnetic center position stability are presented. These data are compared to an equivalent electromagnetic prototype.
NTIS
Quadrupoles; Linear Accelerators

20020087843 Stanford Linear Accelerator Center, Stanford, CA USA
Microwave Quadrupoles for Beam Break-Up Suppression in the NLC Main Linac
Bane, K. L.; Oct. 03, 2001; 16p; In English
Report No.(s): DE2002-798879; SLAC-PUB-9004; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This is a preliminary study of the effect of using microwave quads (MQ's) instead of rf phase shifting to induce BNS damping in the main linac of the NLC collider. We consider MQ's running at X-band, and find that the total length of MQ's needed for the NLC is 6% of the total length of the accelerating structures. We show through simulations that, by using MQ's instead of phase shifting for BNS damping, the quad alignment tolerances can be relaxed but at the expense of shifting the tight tolerances to the MQ's; this can be advantageous if the MQ's can be better aligned than the quads. For the design final energy spread in the NLC of .3%, the quad tolerances are loosened by a factor of 2-3 when using MQ's. These tolerances can be loosened by an additional factor of 1.5, but at the cost of 1.7% in energy overhead.
NTIS
Linear Accelerators; Damping; Superhigh Frequencies

20020087844 Stanford Linear Accelerator Center, Stanford, CA USA
Radiation Protection at Synchrotron Radiation Facilities
Liu, J. C.; Oct. 17, 2001; 25p; In English
Report No.(s): DE2002-798880; SLAC-PUB-9006; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A synchrotron radiation (SR) facility typically consists of an injector, a storage ring, and SR beamlines. The latter two features are unique to SR facilities, when compared to other types of accelerator facilities. The SR facilities have the characteristics of low injection beam power, but high stored beam power. The storage ring is generally above ground with people occupying the experimental floor around a normally thin concrete ring wall. This paper addresses the radiation issues, in particular the shielding design, associated with the storage ring and SR beamlines. Normal and abnormal beam losses for injection and stored beams, as well as typical storage ring operation, are described. Ring shielding design for photons and neutrons from beam losses in the ring is discussed. Radiation safety issues and shielding design for SR beamlines, considering gas bremsstrahlung and synchrotron radiation, are reviewed. Radiation source terms and the methodologies for shielding calculations are presented.
NTIS
Synchrotron Radiation; Radiation Protection

20020087846 Stanford Linear Accelerator Center, Stanford, CA USA
Physics Goals for the Planned Next Linear Collider Engineering Test Facility
Raubenheimer, T. O.; Oct. 02, 2001; 4p; In English
Report No.(s): DE2002-798883; SLAC-PUB-9010; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Next Linear Collider (NLC) Collaboration is planning to construct an Engineering Test Facility (ETF) at Fermilab. As presently envisioned, the ETF would comprise a fundamental unit of the NLC main linac to include X-band klystrons and modulators, a delay-line power-distribution system (DLDS), and NLC accelerating structures that serve as loads. The principal purpose of the ETF is to validate stable operation of the power-distribution system, first without beam, then with a beam having the NLC pulse structure. This paper concerns the possibility of configuring and using the ETF to accelerate beam with an NLC pulse structure, as well as of doing experiments to measure beam-induced wakefields in the rf structures and their influence back on the beam.
NTIS
Test Facilities; Linear Accelerators; Beams (Radiation)

20020087847 Stanford Linear Accelerator Center, Stanford, CA USA
Tevatron Electron Lens Magnetic System
Seryi, A.; Oct. 02, 2001; 4p; In English
Report No.(s): DE2002-798884; SLAC-PUB-9011; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In the framework of collaboration between IHEP and FNAL, a magnetic system of the Tevatron Electron Lens (TEL) has been designed and built. The TEL is currently installed in the superconducting ring of the Tevatron proton-antiproton collider and used for experimental studies of beam-beam compensation.
NTIS
Electron Optics; Magnetic Lenses

20020087848 Stanford Linear Accelerator Center, Stanford, CA USA
Threshold Expansion for Heavy-Light Systems and Flavor Off-Diagonal Current-Current Correlators
Melnikov, K.; Oct. 11, 2001; 5p; In English
Report No.(s): DE2002-798885; SLAC-PUB-9013; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
An expansion scheme is developed for Feynman diagrams describing the production of one massive and one massless particle near the threshold.
NTIS
Quarks; Feynman Diagrams

20020087872 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Studies of the front end of a neutrino factory
Fawley, W.; Penn, G.; Sessler, A.; Wurtele, J.; May 30, 2001; 3p; In English
Report No.(s): DE2001-788045; LBNL-48039; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A neutrino factory employs muons which are produced, collected, cooled, accelerated and then stored so that their eventual decay produces an intense neutrino beam. A general description may be found in the paper by Geer (S. Geer, Phys. Rev. D, 57, 1 (1998)), and two upcoming Comments on Nuclear and Particle Physics articles (S. Geer, 'Future prospects formuon facilities', see http://www-mucool.fnal. gov/mcnotes/muc0154.ps; also A. M. Sessler, 'Neutrino Factories: The Facility', http://www-mcool.fnal. gov/mcnotes/muc0155.pdf). In this contribution, the authors use analytic and numerical tools to investigate the performance of the front end of a neutrino factory. This region starts just after the target and ends just prior to the recirculating accelerators. Extensive previous work has resulted in designs used in the Fermilab Study of 1999-2000 and the Brookhaven Study of 2000-2001. Here the authors explore variations away from these particular designs, seeking possible improvements in final muon output, risk reduction, and ultimate cost. The authors' studies include changes in the overall frontend geometry through optimization of the induction linac design and variations of the rf frequency in the cooling channel acceleration, and initial exploration of the use of helical wiggler fields to increase therange of initial muon energies that are captured.
NTIS
Linear Accelerators; Neutrino Beams; Neutrinos; Nuclear Particles

20020087879 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Real time betatron tune control in RHIC
Schultheiss,; Cameron,; Marusic,; Van Zeijts,; Jun. 02, 2002; 3p; In English
Report No.(s): DE2002-798567; BNL--68984; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Precise control of the betatron tunes is necessary to preserve proton polarization during the RHIC ramp. In addition, control of the tunes during beam deceleration is necessary due to hysteresis in the superconducting magnets. A real-time feedback system to control the betatron tunes during ramping has been developed for use in RHIC. This paper describes this system and presents the results from commissioning the system during the polarized proton run.
NTIS
Betatrons; Feedback Control; Superconducting Magnets; Deceleration; Protons

20020087880 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Study of graphite targets interacting with the 24 GeV proton beam of the BNL muon target experiment
Simos,; Kirk,; Kahn,; McDonals,; Cates,; Jun. 02, 2002; 4p; In English
Report No.(s): DE2002-798569; BNL--69287; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this experiment, graphite and carbon-carbon composite targets were exposed to the AGS beam and their response to induced thermal shock was studied. This paper predicts theoretical prediction results as well as experimental results and makes an assessment of the abilities of prediction models to capture the dynamic response of a solid target.
NTIS
Proton Beams; Targets; Graphite; Dynamic Response

20020087881 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Search for the lepton flavor violating decay A(sup o)/H(sup o) yields t(+/-) m(-/+) at hadron colliders
Assamagan, A.; Deandrea,; Delsart, A.; Jul. 01, 2002; 22p; In English
Report No.(s): DE2002-798570; BNL-69300; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In the two Higgs doublet model (2HDhf) type 111 and in several other extensions of the Standard Model (SM), there are no discrete symmetries that suppress flavor changing couplings at tree level. The experimental observation of the v(sub micro)-v(sub gamma) flavor oscillation may suggest the non-conservation of lepton number. This would lead to the decay of the type A(sup o)/H(sup o) yields gamma plus or minus micro plus or minus . We determine the present low energy limit on lepton flavor violating (LFV) couplings from the muon g - 2 measurement and discuss the prospects for detecting lepton flavor violating decays at the TeVatron and at the Large Hadron Collider. The achievable bounds on the LFV coupling pxameter k(sub micro) (sub gamma) are presented.
NTIS
Hadrons; Couplings; Particle Accelerators; Oscillations; Detection

20020087886 Fermi National Accelerator Lab., Batavia, IL USA
Magnetic design of large-bore superconducting quadrupoles for the AHF
Kashikhin, V. S.; Aug. 13, 2002; 4p; In English
Report No.(s): DE2002-798732; FERMILAB-CONF-02-172-T; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Advanced Hydrotest Facility (AHF), under study by LANL, utilizes large bore superconducting quadrupole magnets to image protons for radiography of fast events. In this concept, 50-GeV proton bunches pass through a thick object and are imaged by a lens system that analyzes the scattered beam to determine object details. Twelve simultaneous views of the object are obtained using multiple beam lines.
NTIS
Superconducting Magnets; Quadrupoles

20020087892 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Isentropic Compression of LX-04 on the Z Accelerator
Reisman, D. B.; Forbes, J. W.; Tarver, C. M.; Garcia, F.; Cauble, R. C.; Jun. 07, 2001; 10p; In English
Report No.(s): DE2002-798775; UCRL-JC-141933; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Three sets of LX-04 samples of 0.18 and 0.49 mm nominal thicknesses were all dynamically loaded by Sandia's Z-accelerator with a ramp compression wave with a 200 ns rise time and about 150 kb peak stress. The LX-04/lithium fluoride samples interface velocities were measured using VISAR's. Comparisons of experimental and computational results will be given. Compression

and release isentropes both show some reaction and kinetic behavior of the LX-04. Experiments were also performed on fine-grained TATB. Future experiments on single crystals of HMX that are designed to measure the phase transition at high pressures will be discussed.
NTIS
Accelerators; Thickness

20020087893 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
BBU and Corkscrew Growth Predictions for the Darht Second Axis Accelerator
Chen, Y. J.; Fawley, W. M.; Jun. 12, 2001; 5p; In English
Report No.(s): DE2002-798776; UCRL-JC-142004; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This paper discusses the means by which we plan to control BBU and corkscrew growth in DARHT-II. In section 2 we present the current design for the solenoidal field tune; since the last PAC meeting in 1999, the design beam current has been lowered from 4 to 2 kA which has lowered the necessary field strengths. In Sec. 3 we discuss the present predictions for the expected BBU growth; these predictions were made having used recent experimental measurements for the impedance of the DARHT-II accelerator cells. Finally, in Sec. 4 we present our most recent calculations for the expected corkscrew growth and also the expected performance of the tuning-V algorithm, which can reduce this growth by more than an order of magnitude.
NTIS
Accelerators; Electron Beams

20020087953 Stanford Linear Accelerator Center, Stanford, CA USA
CP Violation in B Decays and the BaBar Experiment
Clark, P.; Oct. 31, 2001; 8p; In English
Report No.(s): DE2002-798915; SLAC-PUB-9040; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Cp Violation; Decay

20020088712 Stanford Linear Accelerator Center, Stanford, CA USA
Study of Coherent Tune Shift Caused by Electron Cloud in Positron Storage Rings
Heifets, S. A.; Dec. 6, 2001; 4p; In English
Report No.(s): DE2002-798936; SLAC-PUB-9079; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We discuss the transverse betatron tune shift of the coherent dipole motion of a beam interacting with an electron cloud. A positron beam which passes through a frozen charge distribution experiences an electric field, which shifts its tune in the positive direction. The electrons in the actual cloud are not frozen, but move during the bunch passage. Thus, the electron distribution varies due to the interaction with the beam and it is 'soft'. We study the dipole tune shift of the beam interacting with such a 'soft' charge distribution.
NTIS
Electron Clouds; Storage Rings (Particle Accelerators); Betatrons; Positrons

20020089589 Air Force Research Lab., Edwards AFB, CA USA
Comparison of Orbit Transfer Vehicle Concepts Utilizing Mid-Term Power and Propulsion Options
Gulczinski, Frank S., III; Schilling, John H.; May 14, 2002; 3p; In English
Report No.(s): AD-A406811; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The recent announcement of a national nuclear space flight initiative1 has rekindled interest in nuclear propulsion options within the spacecraft propulsion community. Therefore, the Air Force Research Laboratory Propulsion Directorate (AFRL/PRSS) has decided to reexamine the value of utilizing nuclear propulsion for orbit transit and the repositioning of future Air Force space assets. A trade study was conducted with the assumption that technologies had matured to the 2010 level. A comparison was made between advanced chemical, solar thermal, solar electric, and nuclear electric for both expendable and reusable mission concepts, with a particular interest in options that resulted in trip times of 30 days or less. Results show that for expendable stages both solar thermal and, to a greater degree, solar electric propulsion systems can provide a significant increase in payload delivered from LEO to GEO within the required trip times. The solar electric concepts utilize clustered Hall thrusters, thin film photovoltaic solar arrays for power generation, and advanced power processing topologies for power conversion. The nuclear electric option became

advantageous for trip times greater than 30 days. For reusable vehicles, where payload and fuel are supplied to a reusable propulsion tug module, similar results were calculated based on trip time.
DTIC
Orbit Transfer Vehicles; Spacecraft Propulsion; Photovoltaic Cells; Nuclear Electric Propulsion

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OPTICS

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

20020087799 National Inst. of Standards and Technology, Optical Technology Div., Gaithersburg, MD USA
NIST Response to the 6th CORM Report: Pressing Problems and Projected National Needs in Optical Radiometry
Parr, A. C.; Fraser, G. T.; Lykke, K. R.; Nov. 2001; 22p; In English
Report No.(s): PB2002-101002; NISTIR-6828; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Council for Optical Radiation Measurements (CORM) issues periodic reports relevant to the mission of the Optical Technology Division of the Physics Laboratory. The present document summarizes NIST's response to the CORM Sixth Report issued in 1995 and is timed to be contemporary with the CORM Seventh Report to be issued in 2001.
NTIS
Optical Measurement; Metrology; Radiometers

20020087849 Stanford Linear Accelerator Center, Stanford, CA USA
Path Towards X-Ray Free-Electron Lasers
Cornacchia, M.; Oct. 23, 2001; 5p; In English
Report No.(s): DE2002-798886; SLAC-PUB-9015; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The physics and technology of x-ray sources based on self-amplified- spontaneous-emission (SASE) are reviewed, together with an overview of the main activities in this field around the world. The design status of a 1.5 AA SASE-FEL at SLAC, the Linac Coherent Light Source (LCLS) is described.
NTIS
Free Electron Lasers; Linear Accelerators; X Ray Sources

20020087865 Stanford Linear Accelerator Center, Stanford, CA USA
Transverse and Longitudinal Emittance Measurements on an S-Band Photocathode rf Electron Gun
Clendenin, J. E.; Nov. 1, 2001; 1p; In English
Report No.(s): DE2002-798905; SLAC-PUB-8963; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Proposed fourth generation light sources using SASE FELs to generate short pulse, coherent, X-rays require demonstration of high brightness electron sources. The Gun Test Facility (GTF) at SLAC was built to test high brightness sources for the proposed Linac Coherent Light Source at SLAC. The transverse emittance measurements are made at nearly 30 MeV by measuring the spot size on a YAG screen using the quadrupole scan technique. The emittance was measured to vary from 1 to 3.5 mm-mrad as the charge is increased from 50 to 350 pC using a laser pulse width of 2 ps FWHM. The measurements are in good agreement with simulation results using the LANL version of PARMELA.
NTIS
Electron Guns; Emittance; Photocathodes; X Rays

20020088656 Stanford Linear Accelerator Center, Stanford, CA USA
Proposing a Laser Based Beam Size Monitor for the Future Linear Collider
Ross, M. C.; Dec. 10, 2001; 4p; In English
Report No.(s): DE2002-798937; SLAC-PUB-9091; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Compton scattering techniques for the measurement of the transverse beam size of particle beams at future linear colliders (FLC) are proposed. At several locations of the beam delivery system (BDS) of the FLC, beam spot sizes ranging from several hundreds to a few micrometers have to be measured. This is necessary to verify beam optics, to obtain the transverse beam emittance, and to achieve the highest possible luminosity. The large demagnification of the beam in the BDS and the high beam power puts extreme conditions on any measuring device. With conventional techniques at their operational limit in FLC scenarios, new methods for the detection of the transverse beam size have to be developed. For this laser based techniques are proposed capable of measuring high power beams with sizes in the micrometer range. In this paper general aspects and critical issues of

a generic device are outlined and specific solutions proposed. Plans to install a laser wire experiment at an accelerator test facility are presented.
NTIS
Linear Accelerators; Particle Collisions; Laser Beams

20020089490 Army Engineer Research and Development Center, Construction Engineering Research Lab., Champaign, IL USA
Web Interface for Modeling Fog Oil Dispersion During Training ***Final Report***
Lozar, Robert C.; Aug. 2002; 25p; In English; Original contains color images; Prepared in collaboration with U.S. Army Corps of Engineers, Washington, D.C
Report No.(s): AD-A406751; ERDC/CERL-TR-02-16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Predicting the dispersion of military camouflage training materials-Smokes and Obscurants (SO)-is a rapidly improving science. The Defense Threat Reduction Agency (DTRA) developed the Hazard Prediction and Assessment Capability (HPAC), a software package that allows the modeling of the dispersion of several potentially detrimental materials. ERDC/CERL characterized the most commonly used SO material, fog oil in HPAC terminology, to predict the SO dispersion characteristics in various training scenarios that might have an effect on Threatened and Endangered Species (TES) at DoD installations. to make the configuration more user friendly, the researchers implemented an initial web-interface version of HPAC with a modifiable fog-oil component that can be applied at any installation in the world. by this method, an installation SO trainer can plan the location and time of fog oil training activities and is able to predict the degree to which various areas will be effected, particularly important in ensuring the appropriate management of TES on a DoD installation.
DTIC
Applications Programs (Computers); Fog; Oils; Education; Training Devices

20020089493 Nebraska Univ., Dept. of Electrical Engineering, Lincoln, NE USA
Random Noise Polarimetry Technique for Covert Detection of Targets Obscured by Foliage ***Final Report, May 1999-Apr. 2002***
Narayanan, Ram M.; Xu, Xiaojian; Henning, Joseph A.; Kumru, Cihan; Jul. 01, 2002; 174p; In English
Contract(s)/Grant(s): F49620-99-1-0209
Report No.(s): AD-A406760; AFRL-SR-AR-TR-02-0326; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The University of Nebraska has been investigating a novel technique called random noise polarimetry for foliage penetration (FOPEN) imaging applications, under support from the US Air Force Office of Scientific Research (AFOSR). In this final report, we summarize the main activities and results of the research during the past three years (1999-2002). These include: (a) Development of an experimental UHF band ultra wideband (UWB) FOPEN noise radar system; (b) Development of a down range sidelobe suppression; (c) Study of the foliage transmission model and the impact of foliage obscuration; (d) Development of FOPEN SAR imaging model and image formation algorithms; (e) Study of the impact of frequency and aspect angle dependent target signatures on UWB SAR images; (f) Three-dimensional interferometric SAR and ISAR imaging techniques; (g) Development of SAR image enhancement techniques; and (h) Field tests, data acquisition and image processing using the experimental random noise radar system. Suggestions for future work are also presented.
DTIC
Polarimetry; Target Acquisition; Radar Tracking; Broadband

20020089500 Air Force Research Lab., Sensors Directorate, Wright-Patterson AFB, OH USA
The Role of Adaptive Photorefractive Power Limiting on Acousto-Optic Radio Frequency (RF) Signal Excision ***Final Report, 1 Jun. 1997-31 Aug. 2001***
Stevens, Dale M.; Dec. 2001; 192p; In English; Original contains color images
Report No.(s): AD-A406769; AFRL-SN-WP-TR-2002-1131; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Adaptive RF interference reduction for broadband communication systems continues to be problematic. The acousto-optic RF signal excision system offers real-time, narrowband RF interference, frequency domain filtering for broadband communication systems, but has been limited in its capability for adaptive processing and rejection of broadband RF interference. As a means to reduce these limitations, this dissertation examines the application of a novel photorefractive optical power limiting device to achieve adaptive notch filtering, and multi- channel acousto-optic deflection to achieve angle-of-arrival signal discrimination at the notch filter. This dissertation describes basic principles of acousto-optic RF signal excision, including linear phased-array antenna, angle-of- arrival processing using a multi-channel acousto-optic deflector. The principles are verified experimentally by demonstration of frequency domain filtering according to frequency and angle of arrival. This dissertation also describes basic principles of photorefractive optical power limiting, which is a new approach for achieving adaptive,

frequency-domain notch filtering. Photorefractive field shielding of electro-optic birefringence is examined by numerical solution of the band- transport model, and experimental measurement of notch filter amplitude and spatial profiles for high-intensity, Gaussian beam optical illumination and high- intensity, externally applied electric fields. Results indicate that for illumination-beam radius larger than a few microns, power-limiting notch widths follow the illumination intensity and terminate at the dark-to-light illumination interface where excess charge accumulates.
DTIC
Photorefractivity; Radio Frequency Interference; Acousto-Optics; Adaptive Optics; Broadband

20020089857 Heriot-Watt Univ., Dept. of Physics, Edinburgh UK
Compact Adaptive Optics Systems (CAOS) ***Final Report, 3 Aug. 2001-3 Aug 2002***
Greenway, A. H.; Aug. 27, 2002; 11p; In English
Contract(s)/Grant(s): F61775-01-W-E063
Report No.(s): AD-A406783; SPC-01-4063; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As feasibility study has been conducted to investigate whether compact adaptive optical (AO) systems based on the use of transparent wavefront modulators are viable. The results presented here consider the generic properties of suitable wavefront sensor technologies and establish sufficient conditions for their exploitation. Schemes by means of which these properties might be exploited in a multi-conjugate AO system are then considered. It is shown that the prospects for such systems are good, but further work is required to establish necessary conditions and to optimize the system.
DTIC
Adaptive Optics; Wave Fronts

20020090280 Arizona Univ., Dept. of Aerospace and Mechanical Engineering, Tucson, AZ USA
Multimode Scanning Probe Microscope System for Nanocomposite Actuators ***Final Report, 1 Apr. 2001-21 Mar. 2002***
Enikov, Eniko T.; Jul. 08, 2002; 9p; In English; Original contains color images
Contract(s)/Grant(s): F49620-01-1-0224
Report No.(s): AD-A406940; AFRL-SR-AR-TR-02-0309; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This DURIP award has been issued for the acquisition of a scanning probe microscope system (SPM). Scanning Probe Microscopes are (SPMs) are used to probe material surfaces with atomic resolution. Unlike optical and electron microscopes, the SPMs reveal details not only in x- and y-directions but also along the z- axis, perpendicular to the surface. Typical lateral resolutions range from 20 Angstroms down to 1 Angstrom, while in the vertical direction the resolution is better than 1 Angstrom. The main research objective supported by this system is the development of efficient bio-compatible actuators based on a novel polymer/metal composite. The scanning probe microscopy system was acquired using 33% matching funds from University of Arizona. The system was installed on August 31, 2001 and is currently operational.
DTIC
Optical Properties; Electron Microscopes

75
PLASMA PHYSICS

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

20020087701 Stanford Linear Accelerator Center, Stanford, CA USA
Frequency and Pulse Length Scaling of RF Breakdown in Accelerator Structures
Wilson, P. B.; Jan. 17, 2002; 4p; In English
Report No.(s): DE2002-798970; SLAC-PUB-9114; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The plasma spot model predicts that small areas of plasma on the order of 10 microns in diameter form in regions of intense electric field near the iris tips of accelerator structures. These plasma spots act as a dc current source, injecting both electrons and ions into the rf field. The model suggests that an observable breakdown event will occur when electrons, extracted from the spot and accelerated, absorb energy faster than it can be supplied by the rf source. The resulting field collapse, which can occur during processing as the gradient is increased, is not an ultimate limit on accelerating gradient. It is conjectured that surface melting, due to electron back-bombardment at the emitting site, leads to a pseudospark-like discharge which limits the gradient and can produce

massive surface damage. Using a statistical model, the dependence on frequency and pulse length of the probability of triggering a plasma spot is examined.
NTIS
Scaling Laws; Frequencies; Pulse Duration; Radio Frequencies; Electrical Faults; Particle Accelerator Targets

20020087720 Stanford Linear Accelerator Center, Stanford, CA USA
Kinetic model for the one-dimensional electromagnetic solitons in an isothermal plasma
Tajima, T.; Feb. 22, 2002; 22p; In English
Report No.(s): DE2002-799002; SLAC-PUB-9136; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Two nonlinear second order differential equations for the amplitude of the vector potential and for the electromagnetic potential are derived, starting from the full Maxwell equations where the field sources are calculated by integrating in the momentum space the particle distribution function, which is an exact solution of the relativistic Vlasov equation. The resulting equations are exact in describing a hot one-dimensional plasma sustaining a relativistically intense, circularly polarized electromagnetic polarized electromagnetic radiation. The case of standing soliton-like structures in an electron-positron plasma is then investigated. It is demonstrated that at ultrarelativistic temperatures extremely large amplitude solitons can be formed in a strongly overdense plasma.
NTIS
Isothermal Processes; Solitary Waves; Plasmas (Physics); Polarized Electromagnetic Radiation

20020087835 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Simulating Intense Ion Beams for Inertial Fusion Energy
Friedman, A.; Feb. 20, 2001; 6p; In English
Report No.(s): DE2002-798779; UCRL-JC-142546; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Heavy Ion Fusion (HIF) programs goal is the development of the body of knowledge needed for Inertial Fusion Energy (IFE) to realize its promise. The intense ion beams that will drive HIF targets are nonneutral plasmas and exhibit collective, nonlinear dynamics which must be understood using the kinetic models of plasma physics. This beam physics is both rich and subtle: a wide range in spatial and temporal scales is involved, and effects associated with both instabilities and non-ideal processes must be understood. Ion beams have a long memory, and initialization of a beam at mid-system with an idealized particle distribution introduces uncertainties; thus, it will be crucial to develop, and to extensively use, an integrated and detailed source-to-target HIF beam simulation capability.
NTIS
Ion Beams; Confinement

20020087891 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
National Ignition Facility Project: An Update
Hogan, W. J.; Moses, E.; Warner, B.; Sorem, M.; Soures, J.; Dec. 07, 2000; 9p
Report No.(s): DE2002-798774; UCRL-JC-141765; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The National Ignition Facility (NIT) consists of 192 forty-centimeter-square laser beams and a 10-m-diameter target chamber. Physical construction began in 1997. The Laser and Target Area Building and the Optics Assembly Building were the first major construction activities, and despite several unforeseen obstacles, the buildings are now 92% complete and have been done on time and within cost. Prototype component development and testing has proceeded in parallel. Optics vendors have installed full-scale production lines and have done prototype production runs. The assembly and integration of the beam path infrastructure has been reconsidered and a new approach has been developed. This paper will discuss the status of the NIF project and the plans for completion. It will also include summary information on Laser MegaJoule (LMJ).
NTIS
Laser Beams; Laser Targets

20020087937 NASA Marshall Space Flight Center, Huntsville, AL USA
Design of a High-Energy, Two-Stage Pulsed Plasma Thruster
Markusic, T. E., NASA Marshall Space Flight Center, USA; Thio, Y. C. F., NASA Marshall Space Flight Center, USA; Cassibry, J. T., Alabama Univ., USA; [2002]; 20p; In English; 38th AIAA Joint Propulsion Conference, 7-10 Jul. 2002, Indianapolis, IN, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-4125; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Design details of a proposed high-energy (approx. 50 kJ/pulse), two-stage pulsed plasma thruster are presented. The long-term goal of this project is to develop a high-power (approx. 500 kW), high specific impulse (approx. 7500 s), highly efficient (approx. 50%),and mechanically simple thruster for use as primary propulsion in a high-power nuclear electric propulsion system. The proposed thruster (PRC-PPT1) utilizes a valveless, liquid lithium-fed thermal plasma injector (first stage) followed by a high-energy pulsed electromagnetic accelerator (second stage). A numerical circuit model coupled with one-dimensional current sheet dynamics, as well as a numerical MHD simulation, are used to qualitatively predict the thermal plasma injection and current sheet dynamics, as well as to estimate the projected performance of the thruster. A set of further modelling efforts, and the experimental testing of a prototype thruster, is suggested to determine the feasibility of demonstrating a full scale high-power thruster.
Author
Thermal Plasmas; Pulsed Plasma Thrusters; Metallic Plasmas; Design Analysis

20020089472 Naval Research Lab., Washington, DC USA
Advanced Radiation Theory Support Annual Report 2001, Final Report ***Final Report, 1 Oct. 2000-30 Sep. 2001***
Davis, Jack; Sep. 30, 2002; 178p; In English
Report No.(s): AD-A406723; NRL/MR/6720--02-8605; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
This report describes the work of the Radiation Hydrodynamics Branch during FY 2001 in support of the DTRA PRS program. Critical issues covered are: (1) the production of high energy photons, (2) multigroup radiative diffusion, (3) comparison of time-resolved and time-integrated X-ray data, (4) modeling enhanced energy coupling in Z-pinch plasmas, (5) fusion driven K-shell yield production, (6) magnetic flux compression, and (7) assessment of Decade Quad argon double puff nozzle experiments.
DTIC
Plasmas (Physics); Radiative Transfer; Hydrodynamics; Diffusion

20020089862 Kansas Univ., Dept. of Physics and Astronomy, Lawrence, KS USA
Procedures for Including Secondary Electron Emission in Numerical Simulations of Plasma-Insulator Interactions
Beyst, Brian, Kansas Univ., USA; Rezvani, Ali, Kansas Univ., USA; Young, Bin, Kansas Univ., USA; Friauf, Robert J., Kansas Univ., USA; March 1991; 53p; In English
Contract(s)/Grant(s): NSG-3290; RTOP 506-41-3K
Report No.(s): NASA-CR-187090; NAS 1.26:187090; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Previous Monte Carlo simulations provide a data base for properties of secondary electron emission (SEE) from insulators and metals. Incident primary electrons are considered at energies up to 1200 eV. The behavior of secondary electrons is characterized by (1) yield vs. primary energy E(sub p), (2) distribution vs. secondary energy E(sub s), and (3) distribution vs. angle of emission theta. Special attention is paid to the low energy range E(sub p) up to 50 eV, where the number and energy of secondary electrons is limited by the finite band gap of the insulator. For primary energies above 50 eV the SEE yield curve can be conveniently parameterized by a Haffner formula. The energy distribution of secondary electrons is described by an empirical formula with average energy about 8.0 eV. The angular distribution of secondaries is slightly more peaked in the forward direction than the customary cos theta distribution. Empirical formulas and parameters are given for all yield and distribution curves. Procedures and algorithms are described for using these results to find the SEE yield, and then to choose the energy and angle of emergence of each secondary electron. These procedures can readily be incorporated into numerical simulations of plasma-solid surface interactions in low earth orbit.
Author
Plasma Interactions; Monte Carlo Method; Electron Emission; Statistical Distributions; Secondary Emission

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SOLID-STATE PHYSICS

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

20020087610 Stanford Linear Accelerator Center, Stanford, CA USA
Monolithic I-Beam Crystal Monochromator
Bagnasco, J.; Oct. 16, 2001; 10p; In English
Report No.(s): DE2002-798869; SLAC-PUB-8966; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Curved crystal, focusing monochromators featuring cubed-root thickness profiles typically employ side-clamped cooling to reduce thermally induced overall bend deformation of the crystal. While performance is improved, residual bend deformation is often an important limiting factor in the monochromator performance. A slightly asymmetric I-beam crystal cross section with cubed-root flange profiles has been developed to further reduce this effect. Physical motivation, finite-element modeling evaluation and performance characteristics of this design are discussed. Reduction of high mounting stress at the fixed end of the crystal required the soldering of an Invar support fixture to the crystal. Detailed descriptions of this process along with its performance characteristics are also presented.
NTIS
Monochromators; Crystals; Deformation; Cooling

20020087823 Oak Ridge National Lab., TN USA
Comparative Study of Surface-lattice-site Resolved Neutralization of Slow Multicharged Ions during Large-angle Quasi-binary Collisions with Au(110): Simulation and Experiment
Meyer, F. W.; Aug. 24, 2001; 24p
Report No.(s): DE2002-786486; P01-111668; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In this article we extend our earlier studies of the azimuthal dependences of low energy projectiles scattered in large angle quasi-binary collisions from Au(110). Measurements are presented for 20 keV Ar(sup 9+) at normal incidence, which are compared with our earlier measurements for this ion at 5 keV and 10(sup 0) incidence angle. A deconvolution procedure based on MARLOWE simulation results carried out at both energies provides information about the energy dependence of projectile neutralization during interactions just with the atoms along the top ridge of the reconstructed Au(110) surface corrugation, in comparison to, e.g., interactions with atoms lying on the sidewalls. to test the sensitivity of the agreement between the MARLOWE results and the experimental measurements, we show simulation results obtained for a non-reconstructed Au(110) surface with 20 keV Ar projectiles, and for different scattering potentials that are intended to simulate the effects on scattering trajectory of a projectile inner shell vacancy surviving the binary collision, In addition, simulation results are shown for a number of different total scattering angles, to illustrate their utility in finding optimum values for this parameter prior to the actual measurements.
NTIS
Azimuth; Projectiles; Trajectories; Collisions

20020089464 NASA Johnson Space Center, Houston, TX USA
Solar Powered Refrigeration System
Ewert, Michael K., Inventor, NASA Johnson Space Center, USA; Bergeron, David J., III, Inventor, NASA Johnson Space Center, USA; Sep. 24, 2002; 6p; In English; Division of US-Patent-Appl-SN-337208, filed 3 Jun. 1999
Patent Info.: Filed 19 Apr. 2001; NASA-Case-MSC-22970-3; US-Patent-6,453,693; US-Patent-Appl-SN-838680; US-Parent-Appl-SN-337208; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A solar powered vapor compression refrigeration system is made practicable with thermal storage and novel control techniques. In one embodiment, the refrigeration system includes a photovoltaic panel, a variable speed compressor, an insulated enclosure, and a thermal reservoir. The photovoltaic (PV) panel converts sunlight into DC (direct current) electrical power. The DC electrical power drives a compressor that circulates refrigerant through a vapor compression refrigeration loop to extract heat from the insulated enclosure. The thermal reservoir is situated inside the insulated enclosure and includes a phase change material. As heat is extracted from the insulated enclosure, the phase change material is frozen, and thereafter is able to act as a heat sink to maintain the temperature of the insulated enclosure in the absence of sunlight. The conversion of solar power into stored thermal energy is optimized by a compressor control method that effectively maximizes the compressor's usage of available energy. A capacitor is provided to smooth the power voltage and to provide additional current during compressor start-up. A controller monitors the rate of change of the smoothed power voltage to determine if the compressor is operating below or above the available power maximum, and adjusts the compressor speed accordingly. In this manner, the compressor operation is adjusted to convert substantially all available solar power into stored thermal energy.
Official Gazette of the U.S. Patent and Trademark Office
Control Systems Design; Electric Potential; Heat Storage; Refrigerating; Solar Cooling

20020089988 Naval Postgraduate School, Monterey, CA USA
Nanomechanics Model for Static Equilibrium
Jung, Sunghoon; Sep. 2002; 73p; In English; Original contains color images
Report No.(s): AD-A407044; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study presented a computational technique to model and simulate atomistic behavior of materials under static loads, Interatomic potential energy was used to maintain equilibrium among atoms under static loads and constraints, In addition, the atomistic model was coupled with the finite element analysis model so that more flexible loads and constraints could be applied to the atomistic model A multi-scale technique was also presented for some single wall nanotubes of both zigzag and armchair and then their effective stiffness were estimated Those designed nanotubes are woven into fabric composites, which can be used in various military applications including body armored, vehicles, and infantry transportation vehicles because advanced nano-composites could be much lighter and stronger than current ones, Some example problems were presented to illustrate the developed technique for the nano-composites and SWNTs, The proposed technique for nanomechanics can be used for design and analysis of materials at the atomic or molecular level,
DTIC
Static Loads; Atomic Energy Levels; Computation; Finite Element Method; Equilibrium Methods

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PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.

20020087618 Stanford Linear Accelerator Center, Stanford, CA USA
Moduli Stabilization from Fluxes in a Simple IIB Orientifold
Kachru, S.; Jan. 30, 2002; 51p; In English
Report No.(s): DE2002-798986; SLAC-PUB-9066; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We study novel type IIB compactications on the T 6=Z2 orientifold. This geometry arises in the T-dual description of Type I theory on T 6, and one normally introduces 16 space-lling D3-branes to cancel the RR tadpoles. Here, we cancel the RR tadpoles either partially or fully by turning on three-form ux in the compact geometry. The resulting (super)potential for moduli is calculable. We demonstrate that one can nd many examples of N = 1 supersymmetric vacua with greatly reduced numbers of moduli in this system. A few examples with N is greater than 1 supersymmetry or complete supersymmetry breaking are also discussed.
NTIS
String Theory; Vacuum; Compacting

20020087619 Stanford Linear Accelerator Center, Stanford, CA USA
Physics and Chemistry of Aging - Early Developments
Feb. 22, 2002; 15p; In English
Report No.(s): DE2002-798985; SLAC-PUB-9062; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The aging phenomena are very complex physical and chemical processes. The author attempts to qualitatively discuss various physical processes contributing to aging. The satisfactory quantitative explanation is not presently available. In this sense, there is little progress made since the 1986 LBL Aging Workshop. However, what was accomplished during the past decade is a heighten awareness from the research and management sides to pay more attention to this problem, and as a result a number of aging tests have increased in quantity and quality. These efforts will undoubtedly yield some new results in the future. Examples in this paper are mainly from a pre-LHC and pre-HERA-B era of aging, where the total charge doses is limited to much less than one C/cm.
NTIS
Corrosion; Aging (Materials); Radiation Damage; Chemical Reactions

20020087620 Stanford Linear Accelerator Center, Stanford, CA USA
High Reliability Prototype Quadrupole for the Next Linear Collider
Spencer, C. M.; Jan. 04, 2001; 5p; In English
Report No.(s): DE2002-798983; SLAC-PUB-8990; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Next Linear Collider (NLC) will require over 5600 magnets, each of which must be highly reliable and/or quickly repairable in order that the NLC reach its 85$/$ overall availability goal. A multidiscipline engineering team was assembled at SLAC to develop a more reliable electromagnet design than historically had been achieved at SLAC. This team carried out a Failure Mode and Effects Analysis (FMEA) on a standard SLAC quadrupole magnet system. They overcame a number of longstanding design prejudices, producing 10 major design changes. This paper describes how a prototype magnet was constructed and the extensive testing carried out on it to prove full functionality with an improvement in reliability. The magnet's

fabrication cost will be compared to the cost of a magnet with the same requirements made in the historic SLAC way. The NLC will use over 1600 of these 12.7 mm bore quadrupoles with a range of integrated strengths from 0.6 to 132 Tesla, a maximum gradient of 135 Tesla per meter, an adjustment range of 0 to -20$/$ and core lengths from 324 mm to 972 mm. The magnetic center must remain stable to within 1 micron during the 20$/$ adjustment. A magnetic measurement set-up has been developed that can measure sub-micron shifts of a magnetic center. The prototype satisfied the center shift requirement over the full range of integrated strengths.
NTIS
Quadrupoles; Magnetic Measurement; Failure Analysis; Failure Modes

20020087621 Stanford Linear Accelerator Center, Stanford, CA USA
Search for Time Dependent B-S 0-/bar(B-S 0) Oscillations Using Exclusively Reconstructed D-S(carat)+ AT SLD
Lin, C. S.; Jan. 10, 2002; 203p; In English
Report No.(s): DE2002-798981; SLAC-R-584; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Contents: Chapter 1. Introduction; 2. Theoretical Motivation; 3. Experimental Apparatus; 4. Monte Carlo Simulation; 5. Data Reduction; 6. Event Reconstruction; 7. Oscillation Studies; 8. Results and Conclusions; Appendices, and Bibliography.
NTIS
Hadrons; Oscillations; Particle Decay; Time Dependence

20020087622 Stanford Linear Accelerator Center, Stanford, CA USA
Proceedings of the 1998 International Computational Accelerator Physics Conference (ICAP98)
Ko, K.; Jan. 14, 2002; 237p; In English
Report No.(s): DE2002-798980; SLAC-R-580; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The CLASSIC library is a C++ class library which provides services for building portable accelerator models and algorithms for their analysis. This paper describes the motivations behind the CLASSIC library and its main features. It shows how this library can be used in a large accelerator design program like the new version 9 of MAD written in C++. The possibilities are illustrated by presenting some new developments in MAD version 9, like sophisticated matching features with simultaneous matching of two rings. The major part of the CLASSIC library is now implemented. Its source code and some preliminary documentation are available from the author.
NTIS
Accelerators; Physics; C++ (Programming Language); Mathematical Models

20020087623 Stanford Linear Accelerator Center, Stanford, CA USA
Proceedings of the 5th International Symposium on Radiative Corrections(RADCOR 2000)
Haber, H.; May 21, 2001; 862p; In English
Report No.(s): DE2002-798979; SLAC-R-579; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Partial Contents: Beyond the Standard Model (Next-to-leading Order Calculation of Associated Production of Gauginos and Gluinos, Precision Observables in the MSSM: Leading Electroweak Two-loop Corrections, Quantum corrections for the MSSM Higgs couplings to SM fermions, Decoupling Properties of MSSM particles in Higgs and Top Decays, FCNC top quark decays beyond the Standard Model); Calculational Methods (Progress on two-loop non propagator integrals, 'Strategy of Regions': Expansions of Feynman Diagrams in both Euclidean and pseudo-Euclidean Regimes, Letting Real-Virtual Cancellations Happen by Themselves in QCD Calculations, On the two-loop electroweak amplitude of the muon decay, Electroweak radiative corrections: Towards a two-loop analysis, Combinatorics of (perturbative) Quantum Field Theory, Perturbative Quantization of Gravity Theories); e+e- Physics at Present and Future Facilities (Searches at LEP, Standard Model Physics Results from LEP2, Off-shell W-pair production-universal versus non-universal corrections, Non-Annihilation Processes, Fermion-Loop and QED Radiation); Electroweak Physics (Electroweak Measurements on the Z Resonance, Precision Top-Quark Physics, Radiative corrections to bound-state properties in QED, Leading electroweak logarithms at one loop, The Muon Anomalous Magnetic Moment: Standard Model Theory and Beyond); Heavy Quark Physics (First Physics Results from Belle, Indirect Determination of the Vertex and Angles of the Unitarity Triangle, Conceptual aspects of QCD factorization in hadronic B-decays, The width difference of Bs-mesons, Supersymmetric effects in rare semileptonic decays of B-and K-mesons, On Radiative Weak Annihilation Decays dilepton invariant mass spectrum, CP-Violation, the CKM Matrix and New Physics, Inclusive Rare B Decays); Precision Physics at Future Colliders (Higgs and Supersymmetry searches at the Large Hadron Collider, Theoretical Challenges for a Precision Measurement of the W Mass at Hadron Colliders, Giga Z: High Precision Tests of the SM and the

MSSM); QCD Physics (QCD at the Tevatron: Status and Prospects, Conformal Expansions: A Template for QCD Predictions, Review of BFKL, Light Quark Mass Effects in Bottom Quark Mass Determinations, Exclusive QCD).
NTIS
Electroweak Interactions (Field Theory); Precision; Quarks

20020087624 Stanford Linear Accelerator Center, Stanford, CA USA
RF Pulsed Heating
Pritzkau, D. P.; Jan. 03, 2002; 290p; In English
Report No.(s): DE2002-798978; SLAC-R-577; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
RF pulsed heating is a process by which a metal is heated from magnetic elds on its surface due to high-power pulsed RF. When the thermal stresses induced are larger than the elastic limit, microcracks and surface roughening will occur due to cyclic fatigue. Pulsed heating limits the maximum magnetic eld on the surface and through it the maximum achievable accelerating gradient in a normal conducting accelerator structure. An experiment using circularly cylindrical cavities operating in the TE011 mode at a resonant frequency of 11:424 GHz is designed to study pulsed heating on OFE copper, a material commonly used in normal conducting accelerator structures. The high-power pulsed RF is supplied by an X-band klystron capable of outputting 50 MW, 1:5 s perent surface preparations.he cavity are designed to A diagnostic tool is developed to measure the temperature rise in the cavity utilizing the dynamic Q change of the resonant mode due to heating. The diagnostic consists of simultaneously exciting a TE012 mode to steady-state in the cavity at 18 GHz and measuring the change in re ected power as the cavity is heated from high-power pulsed RF. Two experimental runs were completed. One run was executed at a calculated temperature rise of 120 K for 56 106 pulses. The second run was executed at a calculated temperature rise of 82 K for 86106 pulses. Scanning electron microscope pictures show extensive damage occurring in the region of maximum temperature rise on the surface of the test pieces.
NTIS
Resonant Frequencies; Heating; Thermal Stresses; Scanning Electron Microscopy

20020087625 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of Ds+ and Ds*+ Production in B Meson Decays and from Continuum e+e- Annihilation at sqrt(s)=10.6 GeV
Ganzhur, S. F.; Jan. 28, 2002; 8p; In English
Report No.(s): DE2002-798977; SLAC-PUB-9131; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Particle Decay; Continuums; Mesons

20020087679 Stanford Linear Accelerator Center, Stanford, CA USA
Shifts in the Properties of the Higgs Boson from Radion Mixing
Rizzo, T. G.; Feb. 25, 2002; 16p; In English
Report No.(s): DE2002-798999; SLAC-PUB-9132; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We examine how mixing between the Standard Model(SM) Higgs boson, h, and the radion of the Randall-Sundrum model modifies the expected properties of the Higgs boson. In particular we demonstrate that the total and partial decay widths of the Higgs, as well as the h yields gg branching fraction, can be substantially altered from their SM expectations, while the remaining branching fractions are modified less than or approximately 5% for most of the parameter space volume.
NTIS
Standard Model (Particle Physics); Higgs Bosons

20020087680 Stanford Linear Accelerator Center, Stanford, CA USA
Black Hole Production at the LHC: Effect of Voloshin Suppression
Rizzo, T. G.; Jan. 22, 2002; 12p; In English
Report No.(s): DE2002-798976; SLAC-PUB-9127; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We examine the rates for the production of black holes(BH) at the LHC in light of the exponential suppression of the geometric cross section estimate recently proposed by Voloshin. We show that the resulting production rates will still be quite large over a reasonably wide range of model parameters. While BH production may no longer be the dominant collider process, its unique signature will ensure observability over more conventional backgrounds.
NTIS
Black Holes (Astronomy); Signatures

20020087681 Stanford Linear Accelerator Center, Stanford, CA USA
Canonical Hamiltonian Derivation of Hawking Radiation
Melnikov, K.; Oct. 11, 2001; 5p; In English
Report No.(s): DE2002-798878; SLAC-PUB-8999; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present a derivation of Hawking radiation based on canonical quantization of a massless scalar field in the background of a Schwarzschild black hole using Lemaitre coordinates and show that in these coordinates the Hamiltonian of the massless field is time-dependent. This result exhibits the non-static nature of the problem and shows it is better to talk about the time dependence of physical quantities rather than the existence of a time-independent vacuum state for the massless field. We then demonstrate the existence of Hawking radiation and show that despite the fact that the flux looks thermal to an outside observer, the time evolution of the massless field is unitary.
NTIS
Field Theory (Physics); Radiation; Black Holes (Astronomy)

20020087684 Stanford Linear Accelerator Center, Stanford, CA USA
Linear Sigma Models for Open Strings
Kachru, S.; Sep. 28, 2001; 53p; In English
Report No.(s): DE2002-798874; SLAC-PUB-8984; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We formulate and study a class of massive N = 2 supersymmetric gauge field theories coupled to boundary degrees of freedom on the strip. For some values of the parameters, the infrared limits of these theories can be interpreted as open string sigma models describing D-branes in large-radius Calabi-Yau compactifications. For other values of the parameters, these theories flow to CFTs describing branes in more exotic, non-geometric phases of the Calabi-Yau moduli space such as the Landau-Ginzburg orbifold phase. Some simple properties of the branes (like large radius monodromies and spectra of worldvolume excitations) can be computed in our model. We also provide simple worldsheet models of the transitions which occur at loci of marginal stability, and of Higgs-Coulomb transitions.
NTIS
Supersymmetry; String Theory; High Energy Interactions

20020087687 Stanford Linear Accelerator Center, Stanford, CA USA
QCD and QED Corrections to Light-by-Light Scattering
Dixon, L.; Sep. 28, 2001; 17p; In English
Report No.(s): DE2002-798870; SLAC-PUB-8974; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present the QCD (Quantum Chromodynamics) and QED (Quantum Electrodynamics) corrections to the fermion-loop contributions to light-by-light scattering, in the ultrarelativistic limit where the kinematic invariants are much larger than the masses of the charged fermions.
NTIS
Quantum Chromodynamics; Quantum Electrodynamics; Light Scattering

20020087689 Stanford Linear Accelerator Center, Stanford, CA USA
Search for Bs-Bsbar Oscillations with a Charge Dipole Technique at SLD
Thom, J.; Jan. 04, 2002; 190p; In English
Report No.(s): DE2002-798982; SLAC-R-585; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Contents: List of Figures; Chapter 1. Theoretical Motivation; 2. Experimental Apparatus: the Stanford Linear Collider (SLC) and Stanford Linear Collider Detector (SLD); 3. Event Selection; 4. Flavor Tagging and Proper Time Reconstruction; 5. Maximum Likelihood Analysis; 6. Results; Appendices, and Bibliography.
NTIS
Dipoles; Mesons; Oscillations; Hadrons

20020087695 Stanford Linear Accelerator Center, Stanford, CA USA
Summary and Outlook for 9th International Symposium on Heavy Flavor
Quinn, H. R.; Nov. 14, 2001; 10p; In English
Report No.(s): DE2002-798907; SLAC-PUB-9000; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This is the summary talk of a meeting held at the California Institute of Technology Sept 10--13, 2001. I do not attempt to summarize all the beautiful experimental results we have seen this week, nor to repeat the lively theoretical discussions that have

occurred. Rather I will present my own biased perspective on what we have learned, and on the important tasks that need our attention as we work to make the most of the rapidly accumulating data in this field.
NTIS
Conferences; Flavor (Particle Physics); Physics

20020087696 Stanford Linear Accelerator Center, Stanford, CA USA
Testing Factorization
Hiller, G.; Nov. 19, 2001; 8p; In English
Report No.(s): DE2002-798908; SLAC-PUB-9009; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We briefly review the status of factorization in b-decays. We discuss several experimental tests of its nature and stress their importance. We show that decays into mesons which have small decay constants or spin greater than one ('designer mesons') offer a variety of new opportunities.
NTIS
Mesons; Particle Decay; Factorization

20020087697 Stanford Linear Accelerator Center, Stanford, CA USA
Study of CP-Violating Asymmetries in B--> pi + pi, K+ pi - Decays
Olsen, J. D.; Oct. 26, 2001; 9p; In English
Report No.(s): DE2002-798909; SLAC-PUB-9012; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Cp Violation; Asymmetry; Particle Decay

20020087700 Stanford Linear Accelerator Center, Stanford, CA USA
Flavor-Change with Ultra-Light Sbottom and Gluinos
Becher, T. G.; Jan. 07, 2002; 8p; In English
Report No.(s): DE2002-798968; SLAC-PUB-9110; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Implications of a 2 - 5.5 GeV sbottom and 12-16 GeV gluino masses for rare B decay phenomenology are discussed. An effective Hamiltonian is constructed in which the gluinos are integrated out and a b squark remains among the light flavor degrees of freedom. Restrictive constraints come from b yields s gamma and b yields sg, but they allow a substantially enhanced inclusive b decay rate into charmless hadronic final states, and O(10%) direct CP asymmetries in B yields Xs gamma and B plus or minus K(sup o) phi plus and minus decays, which are an order of magnitude larger than in the Standard Model. New contributions to Bs mixing are negligible but significant effects in Bd mixing may be possible.
NTIS
Gluons; Decay Rates; Elementary Particles

20020087702 Stanford Linear Accelerator Center, Stanford, CA USA
Summary and Outlook for KEKTC5
Quinn, H. R.; Jan. 25, 2002; 11p; In English
Report No.(s): DE2002-798971; SLAC-PUB-9115; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This is the summary talk of a meeting held at the KEK, Tsukuba, Japan, November 20-22, 2001. I give a brief summary of the talks we heard, and a few comments of my own on various points that have been made. Other talks given at this meeting are referred to by the speakers last name; these talks will appear in the same proceedings. See these talks for the detailed references for each subject.
NTIS
Conferences; Particle Production; Atomic Physics

20020087703 Stanford Linear Accelerator Center, Stanford, CA USA
Concept of Central Tracking in PEP-N Experiment
Jan. 16, 2002; 7p; In English
Report No.(s): DE2002-798972; SLAC-PUB-9118; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The paper describes a proposal of the central tracking in the PEP-N experiment. It follows the presentation a given at the PEP-N workshop in March 2001 at SLAC.
NTIS
Magnets; Dipoles; Tracking (Position)

20020087704 Stanford Linear Accelerator Center, Stanford, CA USA
PEP-N: A 0.8 GeV x 3.1-GeV Collider at SLAC
Cai, Y.; Jan. 17, 2002; 4p; In English
Report No.(s): DE2002-798973; SLAC-PUB-9119; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The PEP-N project is a proposed new e+e- collider at SLAC to operate in the center of mass energy range of 1.0 GeV to 3.1 GeV. PEP-N consists of a new Very Low Energy electron Ring VLER (less than 800 MeV) to collide with the PEP-II e+ Low Energy Ring (LER) (3.1 GeV) parasitically to PEP-II operation for BaBar. Since the e+ ring has a fixed energy, the very low energy ring needs an energy range of 100 MeV to 800 MeV. This collider would likely be placed in Experimental Hall 12 of the PEP-II complex and have its own dedicated 800 MeV e- injector. The peak luminosity should reach 2 OE 1031 sq cm/s.
NTIS
Particle Acceleration; Storage Rings (Particle Accelerators); Center of Mass; Luminosity; Injectors

20020087705 Stanford Linear Accelerator Center, Stanford, CA USA
Cosmic - the SLC control system migration challenge
MacKenzie, R. R.; Jan. 18, 2002; 5p; In English
Report No.(s): DE2002-798974; SLAC-PUB-9120; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The current SLC control system was designed and constructed over 20 years ago. Many of the technologies on which it was based are obsolete and difficult to maintain. The VMS system that forms the core of the Control System is still robust but third party applications are almost non-existent and its long-term future is in doubt. The need for a Control System at SLAC that can support experiments for the foreseeable future is not in doubt. The present B-Factory or PEPII experiment is projected to run at least 10 years. An FEL laser of unprecedented intensity plus an ongoing series of fixed target experiments is also in our future. The Next Linear Collider or NLC may also be in our future although somewhat farther distant in time. The NLC has performance requirements an order of magnitude greater than anything we have built to date. In addition to large numbers of IOCs and process variables, Physicists would like to archive everything all the time. This makes the NLC Control System a bit like a detector system as well. The NLC Control System will also need the rich suite of accelerator applications that are available with the current SLC Control System plus many more that are now only a glimmer in the eyes of Accelerator Physicists. How can we migrate gradually away from the current SLC Control System towards a design that will scale to the NLC while keeping everything operating smoothly for the ongoing experiments.
NTIS
Control Systems Design; Linear Accelerators; Free Electron Lasers

20020087706 Stanford Linear Accelerator Center, Stanford, CA USA
Positron Polarization and Low Energy Running at a Linear Collider
Rowson, P. C.; Jan. 23, 2002; 12p; In English
Report No.(s): DE2002-798975; SLAC-PUB-9122; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The physics potential of an e+e- linear collider can be significantly enhanced if both the electron and positron beams are polarised. Low energy running at the Z-resonance or close to the W-pair threshold is particularly attractive with polarised positrons. This note discusses the experimental aspects and physics opportunities of both low energy running and positron polarisation.
NTIS
Linear Accelerators; Polarized Radiation; Electron Beams

20020087707 Stanford Linear Accelerator Center, Stanford, CA USA
Brane/Flux Annihilation and the String Dual of a Non-Supersymmetric Field Theory
Kachru, S.; Jan. 30, 2002; 29p; In English
Report No.(s): DE2002-798987; SLAC-PUB-9083; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We consider the dynamics of p anti-D3 branes inside the Klebanov-Strassler geometry, the deformed conifold with M units of RR 3-form flux around the S3. We find that for p less than M the system relaxes to a nonsupersymmetric NS 5-brane 'giant graviton' configuration, which is classically stable, but quantum mechanically can tunnel to a nearby supersymmetric vacuum

with M - p D3 branes. This decay mode is exponentially suppressed and proceeds via the nucleation of an NS 5-brane bubble wall. We propose a dual field theory interpretation of the decay as the transition between a nonsupersymmetric 'baryonic' branch and a supersymmetric 'mesonic' branch of the corresponding SU(2M-p) times SU(M-p) low energy gauge theory. The NS 5-brane tunneling process also provides a simple visualization of the geometric transition by which D3-branes can dissolve into 3-form flux.
NTIS
Annihilation Reactions; String Theory; Field Theory (Physics)

20020087708 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of the b-Quark Fragmentation Function in Z0 Decays
Burrows, P.; Feb. 19, 2002; 32p; In English
Report No.(s): DE2002-798988; SLAC-PUB-9087; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present a measurement of the b-quark inclusive fragmentation function in Z0 decays using a novel kinematic B-hadron energy reconstruction technique. The measurement was performed using 350,000 hadronic Z0 events recorded in the SLD experiment at SLAC between 1997 and 1998. The small and stable SLC beam spot and the CCD-based vertex detector were used to reconstruct B-decay vertices with high eciency and purity, and to provide precise measurements of the kinematic quantities used in this technique. We measured the B energy with good efficiency and resolution over the full kinematic range. We compared the scaled B-hadron energy distribution with models of b-quark fragmentation and with several ad hoc functional forms. A number of models and functions are excluded by the data. The average scaled energy of weakly-decaying B hadrons was measured to be less than xb greater than or equal to 0.709 0.003 (stat) 0.003 (syst) 0.002 (model).
NTIS
Quarks; Fragmentation; Decay Rates

20020087709 Stanford Linear Accelerator Center, Stanford, CA USA
Operational Experience with the DIRC Detector
Schwiening, J.; Jan. 28, 2002; 15p; In English
Report No.(s): DE2002-798989; SLAC-PUB-9088; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The DIRC, a novel type of Cherenkov ring imaging device, is the primary hadronic particle identification system for the BABAR detector at the asymmetric B-factory, Pep-II at SLAC. It is based on total internal reflection and uses long, rectangular bars made from synthetic fused silica as Cherenkov radiators and light guides. BABAR began taking data with colliding beams in late spring 1999. This paper describes the performance of the DIRC during the first 2.5 years of operation.
NTIS
Performance Prediction; Cerenkov Counters; Particle Production

20020087710 Stanford Linear Accelerator Center, Stanford, CA USA
How to Commission, Operate and Maintain a Large Future Accelerator Complex From Far Remote Sites
Phinney, N.; Dec. 07, 2001; 6p; In English
Report No.(s): DE2002-798990; SLAC-PUB-9089; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A study on future large accelerators has considered a facility, which is designed, built and operated by a worldwide collaboration of equal partner institutions, and which is remote from most of these institutions. The full range of operation was considered including commissioning, machine development, maintenance, troubleshooting and repair. Experience from existing accelerators confirms that most of these activities are already performed 'remotely'. The large high-energy physics experiments and astronomy projects, already involve international collaborations of distant institutions. Based on this experience, the prospects for a machine operated remotely from far sites are encouraging. Experts from each laboratory would remain at their home institution but continue to participate in the operation of the machine after construction. Experts are required to be on site only during initial commissioning and for particularly difficult problems. Repairs require an on-site non-expert maintenance crew. Most of the interventions can be made without an expert and many of the rest resolved with remote assistance. There appears to be no technical obstacle to controlling an accelerator from a distance. The major challenge is to solve the complex management and communication problems.
NTIS
Accelerators; Remote Control; Research Facilities; Project Management

20020087711 Stanford Linear Accelerator Center, Stanford, CA USA
Expansion of Bound-State Energies in Powers of m/M and (1-m/M)
Melnikov, K.; Jan. 30, 2002; 9p; In English
Report No.(s): DE2002-798992; SLAC-PUB-9100; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Elaborating on a previous letter, we use a new approach to compute energy levels of a nonrelativistic bound-state of two constituents, with masses m and M, by systematic expansions - one in powers of m/M and another in powers of (1 -m/M). Technical aspects of the calculations are described in detail. Theoretical predictions are given for O(alpha (Z alpha) (sup 5) radiative recoil and O((Z alpha)sup 6) pure recoil corrections to the average energy shift and hyperfine splitting relevant for hydrogen, muonic hydrogen, and muonium.
NTIS
Energy Levels; Computation

20020087712 Stanford Linear Accelerator Center, Stanford, CA USA
Leptonic Unitarity Triangle and CP-Violation
Farzan, Y.; Feb. 01, 2002; 38p; In English
Report No.(s): DE2002-798993; SLAC-PUB-9116; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The area of the unitarity triangle is a measure of CP-violation. We introduce the leptonic unitarity triangles and study their properties. We consider the possibility of reconstructing the unitarity triangle in future oscillation and non-oscillation experiments. A set of measurements is suggested which will, in principle, allow us to measure all sides of the triangle, and consequently to establish CP-violation. For different values of the CP-violating phase, delta D, the required accuracy of measurements is estimated. The key elements of the method include determination of Ue3 and studies of thev (sub micro) - v (sub micro) survival probability in oscillations driven by the solar mass splitting delta m (sup 2) (sub sun). We suggest additional astrophysical measurements which may help to reconstruct the triangle. The method of the unitarity triangle is complementary to the direct measurements of CP-asymmetry. It requires mainly studies of the survival probabilities and processes where oscillations are averaged or the coherence of the state is lost.
NTIS
Triangles; Reconstruction

20020087714 Stanford Linear Accelerator Center, Stanford, CA USA
Bunch Injection Controller for the PEP-II Storage Rings
Chestnut, R. P.; Jan. 23, 2002; 5p; In English
Report No.(s): DE2002-798995; SLAC-PUB-9124; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The PEP-II storage rings at SLAC each have 3492 buckets into which electrons and positrons can be injected into the high- and low-energy rings. Equipment to measure the currents of all the individual buckets was originally provided by the Lawrence Berkeley Laboratory and is implemented in VXI-based hardware. Data from this equipment as well as high precision direct current measurement provide the hard data for the Bunch Injection Controller. A large number of parameters determined by injection design considerations as well as set by operators for different circumstances are also used by the software algorithms to determine the desired bucket injection order and charge quantity for each injection pulse. These requests are then passed on to the venerable SLAC master pattern generator, which provides beams for other applications as well. This highly visible and highly successful system is implemented using the EPICS toolkit, and fits well into the merged SLAC EPICS/SLC control system. The Bunch Injection Controller hardware is a VME-based EPICS IOC, which makes extensive use of shared memory for communicating with the VXI measurement equipment and the SLAC master pattern generator.
NTIS
Beam Injection; Beam Interactions; Storage Rings (Particle Accelerators)

20020087715 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of the B0 Lifetime with Partially Reconstructed B0--> D(star)- l+ /u Decays
Rotondo, M.; Feb. 01, 2002; 7p; In English
Report No.(s): DE2002-798996; SLAC-PUB-9128; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Mesons; Decay Rates

20020087716 Stanford Linear Accelerator Center, Stanford, CA USA
Signals for Noncommutative QED at High Energy e+e- Colliders
Rizzo, T. G.; Jan. 30, 2002; 4p; In English
Report No.(s): DE2002-798997; SLAC-PUB-9129; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We examine the signatures for noncommutative QED at e(sup +) e(sup +) colliders with center of mass energies in excess of 1 TeV such as CLIC. For integrated luminosities of 1 ab to the minus 1 power or more, sensitivities to the associated mass scales greater than squareroot of s are possible.
NTIS
Particle Accelerators; Luminosity

20020087717 Stanford Linear Accelerator Center, Stanford, CA USA
Two-Loop QED and QCD Corrections to Massless Fermion-Boson Scattering
Anastasiou, C.; Feb. 12, 2002; 38p; In English
Report No.(s): DE2002-798998; SLAC-PUB-9130; No Copyright; Avail: Department of Energy Information Bridge
The radion may be the lightest new state present in the Randall-Sundrum (RS) model. We examine the couplings of the radion to the Standard Model (SM) fields in the scenario where they propagate in the bulk and expand into Kaluza-Klein towers. These couplings are then contrasted with those of the more familiar case where the SM fields are confined to the TeV brane. We find that the couplings of the radion to both gg and gamma/gamma can be significantly different in these two cases. Implications for radion collider phenomenology are discussed.
NTIS
Higgs Bosons; Quantum Electrodynamics; Quantum Chromodynamics

20020087718 Stanford Linear Accelerator Center, Stanford, CA USA
Snowmass Points and Slopes: Benchmarks for SUSY Studies
Hewett, J. L.; Feb. 25, 2002; 12p; In English
Report No.(s): DE2002-799000; SLAC-PUB-9134; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The 'Snowmass Points and Slopes' (SPS) are a set of benchmark points and parameter lines in the MSSM (Minimal Supersymmetric Standard Model) parameter space corresponding to different scenarios in the search for Supersymmetry at present and future experiments. This set of benchmarks was agreed upon at the 2001 'Snowmass Workshop on the Future of Particle Physics' as a consensus based on different existing proposals.
NTIS
Supersymmetry; Slopes; Standard Model (Particle Physics)

20020087719 Stanford Linear Accelerator Center, Stanford, CA USA
Final-State Interactions and Single-Spin Asymmetries in Semi-Inclusive Deep Inelastic Scattering
Brodsky, S. J.; Jan. 31, 2002; 11p; In English
Report No.(s): DE2002-799001; SLAC-PUB-9135; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Recent measurements from the HERMES and SMC collaborations show a remarkably large azimuthal single-spin asymmetries AUL and AUT of the proton in semi-inclusive pion leptoproduction gamma (q)p yields pi X. We show that final-state interactions from gluon exchange between the outgoing quark and the target spectator system lead to single-spin asymmetries in deep inelastic lepton-proton scattering at leading twist in perturbative QCD (Quantum Chromodynamics); i.e., the rescattering corrections are not power-law suppressed at large photon virtuality Q2 at fixed xbj. The existence of such single-spin asymmetries requires a phase difference between two amplitudes coupling the proton target with J (sup z) (sub p) equals plus or minus one half to the same final-state, the same amplitudes which are necessary to produce a nonzero proton anomalous magnetic moment. We show that the exchange of gauge particles between the outgoing quark and the proton spectators produces a Coulomb-like complex phase which depends on the angular momentum Lz of the proton's constituents and is thus distinct for different proton spin amplitudes. The single-spin asymmetry which arises from such final-state interactions does not factorize into a product of distribution function and fragmentation function, and it is not related to the transversity distribution delta q(x,Q) which correlates transversely polarized quarks with the spin of the transversely polarized target nucleon.
NTIS
Interactions; Inelastic Scattering; Asymmetry; Spin

20020087721 Stanford Linear Accelerator Center, Stanford, CA USA

Unitary and Renormalizable Theory of the Standard Model in Ghost-Free Light-Cone Gauge

Brodsky, S. J.; Feb. 15, 2002; 36p; In English

Report No.(s): DE2002-799003; SLAC-PUB-9137; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Light-front (LF) quantization in light-cone (LC) gauge is used to construct a unitary and simultaneously renormalizable theory of the Standard Model. The framework derived earlier for QCD (Quantum Chromodynamics) is extended to the Glashow, Weinberg, and Salam (GWS) model of electroweak interaction theory. The Lorentz condition is automatically satisfied in LF-quantized QCD in the LC gauge for the free massless gauge field. In the GWS model, with the spontaneous symmetry breaking present, we find that the t Hooft condition accompanies the LC gauge condition corresponding to the massive vector boson. The two transverse polarization vectors for the massive vector boson may be chosen to be the same as found in QCD. The non-transverse and linearly independent third polarization vector is found to be parallel to the gauge direction. The framework is ghost-free, and the interaction Hamiltonian of electroweak theory can be expressed in a form resembling that of covariant theory, except for few additional instantaneous interactions which can be treated systematically. The LF formulation also provides a transparent discussion of the Goldstone Boson (or Electroweak) Equivalence Theorem.

NTIS

Standard Model (Particle Physics); Electroweak Model; Light-Cone Expansion

20020087722 Stanford Linear Accelerator Center, Stanford, CA USA

Rare Hadronic and Radiative Penguin B Decays at BaBar

Willocq, S.; Feb. 07, 2002; 7p; In English

Report No.(s): DE2002-799004; SLAC-PUB-9139; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We report recent results in the study of rare hadronic and radiative penguin decays of B mesons. These results are based on a sample of 23 million BB pairs collected by the BaBar Collaboration at the SLAC (Stanford Linear Accelerator) PEP-II e+e- B Factory.

NTIS

Mesons; Hadrons; Particle Decay

20020087807 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Target Space Symmetries in Topological Theories I

Baulieu, L.; Losev, A. S.; Nekrasov, N. A.; Mar. 2002; 28p

Report No.(s): PB2003-100593; IHES/M/02/20; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

We study realization of the target space diffeomorphisms in the type C topological string. We found that the charges, which generate transformations of the boundary observables, form an algebra, which differs from that of bulk charges by the contribution of the bubbled disks. We discuss applications to noncommutative field theories.

NTIS

Topology; String Theory; Symmetry

20020087808 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Kasner-Like Behaviour for Subcritical Einstein-Matter Systems

Damour, T.; Henneaux, M.; Rendall, A. D.; Weaver, M.; Feb. 2002; 62p

Report No.(s): PB2003-100595; IHES/M/02/06; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Confirming previous heuristic analyses a la Belinskii-Khalatnikov-Lifshitz, it is rigorously proven that certain 'subcritical' Einstein-matter systems exhibit a monotone, generalized Kasner behavior in the vicinity of a spacelike singularity. The D-dimensional coupled Einstein-dilaton-p-form system is subcritical if the dilaton couplings of the p-forms belong to some dimension dependent open neighborhood of zero, while pure gravity is subcritical if D is greater than or equals 11. Our proof relies, like the recent theorem dealing with the (always subcritical) Einstein-dilaton system, on the use of Fuchsian techniques, which enable one to construct local, analytic solutions to the full set of equations of motion. The solutions constructed are 'general' in the sense that they depend on the maximal expected number of free functions.

NTIS

Singularity (Mathematics); Stretching; Dimensions

20020087822 Stanford Linear Accelerator Center, Stanford, CA USA
B Decay Charm Counting via Topological Vertexing
Chou, A. S.; Oct. 15, 2001; 177p; In English
Report No.(s): DE2002-798899; SLAC-R-578; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present a new and unique measurement of the branching fractions of b hadrons to states with 0, 1, and 2 open charm hadrons, using a sample of 350,000 hadronic Z0 decays collected during the SLD/SLC 97-98 run. The method takes advantage of the excellent vertexing resolution of the VXD3, a pixel-based CCD vertex detector, which allows the separation of B and cascade D decay vertices. A fit of the vertex count and the decay length distributions to distribution shapes predicted by Monte Carlo simulation allows the extraction of the inclusive branching fractions.
NTIS
Particle Decay; Hadrons; Charm (Particle Physics)

20020087828 Stanford Linear Accelerator Center, Stanford, CA USA
Positron Polarisation and Low Energy Running at a Linear Collider
Rowson, P. C.; Jan. 07, 2002; 12p; In English
Report No.(s): DE2002-798967; SLAC-PUB-9109; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The physics potential of an e+e- linear collider can be significantly enhanced if both the electron and positron beams are polarized. Low energy running at the Z-resonance or close to the W-pair threshold is particularly attractive with polarized positrons. This note discusses the experimental aspects and physics opportunities of both low energy running and positron polarization.
NTIS
Linear Accelerators; Positrons; Polarization

20020087829 Stanford Linear Accelerator Center, Stanford, CA USA
Photon-Photon and Electron-Photon Colliders with Energies Below a TeV
Hewett, J. L.; Jan. 07, 2002; 29p; In English
Report No.(s): DE2002-798966; SLAC-PUB-9108; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We investigate the potential for detecting and studying Higgs bosons in and photon-photon and electron-photon collisions at future linear colliders with energies below a TeV. Our study incorporates realistic spectra based on available laser technology, and NLC and CLIC acceleration techniques. Results include detector simulations. We study the cases of: (1) a SM-like Higgs boson based on a devoted low energy machine with psee 200 GeV; (2) the heavy MSSM Higgs bosons; and (3) charged Higgs bosons in electron-photon collisions.
NTIS
Higgs Bosons; Linear Accelerators; Electron Phonon Interactions

20020087831 Stanford Linear Accelerator Center, Stanford, CA USA
Monitor of the Focusing Strength of Plasma Lenses using MeV Synchrotron Radiation
Field, C.; Jan. 09, 2002; 18p; In English
Report No.(s): DE2002-798969; SLAC-PUB-9111; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The focusing strength of plasma lenses used with high energy electron or positron beams can give rise to synchrotron radiation with critical energies in the MeV range. A method is described for measuring the characteristic energy of this radiation as a way of monitoring the strength of the focus. The principle has been implemented in a plasma lens experiment with a 28.5 GeV positron beam.
NTIS
Synchrotron Radiation; Monitors; Focusing; Plasmas (Physics); Lenses; Electrical Measurement

20020087832 Stanford Linear Accelerator Center, Stanford, CA USA
Recent Tests of QCD at SLD
Muller, D.; Nov. 15, 2001; 14p; In English
Report No.(s): DE2002-798901; SLAC-PUB-8792; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present selected results on strong interaction physics from the SLD experiment at the SLAC Linear Collider. We report on several new studies of 3- and 4-jet hadronic Z0 decays, in which jets are identied as quark, antiquark or gluon. The gluon energy spectrum is measured over the full kinematic range, providing an improved test of QCD and limits on anomalous bbg and bbg couplings. The parity violation in Z0bbg decays is consistent with electroweak theory plus QCD. New tests of T- and

CP-conservation at the bbg vertex are performed. An improved measurement of the rate of gluon splitting into bb pairs yields gbb=0.002440 00059(stat.) plus or minus 0.00034(syst.). We also present a number of new results on jet fragmentation into identied hadrons. The B hadron energy spectrum is measured over the full kinematic range using a new, inclusive technique, allowing stringent tests of predictions for its shape and a precise measurement of (xb)=0.7100 plus or minus 003(stat.) 0.006(syst.) (Preliminary). Flavor-dependent long-range correlations are observed for all combinations of these hadron species, yielding new information on leading particle production. The rst study of correlations using rapidities signed such that y greater than 0 corresponds to the quark direction provides additional new insights into fragmentation, including the rst direct observation of baryon number ordering along the qq axis.
NTIS
Quantum Chromodynamics; Linear Accelerators; Particle Decay; Hadrons

20020087834 Stanford Linear Accelerator Center, Stanford, CA USA
Recent Results of BaBar
Bernard, D.; Nov. 7, 2001; 10p; In English
Report No.(s): DE2002-798919; SLAC-PUB-9048; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The $BABAR$ detector at SLAC's (Stanford Linear Accelerator) PEP-II storage ring has collected data equivalent to about 30.4 fb through June 2001. Results on CP violation, and in particular searches for direct CP violation, and measurement of rare B decays are presented.
NTIS
Linear Accelerators; Mesons; Cp Violation

20020087852 Stanford Linear Accelerator Center, Stanford, CA USA
Center-of-Mass Energy of PEP-II
Sullivan, M. K.; Oct. 11, 2001; 3p; In English
Report No.(s): DE2002-798889; SLAC-PUB-9018; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The PEP-II B-factory is designed to operate at a center-of-mass energy (E(sub cm)) of 10.58 GeV, the mass value of the upsilon 4S resonance. It is important to set and maintain the E$-(cm)$ to the peak of this resonance in order to maximize the production of B mesons that enable the BaBar detector to measure CP violation. There are several elements in the determination of the beam energies. Aside from the strength of the main bending magnets, there is a contribution to the beam energy from horizontal correctors. In addition, the frequency of the RF system also influences the ring energies by controlling the closed orbit circumference. The low-energy ring (LER) in PEP-II has a wiggler magnet for emittance control that also contributes to the beam energy of the LER. We discuss these aspects of beam energy determination and the algorithms used to monitor the beam energies.
NTIS
Linear Accelerators; Resonance; Mesons

20020087854 Stanford Linear Accelerator Center, Stanford, CA USA
Hadronic B Decays to Open Charm at the BABAR Experiment
Schieck, J. R.; Oct. 09, 2001; In English
Report No.(s): DE2002-798891; SLAC-PUB-9020; No Copyright; Avail: National Technical Information Service (NTIS); Abstract Only
No abstract available.
NTIS
Hadrons; Mesons; Particle Decay; Charm (Particle Physics)

20020087855 Stanford Linear Accelerator Center, Stanford, CA USA
New Tools for Fermion Masses from Extra Dimensions
Kaplan, D. E.; Oct. 11, 2001; 30p; In English
Report No.(s): DE2002-798892; SLAC-PUB-9021; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present models in which the observed fermion masses and mixings are generated by dynamically localizing the three generations of matter in a flat compact extra dimension. We first construct models assuming the hierarchy problem is addressed by the existence of large extra dimensions, $i.e$. the fundamental scale is not far above a TeV and supersymmetry is not imposed. These models are compactified, chiral, and don't require fine-tuning to generate the top mass. Limits on the compactification scale based on flavor-changing neutral currents are relaxed compared to those on existing models. We then supersymmetrize some of these models. Using N=1 superspace language in extra dimensions, we find space-dependent flat directions which can be used

to localize fields. Finally, we discuss methods of breaking supersymmetry and the impact of these models on the superpartner spectrum.
NTIS
Fermions; Supersymmetry

20020087856 Stanford Linear Accelerator Center, Stanford, CA USA
Perspectives and Challenges for QCD Phenomenology
Brodsky, S. J.; Oct. 08, 2001; 19p; In English
Report No.(s): DE2002-798893; SLAC-PUB-9022; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A fundamental understanding of quantum chromodynamics, particularly at the amplitude level, is essential for progress in high energy physics. For example, the measurement and interpretation of the basic parameters of the electroweak theory and CP violation depends on an understanding of the dynamics and phase structure of exclusive B-meson decay amplitudes. In this review, I discuss a number of ways in which the required hadron wavefunctions can be measured (such as two-photon reactions and diffractive dissociation) or calculated from first principles. An important tool for describing relativistic composite systems in quantum field theory is the light-front Fock expansion, which encodes the properties of a hadrons in terms of a set of frame-independent n-particle wavefunctions. Light-front quantization in the doubly-transverse light-cone gauge has a number of remarkable advantages, including explicit unitarity, the absence of ghost degrees of freedom, and the decoupling properties needed to prove factorization theorems in high momentum transfer inclusive and exclusive reactions. Evolution in light-cone time allows the construction of an 'event amplitude generator' in which only non-ghost physical degrees of freedom and integration over physical phase appear. The diffractive dissociation of a hadron at high energies, by either Coulomb or Pomeron exchange, has a natural description in QCD as the materialization of the projectile's light-cone wavefunctions; in particular, the diffractive dissociation of a meson, baryon, or photon into high transverse momentum jets measures the shape and other features of the projectile's distribution amplitude. Diffractive dissociation can thus test fundamental properties of QCD, including color transparency and intrinsic charm. I also review recent work which shows that the structure functions measured in deep inelastic lepton scattering are affected by final-state rescattering, thus modifying their connection with the light-cone probability distributions. In particular, the shadowing of nuclear structure functions is due to destructive interference effects from leading-twist diffraction of the virtual photon, physics not included in the nuclear light-cone wavefunctions.
NTIS
Quantum Chromodynamics; Wave Functions; Hadrons; Mesons; Particle Decay

20020087860 Stanford Linear Accelerator Center, Stanford, CA USA
Search for Direct CP Violation in B to K pi, pi pi, K K, Quasi-Two-Body B Decays and B to Kstar gamma with the BABAR Detector at the PEP-II Collider
Menke, S.; Oct. 23, 2001; 5p; In English
Report No.(s): DE2002-798897; SLAC-PUB-9032; No Copyright; Avail: Department of Energy Information Bridge
The PEP-N project at SLAC consists of a Very Low Energy small electron Ring (VLER) that will collide with the low-energy 3.1 GeV positron beam (LER) of PEP-II, producing center-of-mass energies between GeV and the J/psi. The beams will collide head-on and will be separated in the detector magnetic field which is part of the Interaction Region (IR) . The IP functions were chosen such as to optimize both luminosity and beam beam tune shifts, while keeping the LER tune shifts small. This paper describes the lattice of the VLER for the 'baseline' design at 500 MeV.
NTIS
Positron Annihilation; Particle Decay; Radiation Counters

20020087862 Stanford Linear Accelerator Center, Stanford, CA USA
Increasing SLEDed Linac Gradient
Farkas, Z. D.; Nov. 8, 2001; 16p; In English
Report No.(s): DE2002-798900; SLAC-AP-138; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This note will show how to increase the SLED gradient by varying Qe, the external Q of the SLED cavity, by increasing its Q0 andective, then the copper losses should be small so that Q0 is much greater than Qe. Methods of varying Qe will be indicated but no experimental data will be presented. If we increase the klystron pulse width from 3.5 to 5 S and increase Q0 from the present 100000 to 300000, then the gradient increases by 19% and the beam energy increases from 50 to 60 GeV. This note will also discuss SLED operation at 11424 MHz, the NLC frequency. Without Qe switching, using SLED at 11424 MHz increases the SLAC

gradient from 21 MV/m to 34 MV/m, and at the same repetition rate, uses about 1/5 of rf average power. If we also double the compression ratio, we reach 47 MV/m and over 100 GeV beam energy.
NTIS
Linear Accelerators; Beams (Radiation); Klystrons

20020087864 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of B--> K*gamma Branching Fractions and Charge Asymmetries
Jessop, C. P.; Oct. 26, 2001; 1p; In English
Report No.(s): DE2002-798904; SLAC-PUB-8952; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Particle Decay; Branching (Physics)

20020087866 Stanford Linear Accelerator Center, Stanford, CA USA
CP Violation and B Physics
Quinn, H. R.; Nov. 13, 2001; 43p; In English
Report No.(s): DE2002-798906; SLAC-PUB-8965; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
These lectures provide a basic overview of topics related to the study of CP Violation in B decays. In the first lecture, I review the basics of discrete symmetries in field theories, the quantum mechanics of neutral but flavor-non-trivial mesons, and the classification of three types of CP violation. The actual second lecture which I gave will be separately published as it is my Dirac award lecture and is focussed on the separate topic of strong CP Violation. In Lecture 2 here, I cover the Standard Model predictions for neutral B decays, and in particular discuss some channels of interest for CP Violation studies. Lecture 3 reviews the various tools and techniques used to deal with the hadronic physics effects. In Lecture 4, I briefly review the present and planned experiments that can study B decays. I cannot teach all the details of this subject in this short course, so my approach is instead to try to give students a grasp of the relevant concepts and an overview of the available tools. The level of these lectures is introductory. I will provide some references to more detailed treatments and current literature, but this is not a review article so I do not attempt to give complete references to all related literature. by now there are some excellent textbooks that cover this subject in great detail. I refer students to these for more details and for more complete references to the original literature.
NTIS
Particle Decay; Cp Violation

20020087950 Stanford Linear Accelerator Center, Stanford, CA USA
Observation of CP Violation in the B0 System
Touramanis, C.; Oct. 26, 2001; 11p; In English
Report No.(s): DE2002-798912; SLAC-PUB-9031; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Cp Violation; Observation; Radiation Detectors

20020087951 Stanford Linear Accelerator Center, Stanford, CA USA
Three Body Decays of D0 and DS Mesons
Palano, A.; Nov. 1, 2001; 11p; In English
Report No.(s): DE2002-798913; SLAC-PUB-9034; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Mesons; Decay

20020087954 Stanford Linear Accelerator Center, Stanford, CA USA
Charmless Hadronic B Decays at BaBar
Bona, M.; Nov. 6, 2001; 6p; In English
Report No.(s): DE2002-798916; SLAC-PUB-9045; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Hadrons; Particle Decay

20020087955 Stanford Linear Accelerator Center, Stanford, CA USA
Fragmentation and Hadronization in e+e- Collisions
Muller, D.; Nov. 15, 2001; 11p; In English
Report No.(s): DE2002-798921; SLAC-PUB-9051; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We present a number of jet fragmentation and hadronization measurements in right arrow hadrons. The L3 collaboration has searched for pointlike color singlet radiation in multi-jet events, limiting any such contribution to rapidity gap events at the few percent level. ALEPH and SLD have measured production rates of a number of identified hadrons, including precise, full-coverage spectra of B hadrons. L3 and SLD have studied charged track and identified hadron production in heavy- and light-flavor events. OPAL has made a pioneering comparison of charged multiplicities between events of the three light flavors.
NTIS
Hadrons; Fragmentation

20020087956 Stanford Linear Accelerator Center, Stanford, CA USA
Black Hole Production Rates at the LHC: Still Large
Rizzo, T. G.; Nov. 19, 2001; 3p; In English
Report No.(s): DE2002-798922; SLAC-PUB-9053; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We examine the rates for the production of black holes(BH) at the large hadron collider (LHC) in light of the exponential suppression of the geometric cross section estimate proposed by Voloshin. We show that these rates will still be quite large over a reasonable range of model parameters. While BH production may not be the dominant process, its unique signature will ensure observability over conventional backgrounds.
NTIS
Particle Accelerators; Black Holes (Astronomy)

20020087958 Stanford Linear Accelerator Center, Stanford, CA USA
Heisenberg Matrix Formulation of Quantum Field Theory
Brodsky, S. J.; Nov. 21, 2001; 12p; In English
Report No.(s): DE2002-798924; SLAC-PUB-9055; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Heisenberg's matrix formulation of quantum mechanics can be generalized to relativistic systems by evolving in light-front time. The spectrum and wavefunctions of bound states, such as hadrons in quantum chromodynamics, can be obtained from matrix diagonalization of the light-front Hamiltonian on a finite dimensional light-front Fock basis defined using periodic boundary conditions. This method, discretized light-cone quantization (DLCQ), preserves the frame-independence of the front form even at finite resolution and particle number. Light-front quantization can also be used in the Hamiltonian form to construct an event generator for high energy physics reactions at the amplitude level. The light-front partition function, summed over exponentially-weighted light-front energies, has simple boost properties which may be useful for studies in heavy ion collisions. I also review recent work which shows that the structure functions measured in deep inelastic lepton scattering are affected by final-state rescattering, thus modifying their connection to light-front probability distributions. In particular, the shadowing of nuclear structure functions is due to destructive interference effects from leading-twist diffraction of the virtual photon, physics not included in the nuclear light-front wavefunctions.
NTIS
Quantum Mechanics; Matrix Methods

20020087959 Stanford Linear Accelerator Center, Stanford, CA USA
Emergent Gauge Bosons
Bjorken, J.; Nov. 21, 2001; 14p; In English
Report No.(s): DE2002-798927; SLAC-PUB-9063; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The old idea that the photon is a Goldstone boson emergent from a spontaneously broken theory of interacting fermions is revisited. It is conjectured that the gauge-potential condensate has a vacuum expectation value which is very large, perhaps the GUT/Planck momentum scale, but that the magnitude of the effective potential which generates it is very small, so small that in the limit of vanishing cosmological constant it would vanish. In this way, the threat of unacceptably large observable, noncovariant residual effects is mitigated. The linkage of these ideas to other speculative ideas involving black holes and parametrizations of Standard-Model coupling constants is also described.
NTIS
Bosons; Photons

20020087960 Stanford Linear Accelerator Center, Stanford, CA USA
R-b,R-c Measurements at SLD and LEP-I
Su, D.; Dec. 12, 2001; 8p; In English
Report No.(s): DE2002-798930; SLAC-PUB-8668; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report summarizes the measurements of R(sup b), R(sup c) at SLD and LEP-I. These measurements are sensitive probes of the Z(sup 0) couplings to heavy quarks, which provide precision tests of the Standard Model of electroweak interactions at 0.3% and 2% level respectively.
NTIS
Quarks; Electroweak Model

20020088419 Stanford Linear Accelerator Center, Stanford, CA USA
Determination of the Wrong Sign Decay Rate D--> K+pi- and the Sensitivity to D0-D0bar Mixing.
Egede, U.; Nov. 20, 2001; 6p; In English
Report No.(s): DE2002-798911; SLAC-PUB-9026; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Decay Rates; Sensitivity; Symbols; Mesons; Standard Model (Particle Physics)

20020088420 Stanford Linear Accelerator Center, Stanford, CA USA
Improved Direct Measurement of A-b and A-c at the Z 0 Pole Using a Lepton Tag
Schumm, B. A.; Nov. 2, 2001; 14p; In English
Report No.(s): DE2002-798903; SLAC-PUB-8951; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Alternating Current; Leptons; Parity; Measurement

20020088422 Stanford Linear Accelerator Center, Stanford, CA USA
QCD Phenomenology and Light-Front Wavefunctions
Brodsky, S. J.; Nov. 21, 2001; 56p; In English
Report No.(s): DE2002-798925; SLAC-PUB-9056; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A natural calculus for describing the bound-state structure of relativistic composite systems in quantum field theory is the light-front Fock expansion which encodes the properties of a hadrons in terms of a set of frame-independent $n-$particle wavefunctions. Light-front quantization in the doubly-transverse light-cone gauge has a number of remarkable advantages, including explicit unitarity, a physical Fock expansion, the absence of ghost degrees of freedom, and the decoupling properties needed to prove factorization theorems in high momentum transfer inclusive and exclusive reactions. A number of applications are discussed in these lectures, including semileptonic B decays, two-photon exclusive reactions, diffractive dissociation into jets, and deeply virtual Compton scattering. The relation of the intrinsic sea to the light-front wavefunctions is discussed. Light-front quantization can also be used in the Hamiltonian form to construct an event generator for high energy physics reactions at the amplitude level. The light-cone partition function, summed over exponentially-weighted light-cone energies, has simple boost properties which may be useful for studies in heavy ion collisions. I also review recent work which shows that the structure functions measured in deep inelastic lepton scattering are affected by final-state rescattering, thus modifying their connection to light-front probability distributions. In particular, the shadowing of nuclear structure functions is due to destructive interference effects from leading-twist diffraction of the virtual photon, physics not included in the nuclear light-cone wavefunctions.
NTIS
Quantum Chromodynamics; Wave Functions

20020088651 Stanford Linear Accelerator Center, Stanford, CA USA
Deconstructing Noncommutativity with a Giant Fuzzy Moose
Adams, A. W.; Dec. 5, 2001; 25p; In English
Report No.(s): DE2002-798931; SLAC-PUB-9052; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We argue that the world volume theories of D-branes probing orbifolds with discrete torsion develop, in the large quiver limit, new non-commutative directions. This provides an explicit 'deconstruction' of a wide class of noncommutative theories. This also provides insight into the physical meaning of discrete torsion and its relation to the T-dual B field. We demonstrate that the strict large quiver limit reproduces the matrix theory construction of higher-dimensional D-branes, and argue that finite 'fuzzy moose'

theories provide novel regularizations of non-commutative theories and explicit string theory realizations of gauge theories on fuzzy tori. We also comment briefly on the relation to NCOS, (2,0) and little string theories.
NTIS
Gauge Invariance; String Theory

20020088653 Stanford Linear Accelerator Center, Stanford, CA USA
Physics at the Light-Front
Brodsky, S. J.; Dec. 5, 2001; 14p; In English
Report No.(s): DE2002-798933; SLAC-PUB-9074; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The light-front representation of quantum chromodynamics provides a frame-independent, quantum-mechanical representation of hadrons at the amplitude level, capable of encoding their multi-quark, hidden-color and gluon momentum, helicity, and flavor correlations in the form of universal process-independent hadron wavefunctions. The light-front quantization of QCD in light-cone gauge has a number of advantages, including explicit unitarity, a physical Fock expansion, the absence of ghost degrees of freedom, and the decoupling properties needed to prove factorization theorems in high momentum transfer inclusive and exclusive reactions. The universality and frame-independence of the LCWF's thus allow a profound connection between diffractive dissociation, hard scattering exclusive processes such as elastic form factors, two-photon reactions, and heavy hadron decays. In this concluding talk of the ECT* International Conference On Light-Cone Physics: Particles and Strings (Trento 2001), I review recent calculations and new applications of light-front wavefunctions in QCD and other theories. I also review the distinction between the structure functions measured in deep inelastic lepton scattering and the quark distributions determined from light-front wavefunctions.
NTIS
Quantum Chromodynamics; Hadrons; Inelastic Scattering

20020088654 Stanford Linear Accelerator Center, Stanford, CA USA
Measurements of CP Violation, Mixing and Lifetimes of B Mesons with the BaBar Detector
Prell, S.; Dec. 10, 2001; 13p; In English
Report No.(s): DE2002-798934; SLAC-PUB-9075; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Cp Violation; Mesons; Invariance; Particle Theory

20020088711 Stanford Linear Accelerator Center, Stanford, CA USA
Measurements of the Beam-Beam Interaction at PEP-II
Seeman, J. T.; Dec. 11, 2001; 4p; In English
Report No.(s): DE2002-798938; SLAC-PUB-9093; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The beam-beam interaction is one of the performance limitations at PEP-II. The peak luminosity in PEP-II has reached 3.4x10(33)/cm2/s with 693 bunches with a positron current of 1.6 A and an electron current of 0.84 A. The beam-beam tune shift limits have exceeded 0.06 horizontally and 0.03 vertically. A model of the luminosity with current using the measured beam sizes has been developed. Studies are underway to increase the luminosity toward 10(34)/cm2/s and beyond by increasing the number of bunches, raising the beam currents, lowering the betas at the interaction points, and shortening the bunch lengths.
NTIS
Beam Interactions; Luminosity; Beta Particles

20020088713 Stanford Linear Accelerator Center, Stanford, CA USA
Physics Opportunities at a Multi-TeV e+e- Linear Collider
Barklow, T. L.; Dec. 21, 2001; 21p; In English
Report No.(s): DE2002-798949; SLAC-PUB-9068; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The physics at an e+e- linear collider with a center of mass energy of 3-5 TeV is reviewed. The following topics are covered: experimental environment, Higgs physics, supersymmetry, fermion pair-production, W+W- scattering, extra dimensions, non-commutative theories, and black hole production.
NTIS
Linear Accelerators; Center of Mass; Supersymmetry; Pair Production

20020088714 Stanford Linear Accelerator Center, Stanford, CA USA
Strong Symmetry Breaking at e+e- Linear Colliders
Barklow, T. L.; Dec. 21, 2001; 7p; In English
Report No.(s): DE2002-798948; SLAC-PUB-9067; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Broken Symmetry; Collisions

20020088715 Stanford Linear Accelerator Center, USA
Measurement of B0-anti-B0 Flavor Oscillations in Hadronic B0 Decays
MacFarlane, D. B.; Jan. 04, 2002; 7p; In English
Report No.(s): DE2002-798947; SLAC-PUB-9061; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Oscillations; Hadrons; Electron Scattering

20020088716 Stanford Linear Accelerator Center, USA
Study of Time-Dependent CP-Violating Asymmetries and Flavor Oscillations in Neutral B Decays at the Upsilon(4S)
MacFarlane, D. B.; Jan. 10, 2002; 58p; In English
Report No.(s): DE2002-798946; SLAC-PUB-9060; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Mesons; Oscillations

20020088717 Stanford Linear Accelerator Center, USA
Rare Charm Decays in the Standard Model and Beyond
Hewett, J. L.; Dec. 19, 2001; 46p; In English
Report No.(s): DE2002-798945; SLAC-PUB-9057; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We perform a comprehensive study of a number of rare charm decays, incorporating the first evaluation of the QCD corrections to the short distance contributions, as well as examining the long range effects. We also obtain predictions for these decays within extensions of the Standard Model, including extensions of the Higgs, gauge and fermion sectors, as well as models of dynamical electroweak symmetry breaking.
NTIS
Quantum Chromodynamics; Correction; Electroweak Interactions (Field Theory); Charm (Particle Physics)

20020088718 Stanford Linear Accelerator Center, Stanford, CA USA
Report of the Snowmass Subgroup on Extra Dimensions
Rizzo, T. G.; Dec. 17, 2001; 10p; In English
Report No.(s): DE2002-798944; SLAC-PUB-9030; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In this report we summarize the work performed at Snowmass 2001 on the physics of extra dimensions. We divide these analyses into the following classes: searches for extra dimensional phenomena, identification of specific new physics scenarios, studies of black hole production and non-commutative QED (quantum electrodynamics).
NTIS
Quantum Electrodynamics; Particle Collisions

20020088719 Stanford Linear Accelerator Center, Stanford, CA USA
Status Report of the Inter-Laboratory Task Force on Remote Operation
Phinney, N.; Dec. 13, 2001; 33p; In English
Report No.(s): DE2002-798943; SLAC-R-583; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In February 2000, the International Committee for Future Accelerators initiated a study of a new model for international collaboration on a future large accelerator project, the Global Accelerator Network. The study is based on a model of a facility, which is remote from most of the collaborating institutions. It is designed, built and operated by a collaboration of equal partner institutions distributed around the world. According to this model, the expert-staff from each laboratory remains based at their home institution but continues to participate in the operation of the machine after construction. This report summarizes the conclusions of the Task Force on Remote Operation, which investigated the general and technical implications of far-remote operations.
NTIS
Remote Control; Particle Accelerators

20020088724 Stanford Linear Accelerator Center, Stanford, CA USA
Search for the Rare Decays B--> Kl+l- and B--> K(892)*l+l-
Jan. 04, 2002; 7p; In English
Report No.(s): DE2002-798961; SLAC-PUB-9102; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Particle Decay; Leptons

20020088725 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of the Time Dependence of B-d-bar B-d Mixing with Kaon Tagging
Wittlin, J. L.; Dec. 10, 2001; 193p; In English
Report No.(s): DE2002-798942; SLAC-R-582; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Mesons; Marking; Time Measurement

20020088726 Stanford Linear Accelerator Center, Stanford, CA USA
Strong-Weak CP Hierarchy from Non-Renormalization Theorems
Hiller, G.; Jan. 28, 2002; 38p; In English
Report No.(s): DE2002-798953; SLAC-PUB-9080; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We point out that the hierarchy between the measured values of the CKM phase and the strong CP phase has a natural origin in supersymmetry with spontaneous CP violation and low energy supersymmetry breaking. The underlying reason is simple and elegant: in supersymmetry the strong CP phase is protected by an exact non-renormalization theorem while the CKM phase is not. We present explicit examples of models which exploit this fact and discuss corrections to the non-renormalization theorem in the presence of supersymmetry breaking. This framework for solving the strong CP problem has generic predictions for the superpartner spectrum, for CP and flavor violation, and predicts a preferred range of values for electric dipole moments.
NTIS
Cp Violation; Dipole Moments; Electric Dipoles; Normalizing (Statistics)

20020088732 Stanford Linear Accelerator Center, Stanford, CA USA
Hadron Spin Dynamics
Brodsky, S. J.; Jan. 09, 2002; 24p; In English
Report No.(s): DE2002-798965; SLAC-PUB-9107; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Spin effects in exclusive and inclusive reactions provide an essential new dimension for testing QCD and unraveling hadron structure. Remarkable new experiments from SLAC, HERMES (DESY), and Jefferson Lab present many challenges to theory, including measurements at HERMES and SMC of the single spin asymmetries in ep yields e' pi x where the proton is polarized normal to the scattering plane. This type of single spin asymmetry may be due to the effects of rescattering of the outgoing quark on the spectators of the target proton, an effect usually neglected in conventional QCD analyses. Many aspects of spin, such as single-spin asymmetries and baryon magnetic moments are sensitive to the dynamics of hadrons at the amplitude level, rather than probability distributions. I will illustrate the novel features of spin dynamics for relativistic systems by examining the explicit form

of the light-front wave functions for the two-particle Fock state of the electron in QED, thus connecting the Schwinger anomalous magnetic moment to the spin and orbital momentum carried by its Fock state constituents and providing a transparent basis for understanding the structure of relativistic composite systems and their matrix elements in hadronic physics. I also present a survey of outstanding spin puzzles in QCD, particularly ANN in elastic pp scattering, the J/psi yields p pi puzzle, and J/psi polarization at the Tevatron.
NTIS
Hadrons; Spin Dynamics; Quantum Chromodynamics

20020088733 Stanford Linear Accelerator Center, Stanford, CA USA
Characterization of Longitudinal Impedances in Storage Rings Via Multibunch Effects
Teytelman, D.; Jan. 08, 2002; 46p; In English
Report No.(s): DE2002-798964; SLAC-PUB-9106; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In this paper we present two new techniques for frequency-resolved characterization of longitudinal impedances in storage rings. The first method is based on transient measurements of the growth rates and tune shifts of unstable coupled-bunch modes. In the second approach estimates of the impedances are obtained from analysis of the steady-state synchronous phases of the bunches for uneven fill patterns. These techniques are applicable to measurement of both fundamental and higher-order mode impedances and allow characterization of shunt impedances and quality factors of the HOMs. Methods presented here are complementary to lab bench measurements of RF cavities, in that the beam based measurements directly sense the physical impedance in the installed configuration. Experimental results from ALS and BESSY-II are presented showing the use of these techniques to measure complex impedances.
NTIS
Impedance; Storage Rings (Particle Accelerators); Longitude; Beam Steering

20020088734 Stanford Linear Accelerator Center, Stanford, CA USA
Qualitative analysis of the e-cloud formation
Heifets, S. A.; Jan. 17, 2002; 23p; In English
Report No.(s): DE2002-798963; SLAC-PUB-9105; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The qualitative analysis of the electron cloud formation is presented. Two mechanisms of the cloud formation, generation of jets of primary photo-electrons and thermalization of electrons in the electron cloud, are analyzed and compared with simulations for the NLC damping ring.
NTIS
Qualitative Analysis; Electrons; Electron Clouds; Formations

20020088735 Stanford Linear Accelerator Center, Stanford, CA USA
Two-Loop Helicity Amplitudes for Gluon-Gluon Scattering in QCD and Supersymmetric Yang-Mills Theory
Dixon, L.; Jan. 18, 2002; 56p; In English
Report No.(s): DE2002-798962; SLAC-PUB-9103; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present the two-loop helicity amplitudes for the scattering of two gluons into two gluons in QCD, which are relevant for next-to-next-to-leading order corrections to jet production at hadron colliders. We give the results in the Hooft-Veltman and four-dimensional helicity variants of dimensional regularization. Summing our expressions over helicities and colors, and converting to conventional dimensional regularization, gives results in complete agreement with those of Glover, Oleari and Tejeda-Yeomans. We also present the amplitudes for 2 to 2 scattering in pure N = 1 supersymmetric Yang-Mills theory.
NTIS
Gluons; Quantum Chromodynamics; Particle Beams; Scattering; Amplitudes

20020088736 Stanford Linear Accelerator Center, Stanford, CA USA
Semileptonic b to u Decays: Lepton Invariant Mass Spectrum
Melnikov, K.; Jan. 09, 2002; 5p; In English
Report No.(s): DE2002-798960; SLAC-PUB-9101; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We compute O(alpha (sup 2) (sub s)) QCD corrections to the lepton invariant mass spectrum in the decay b yields ulv (sub 1), relevant for the determination of the CKM matrix element straight line V (sub ub) straight line. Our method can also be used to evaluate moments of the lepton energy distribution with an O(alpha (sup 2) (sub s)) accuracy. The abelian part of our result

gives the neutrino invariant mass spectrum in the muon decay and, upon integration, the O (alpha (sup 2)) correction to the muon lifetime.
NTIS
Mesons; Leptons; Particle Decay

20020088737 Stanford Linear Accelerator Center, USA
Nonlocal String Theories on AdS-3 x S 3 and Stable Non-Supersymmetric Backgrounds
Silverstein, E. M.; Jan. 16, 2002; 41p; In English
Report No.(s): DE2002-798959; SLAC-PUB-9099; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We exhibit a simple class of exactly marginal 'double-trace' deformations of two dimensional CFTs which have AdS(sub3) duals, in which the deformation is given by a product of left and right-moving U(1) currents. In this special case the deformation on AdS(sub3) is generated by a local boundary term in three dimensions, which changes the physics also in the bulk via bulk-boundary propagators. However, the deformation is non-local in six dimensions and on the string worldsheet, like generic non-local string theories (NLSTs). Due to the simplicity of the deformation we can explicitly make computations in the non-local string theory and compare them to CFT computations, and we obtain precise agreement. We discuss the effect of the deformation on closed strings and on D-branes. The examples we analyze include a supersymmetry-breaking but exactly marginal 'double-trace' deformation, which is dual to a string theory in which no destabilizing tadpoles are generated for moduli nonperturbatively in all couplings, despite the absence of supersymmetry. We explain how this cancellation works on the gravity side in string perturbation theory, and also non-perturbatively at leading order in the deformation parameter. We also discuss possible flat space limits of our construction.
NTIS
Supersymmetry; String Theory; Perturbation Theory; Couplings

20020088738 Stanford Linear Accelerator Center, USA
Measurement of the B0-anti-B0 Oscillation Frequency with Inclusive Dilepton Events
Bozzi, C.; Jan. 04, 2002; 7p; In English
Report No.(s): DE2002-798958; SLAC-PUB-9096; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The B(sup 0)-B(with a line over the top)(sup 0) oscillation frequency has been measured with a sample of 23 million BB(with a line over the top) pairs collected with the BABAR detector at the PEP-II asymmetric B Factory at SLAC. In this sample, we select events in which both B mesons decay semileptonically and use the charge of the leptons to identify the flavor of each B meson. A simultaneous fit to the decay time difference distributions for opposite- and same-sign dilepton events gives (delta)m(sub d) = 0.493 plus or minus 0.012 (stat) plus or minus 0.009 (syst) ps to the minus one power.
NTIS
Oscillations; Frequencies; Asymmetry; Leptons

20020088739 Stanford Linear Accelerator Center, USA
Internal Alignment of the SLD Vertex Detector using a Matrix Singular Value Decomposition Technique
Su, D.; Jan. 03, 2002; 23p; In English
Report No.(s): DE2002-798957; SLAC-PUB-9092; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The tracking resolution and vertex finding capabilities of the SLD experiment depend upon a precise knowledge of the location and orientation of the 96 elements of the SLD pixel vertex detector (VXD3) in 3D space. At the heart of the deterministic procedure described here to align the 96 CCDs is the matrix inversion technique of singular value decomposition (SVD). This tool is employed to unfold the detector geometry corrections from the track hit residual data in the VXD3. The algorithm is adapted to perform an optimal chi(sup 2) minimization by careful treatment of the errors and correlations in the residual measurements. The general form of the problems that might be solved with this technique is discussed. The tracking resolution obtained with the aligned geometry is compared with the starting point, based on an optical survey of the CCDs, and is shown to achieve the design performance.
NTIS
Alignment; Decomposition; Singularity (Mathematics); Value Engineering; Character Recognition

20020088740 Stanford Linear Accelerator Center, USA
Systematic Ground Motion and Macro-Alignment for Linear Colliders
Pitthan, R.; Jan. 07, 2002; 3p; In English
Report No.(s): DE2002-798956; SLAC-PUB-9086; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Future colliders with their micrometer-range operational tolerances still need to be classically aligned to the 50 - 100 micrometer range, and kept there, over the km range. This requirement will not be a show-stopper, but not be trivial either. 50 micrometer ground movements over a betatron wavelength is a the range where systematic long term motions can prevent efficient operation.
NTIS
Linear Accelerators; Earth Movements; Ground Resonance; Betatrons; Acceleration (Physics)

20020088741 Stanford Linear Accelerator Center, Stanford, CA USA
Pion Pole Contribution to Hadronic Light-by-Light Scattering and Muon Anomalous Magnetic Moment
Melnikov, K.; Jan. 09, 2002; 4p; In English
Report No.(s): DE2002-798955; SLAC-PUB-9084; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We derive an analytic result for the pion pole contribution to the light-by-light scattering correction to the anomalous magnetic moment of the nuon, a micro equals (gmicro - 2)/2. Using the Vector Meson Dominance model (VMD) for the pion transition form factor, we obtain a (sub micro) (sup LBL,pi(sup o)) equals + 56 times ten to the minus 11th power.
NTIS
Hadrons; Light Scattering; Magnetic Moments; Pions

20020088742 Stanford Linear Accelerator Center, Stanford, CA USA
Graviton Production at CLIC
Rizzo, T. G.; Dec. 17, 2001; 5p; In English
Report No.(s): DE2002-798954; SLAC-PUB-9082; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Collisions; Gravitons; Linearity

20020088743 Stanford Linear Accelerator Center, Stanford, CA USA
Improved Model-Independent Analysis of Semileptonic and Radiative Rare B Decays
Hiller, G.; Dec. 21, 2001; 33p; In English
Report No.(s): DE2002-798951; SLAC-PUB-9076; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We update the branching ratios for the inclusive decays B yields X(sub s) L (sup +) l (sup -) and the exclusive decays B yields (K,Kasterisk) L (sup +) l (sup -), with l = e, micro, in the standard model by including the explicit O(as) and upside-down-VQCD/mb corrections. This framework is used in conjunction with the current measurements of the branching ratios for B yields Xs(gamma) and B yields K L (sup +) l (sup -). decays and upper limits on the branching ratios for the decays B (K.,Xs) L (sup +) l (sup -). to work out bounds on the Wilson coefficients C7, C8, C9 and C10 appearing in the effective Hamiltonian formalism. The resulting bounds are found to be consistent with the predictions of the standard model and some variants of supersymmetric theories. We illustrate the constraints on supersymmetric parameters that the current data on rare B decays implies in the context of minimal flavor violating model and in more general scenarios admitting additional flavor changing mechanisms. Precise measurements of the dilepton invariant mass distributions in the decays B yields (Xs,K.,K) L (sup +) l (sup -), in particular in the lower dilepton mass region, and the forward-backward asymmetry in the decays B yields (Xs,Kasterisk) L (sup +) l (sup -), will greatly help in discriminating among the SM and various supersymmetric theories.
NTIS
Branching (Physics); Particle Decay; Supersymmetry; Asymmetry

20020088744 Stanford Linear Accelerator Center, Stanford, CA USA
Radion Mixing Effects on the Properties of the Standard Model Higgs Boson
Rizzo, T. G.; Jan. 02, 2002; 4p; In English
Report No.(s): DE2002-798950; SLAC-PUB-9072; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We examine how mixing between the Standard Model(SM) Higgs boson, h, and the radion of the Randall-Sundrum model modifies the expected properties of the Higgs boson. In particular, we demonstrate that the total and partial decay widths of the Higgs, as well as the h/to gg branching fraction, can be substantially altered from their SM expectations, while the remaining Higgs branching fractions are modified less than approximately less than 5 for most of the parameter region.
NTIS
Higgs Bosons; Standard Model (Particle Physics)

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

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

20020088680 American Museum of Natural History, Hayden Planetarium, New York, NY USA
Expanding the Frontiers of Knowledge
deGrasseTyson, Neil, American Museum of Natural History, USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 127-136; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

I do not want to preach to the choir today. You are the choir, and we have a panel of preachers here. Instead, I want to try to stir the pot a little and maybe get you angry, but hopefully not with me. I want to offer a point of view that I have not seen discussed in forums such as this. It is a point of view that represents the landscape in which most of this conversation would need to be present if any of our grand plans for space exploration are to come true. We all know how important it is to fly. We have been doing it since 1903, and it Is a point of pride in our species. We finally could do things the birds could do. by the way, many people before the Wright brothers said that it would be impossible to fly. Even some well-known scientists, Lord Calvin among them, said, ”We’ll never have heavier than air flight.” Well, of course, birds are heavier than air, and they have no problems flying. So there couldn’t be a law of physics against heavier than air flight. So we have to be careful about what we say is impossible. I would like to offer an argument for why I think it is unlikely that humans will ever leave low-Earth orbit for the next hundred years. I am not going to invoke laws of physics to make that point, because, basically, if the laws of physics do not forbid something, then it can happen. This is why, of course, the people who said nothing would ever go faster than the sound barrier were ignorant, because, in fact, we already had rifle bullets traveling faster than sound.
Derived from text
Space Exploration; Topography; Radar Imagery

20020088683 San Francisco State Univ., CA USA
The Ethics of Human Spaceflight
Zoloth, Laurie, San Francisco State Univ., USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 165-188; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

There is a letter from Meriwether Lewis, struggling with the technology of the new collapsible iron-framed boat he has engineered for his great Journey west into the Louisiana Territory. In this, we hear a story so familiar that it startles us. He is about to embark into a land so unknown that the maps are blank beneath his hands. He is inventing a technology that he and his mentor and master engineer President Thomas Jefferson have sketched Out Oil an oak table at Monticello, and he is jerry-rigging, piece by piece, wood for iron. He is looking to hire on men for the journey who will be bold, physically able, and yet composed enough to live together in a small boat in terrifying danger. It is a ship that will fail him utterly in the middle of the journey. In the letter, he anguishes about funding for the project, about the time it is taking to make the boat, and about the way the trip Must be tuned precisely or postponed for another year. Congress is Uneasy about the expenditures, and he must balance his work and his mission-commerce, science, exploration, and foreign policy. ”I visit him every day and endeavor by every means in my power to hasten completion of the work . . . ” lie says of the shipbuilder, and, of the river, its level dropping, lie promises ”this may impede my progress, but shall not prevent my proceeding, being determined to go forward . . . ”
Author
Ethics; Commerce; Human Beings; Foreign Policy

20020089944 University of Electro-Communications, Tokyo, Japan
Improvement of Physics: Experiments in Three Major Education Universities in Indonesia
Sasaki, Yukihiko, University of Electro-Communications, Japan; Tohyama, Kohji, Kanagawa Inst. of Tech., Japan; Hinduan, Achmad A., Universitas Pendidikan Indonesia, Indonesia; Wirasamita, Omang, Universitas Pendidikan Indonesia, Indonesia; Mundilarto, Universitas Negeri Yogyakarta, Indonesia; Purwanto, Agus, Universitas Negeri Yogyakarta, Indonesia; Kusairi, Sentoto, Universitas Negeri Yogyakarta, Indonesia; Bulletin of the University of Electro-Communications; January 2002; ISSN 0915-0935; Volume 14, No. 2, pp. 195-209; In Japanese; Copyright; Avail: Issuing Activity

We have been participating in a five-year bilateral project for ”Development of Science and Mathematics Teaching for Primary and Secondary Education” in Indonesia started in 1998, where many Japanese specialists have been delegated in one-month to a-few-year shifts. Furthermore, various kinds of experimental and teaching instruments for physics and electronics have been contributed successively since 2000 to the faculty of mathematics and natural science in three major education

universities; Universitas Pendidikan Indonesia, Universitas Negeri Yogyakarta and Universitas Negeri Malang located in the western, central and eastern Jawa, respectively. Education of the experiments there has been gradually improved. Current circumstances, processes and some proposals on the improvement are discussed in detail, concerning curricula, procedures, manuals and technique of the experiments for the physics, education physics, and incumbent-high-school teacher programs in the department of physics.
Author
Education; Universities; Procedures; Manuals; Physics

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20020087673 General Accounting Office, Washington, DC USA
Highlights of the GAO Roundtable: The Chief Operating Officer Concept: A Potential Strategy to Address Federal Governance Challenges
Oct. 2002; 16p; In English
Report No.(s): PB2003-100334; GAO-03-192SP; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The federal government is in a period of profound transition that requires a comprehensive review, reassessment, reprioritization, and reengineering of what the government does, how it does business, and, in some cases, who does the government's business. Agencies will need to transform their cultures so that they are more results oriented, customer focused, and collaborative in nature.
NTIS
Management Analysis; Governments; Commerce

20020088660 General Accounting Office, Washington, DC USA
Financial Statement Restatements: Trends, Market Impacts, Regulatory Responses, and Remaining Challenges
Oct. 2002; 276p
Report No.(s): PB2003-100921; GAO-03-138; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
A number of well-publicized announcements about financial statement restatements by large, well-known public companies such as Xerox, Enron, and WorldCom have erased billions of dollars of previously reported earnings and raised questions about the credibility of accounting practices and the quality of corporate financial disclosure and oversight in the USA. Industry officials and academics have speculated that several factors may have caused U.S. companies to use questionable accounting practices, including (1) corporate pressure to meet quarterly earnings projections and thus maintain stock prices during and after the market expansion of the 1990s, (2) perverse executive compensation incentives, (3) outdated accounting and rule-based standards, and (4) complex corporate financing arrangements. Industry officials also have testified that public accounting firms independence has been compromised and that they may have faced some pressure to agree with, or ignore, questionable accounting practices in order to keep some clients business. Some of these officials added that increased focus and guidance by the Securities and Exchange Commission (SEC or Commission) on accounting issues in the late 1990s may have prompted more companies to restate previously reported financial statements. This document determines the number of, reasons for, and other trends in financial statement restatements since 1997; analyzes the impact of restatement announcements on the restating companies stock market capitalization; studies available data to determine the impact of financial statement restatements on investors confidence in the existing U.S. system of financial reporting and capital markets; analyzes SEC enforcement actions involving accounting and auditing irregularities; and describes the major limitations of the existing oversight structure and steps that have been and are being taken to ensure the intefrity of corporate financial disclosures and ongoing challenges.
NTIS
Financial Management; Accounting; Industries; Crime

20020088678 Boeing Co., Space and Communications Office, Washington, DC USA
Going Commercial
Walker, Charles D., Boeing Co., USA; Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium; 2002, pp. 107-121; In English; Also announced as 20020088669; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche
Robert Crippen's comments take me back to my college days, when we were first introduced to spaceflight with the MOL opportunity. At that time, I was just beginning to think about what space might mean in my career, although I'd been interested

in space for many years. I had read a lot of science fiction and closely watched Al Shepard's first short jaunt into space followed by Gus Grissom's. Gus Grissom's flight actually brought it home pretty personally because Gus grew up 12 miles from my hometown. Twelve miles in Indiana is a long way, but still everybody is family within the state. So we thought of Gus as a hometown hero, and that impressed upon me that, gosh, real people can go into space. You have to be very well qualified and physically fit to withstand the rigors of spaceflight. But I figured that a small-town boy from Indiana could go into space if he gets a good education. So I went to Purdue University, the same school that Gus went to, and graduated in engineering. Even then, I believed that I was going to design and build spaceflight equipment. It was only in the 1970s, as NASA began to build the first reusable space ship, that I came to the slow realization that, "It's not just the test pilots, not just the Bob Crippens of the world, that are going to get go into space, but scientists and engineers too. Gosh, I am an engineer. Maybe I can do this."
Derived from text
Astronauts; Engineers; Physical Fitness; Space Flight; Test Pilots

20020089584 DN American, Fairmont, WV USA
IV and V Training Needs Assessment Final Report for the Science and Engineering Technical Assessments (SETA) Program ***Final Report, 1 Mar. - 30 Sep. 2002***
Hickey, Crystal, DN American, USA; Muto, Carol, DN American, USA; Tinder, Shelly, DN American, USA; Sep. 12, 2002; 33p; In English
Contract(s)/Grant(s): NAS2-98028; No Copyright; Avail: Issuing Activity
This final report summarizes all activities for the Science and Engineering Technical Assessments (SETA) performed during CTO #26 period of performance March 1, 2002 through September 30, 2002.
Author
Project Management; Education; Computer Systems Performance; Software Reliability

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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.

20020087693 NASA Langley Research Center, Hampton, VA USA
Evaluating the Effectiveness of the 2000-2001 NASA CONNECT(TM) Program
Pinelli, Thomas E., NASA Langley Research Center, USA; Frank, Kari Lou, College of William and Mary, USA; Lambert, Matthew A., College of William and Mary, USA; November 2002; 109p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 332-16-30-03
Report No.(s): NASA/TM-2002-211922; NAS 1.15:211922; L-18234; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report contains the results of the evaluation conducted for the 2000-2001 NASA CONNECT(TM) program conducted in March 2001. The analysis is based on the results collected from 154 surveys collected from educators registered for the program. Respondents indicated that the objectives for each program were met; the programs were aligned with the national (mathematics, science, and technology) standards; the programs were developmentally (grade level) appropriate; and the programs in the 2000-2001 NASA CONNECT(TM) series enhanced/enriched the teaching of mathematics, science, and technology.
Author
Education; Research and Development; Mathematical Programming; Science

20020087811 Institute for Intergovernmental Research, Tallahassee, FL USA
RISS Program: 2000. Regional Information Sharing Systems Program
Apr. 2001; 38p; In English
Report No.(s): PB2003-100803; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Regional Information Sharing Systems (RISS) Program is comprised of six regional intelligence centers operating in mutually exclusive geographic regions that include all 50 states, the District of Columbia, U.S. territories Canada, Australia, and England. This report presents RISS technology highlights, membership, services, and results of member agency investigations supported by RISS center services for calendar year 2000. The Bureau of Justice Assistance (BJA) provides funding oversight

and program management for the RISS Program, which is federally funded. Under BJA Guidelines, all RISS centers must provide information sharing, analytical, and telecommunications services.
NTIS
Information Systems; Intelligence

20020088730 NASA Langley Research Center, Hampton, VA USA
Evaluating the Effectiveness of the 2000-2001 NASA ”Why?” Files Program
Pinelli, Thomas E., NASA Langley Research Center, USA; Frank, Kari Lou, College of William and Mary, USA; Ashcroft, Scott B., Mount Saint Mary’s Coll., USA; Williams, Amy C., Old Dominion Univ., USA; November 2002; 66p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 727-04-20-30
Report No.(s): NASA/TM-2002-211775; NAS 1.15:211775; L-18224; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

NASA ’Why?’ Files, a research and standards-based, Emmy-award winning series of 60-minute instructional programs for grades 3-5, introduces students to NASA; integrates mathematics, science, and technology by using Problem-Based Learning (PBL), scientific inquiry, and the scientific method; and motivates students to become critical thinkers and active problem solvers. All four 2000-2001 NASA ’Why?’ Files programs include an instructional broadcast, a lesson guide, an interactive web site, plus numerous instructional resources. In March 2001, 1,000 randomly selected program registrants participated in a survey. of these surveys, 185 (154 usable) met the established cut-off date. Respondents reported that (1) they used the four programs in the 2000-2001 NASA ’Why?’ Files series; (2) series goals and objectives were met; (3) programs met national mathematics, science, and technology standards; (4) program content was developmentally appropriate for grade level; and (5) programs enhanced/enriched the teaching of mathematics, science, and technology.
Author
Education; Surveys; Schools; Instructors

20020089435 Army Signal Command, Fort Huachuca, AZ USA
Army Transformation and the Network Enterprise Technology Command (NETCOM)
Gentry, Michael L.; Apr. 24, 2002; 22p; In English; Original contains color images
Report No.(s): AD-A406590; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Briefing from the Phoenix Challenge 2002.
DTIC
Electronic Warfare; Computer Networks; Armed Forces (USA); Military Technology

20020089438 Defense Technical Information Center, Fort Belvoir, VA USA
FY2001 Customer Satisfaction Survey Report
Jun. 2001; 22p; In English; Original contains color images
Report No.(s): AD-A406595; No Copyright; Avail: CASI; A03, Hardcopy

Knowledge is the fuel that drives today’s global information technology businesses. Therefore, our continued success or failure depends on our ability to learn what our customers really want and need. to successfully achieve this purpose, it is imperative that we gain a ”customer-valued” perspective of how well we are doing in meeting customer expectations. In other words, do we provide the kind of products, services and customer care that compels customers to choose us rather than other available sources? to ensure that we gain this requisite knowledge, the 2001 Customer Satisfaction Survey, Part 1 of the two part survey process, was specifically designed to meet the following knowledge objectives: 1) to improve customer relations; 2) to determine the quality of customer care and support; 3) to track the effects of change in product and service quality; 4) to indicate staff and process strengths and weaknesses; and 5) to determine the perceived quality of products, services and web pages.
DTIC
Information Systems; Surveys; Human Relations

20020089439 Defense Technical Information Center, Fort Belvoir, VA USA
Top 200 Users Survey Report, *FY 2001*
Sep. 2001; 19p; In English; Original contains color images
Report No.(s): AD-A406596; No Copyright; Avail: CASI; A03, Hardcopy

Our continued success or failure depends on really knowing our customers, especially our core customers. Why? Core customers represent the single best source for our continued growth. to put this into perspective, look at the core customers’ impact

on UTIC's FY 2000 business results. Core ETIC users accounted for 86 percent of all document orders, 86 percent of total billing and 48 percent of all full-text downloads. to successfully achieve this important purpose, it is imperative that we gain a "customer-valued" perspective of how well we are meeting their expectations. In other words, do we provide the kind of products, services and customer care that compels our core customers to remain loyal clients rather than seeking other available sources? The Top 200 User Survey (Part II of the annual survey process) was specifically designed not only to collect critical customer satisfaction data, but also to meet the following objectives: 1) Improve customer retention; 2) Determine the quality of customer care and support; 3) Track the effects of change in product and service quality; 4) Indicate trends in product, service and customer care; and 5) Determine the quality of products, services and web pages.
DTIC
Surveys; Information Systems; Human Relations; Production Engineering

20020089448 QinetiQ Ltd., London UK
Information Capabilities as a Force for Change and Force Multiplier
Sleigh, Andrew; Sep. 25, 2001; 30p; In English; See Also ADM001419 for whole conference on CD-ROM. These papers are from the Harnessing Advanced Technology for C4ISTAR, The Second Annual Advanced Technology Conference, held 25-27 September 2001 at The Great Malvern Theatre Complex
Report No.(s): AD-A406669; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract available.
Author
Information Systems; Military Technology

20020089449 National Security Agency, Central Security Service, Fort Meade, MD USA
Common Criteria for Information Technology Security Evaluation: Department of Defense Public Key Infrastructure and Key Management Infrastructure Token Protection Profile (Medium Robustness)
Mar. 22, 2002; 177p; In English; Original contains color images
Report No.(s): AD-A406677; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
This protection profile (PP) is the result of work done by the National Security Agency (NSA) with guidance from the Department of Defense (DoD) community. It is based on the Smart Card Security User Group Smart Card Protection Profile, Draft Version 2.0, May 1, 2000. The structure for this PP was established through the use of the Common Criteria Toolbox (version 5.0, 28 February 2000). This toolbox was developed by SPARTA, Inc., for the NSA.
DTIC
Information Systems; Security

20020089548 Naval Research Lab., Bay Saint Louis, MS USA
Efficient Storage of Large Volume Spatial and Temporal Point-Data in an Object-Oriented Database
Oliver, David V.; Ladner, Roy V.; McCreedy, Frank P.; Wilson, Ruth A.; May 2002; 21p; In English
Report No.(s): AD-A406876; NRL/BC/7440--02-1001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Data mining applications must deal with large volumes of data. In particular, Spatio-Temporal Information Systems must efficiently store and access potentially very large quantities of spatial and temporal data. Therefore, storing the data in an efficient and useful way is of great importance. Binary Large Objects (BLOBs) are found in many database systems and have been extensively used in typical database applications for the storage of large volume data. In this chapter, we describe the extension of basic BLOBs for specialized use with spatial and temporal data. These ncw repositories, Spatial BLOBs and Temporal BLOBs. add additional functionality for the query and retrieval of the repository's contents in a semantically meaningful, object-oriented form. The repositories are designed as flexible frameworks, decoupled from the particular binary format of their internal contents. Custom plug-ins allow the frameworks to be extended to use a particular binary format that is most appropriate for a given data type.
DTIC
Data Storage; Data Bases; Object-Oriented Programming

20020089561 Naval Postgraduate School, Monterey, CA USA
A Requirement Analysis for the Naval Postgraduate School's Alumni Database System
Gaines, Lawrence M.; Sep. 2002; 102p; In English; Original contains color images
Report No.(s): AD-A406907; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Currently the Naval Postgraduate School's Alumni Database houses the records of nearly twenty-six thousand alumni, however there are over fifty thousand more records that need to be added. Although a database currently exists that attempts to fulfill many of the requirements of an alumni system, it has been determined that overall the current database is inadequate. A need exists to either modify or replace the current system to ensure that all of the Naval Postgraduate School's alumni relation needs are met. A decision is being pondered about whether the creation and management of such a system should be done within the confines of the school or outsourced to another organization, this thesis will aid in that decision making process. Throughout this study, evaluations are made on the feasibility of having an alumni system, and the most cost effective way to obtain it. Assessments and recommendations are also made on issues involving security, accessibility, and the responsibilities of the system's users, as well as the system. In its entirety, this thesis will serve as a foundation for those who will determine how the Naval Postgraduate School will proceed in finding a solution to its alumni needs.
DTIC
Data Bases; Decision Making

20020089608 NASA Langley Research Center, Hampton, VA USA
Evaluating the Effectiveness of the 2001-2002 NASA "Why?" Files Program
Pinelli, Thomas E., NASA Langley Research Center, USA; Frank, Kari Lou, College of William and Mary, USA; Lambert, Matthew A., College of William and Mary, USA; November 2002; 63p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 706-17-41-21
Report No.(s): NASA/TM-2002-211935; NAS 1.15:211935; L-18233; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report contains the results of the evaluation conducted for the 2001-2002 NASA 'Why?' Files program that was conducted in March 2002. The analysis is based on the results of 139 surveys collected from educators registered for the program. Respondents indicated that (1) the programs in the series are aligned with the national mathematics, science, and technology standards; (2) the programs are developmentally (grade level) appropriate; and (3) the programs enhance and enrich the teaching and learning of mathematics, science, and technology.
Author
Education; Surveys; Instructors; Schools

20020090097 Army Command and General Staff Coll., Fort Leavenworth, KS USA
The Role of Public Affairs in Special Operations and Missions
Nye, Edward T.; May 2002; 131p; In English; Original contains color images
Report No.(s): AD-A407059; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This thesis sets out to answer the primary question, How do special operations public affairs officers achieve the required balance between the clear and dominant need for operational security before, during, and after an operation while maintaining the public affairs (PA) imperative of Maximum Disclosure, Minimum Delay? In short, can the special mission community move beyond the no comment or I can neither confirm nor deny approach and adopt a more sophisticated and effective PA plan. Along the way the thesis explored concepts, like Just War, and brought to light the unique societal questions posed by the government's need for secret military units and capabilities and the problems these units pose for a free and open society. Four allied nations--Britain, Australia, New Zealand and Canada--have all experienced public debate about their country's secret military units and have struggled to reevaluate their respective secrecy policies. In the aftermath of the terrorist attacks of 11 September 2001, the American public has not yet joined this debate. When it does, will the Department of Defense's PA policy of not discussing special operations missions withstand public and political scrutiny?
DTIC
Public Relations; Governments; Policies; Security; Warfare; Armed Forces

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes: aviation law; space law and policy; international law; international cooperation; and patent policy

20020088661 General Accounting Office, Washington, DC USA
International Trade: Advisory Committee System Should Be Updated to Better Serve U.S. Policy Needs
Sep. 2002; 124p
Report No.(s): PB2003-100922; GAO-02-876; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In light of these concerns, as well as the launch of a major round of trade talks at the World Trade Organization (WTO) and accelerating negotiations for regional free trade, you asked us to examine the role, structure, and operations of the trade advisory committee system to ensure that it is still poised to meet the objectives set by Congress. In this report, we examine (1) the system's value to U.S. trade policy, (2) participants' level of satisfaction with specific aspects of the consultation process as well as aspects that participants said could be improved, (3) the degree to which the system matches the current U.S. economy and supports U.S. trade policy needs, and (4) the Office of the U.S. Trade Representatives (USTR) and the other agencies management of the system.
NTIS
International Trade; USA; Policies

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see 03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion. For specific technology transfer applications see also the category where the subject is treated.

20020087797 General Accounting Office, Washington, DC USA
Intellectual Property: Federal Agency Efforts in Transferring and Reporting New Technology
Oct. 2002; 106p; In English
Report No.(s): PB2003-100913; GAO-03-47; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Both the Bayh-Dole Act and the Technology Transfer Commercialization Act of 2000 contain requirements that GAO issue a report on the implementation of the acts at least once every 5 years. The primary objective the current report was to provide information on how federal agencies had identified, patented, and licensed inventions created in their own facilities during fiscal years 1997-2001. to obtain information on federal technology transfer programs and to determine the extent to which agencies complied with the reporting requirement of the Technology Transfer Commercialization Act of 2000, we analyzed the activities of the nine federal agencies that each had estimated internal research budgets of at least $500 million in fiscal year 2001. These agencies were the Agricultural Research Service (ARS) within the Department of Agriculture; the Department of the Air Force within the Department of Defense (DOD); the Department of the Army within DOD; the Department of Energy (DOE); the National Aeronautics and Space Administration (NASA); the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce; the National Institutes of Health (NIH) within the Department of Health and Human Services; the Department of the Navy within DOD; and the U.S. Geological Survey (USGS) within the Department of the Interior. to determine what federal agencies had done to improve compliance with reporting requirements under the Bayh-Dole Act, we analyzed the activities of the five agencies that were included in our 1999 report on this issue.
NTIS
Technology Transfer; Commercialization; Government/Industry Relations; Research and Development

89
ASTRONOMY

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

20020087570 NASA Goddard Space Flight Center, Greenbelt, MD USA
Mapping the X-Ray-Emitting Ejecta in Cassiopeia A with Chandra
Hwang, Una, NASA Goddard Space Flight Center, USA; Holt, Stephen S., NASA Goddard Space Flight Center, USA; Petre, Robert, NASA Goddard Space Flight Center, USA; The Astrophysical Journal; Jul. 10, 2000; Volume 537, pp. L119-L122; In English; Original contains color illustrations; Copyright; Avail: Issuing Activity

We present X-ray emission-line equivalent width images of the bright Galactic supernova remnant Cassiopeia A for the elements Si, S, Ar, Ca, and Fe using a 50,000 s observation with the Advanced CCD Imaging Spectrometer on the Chandra X-Ray Observatory. The images essentially map the bulk of detectable ejecta of these elements over a wide range of surface brightnesses and show morphologies distinctly different from that of the broadband X-ray emission and the 4-6 keV continuum emission. The Si, S, Ar, and Ca maps, while different in turn from those of Fe, are similar to the distribution of fast optical ejecta knots in that they clearly delineate the X-ray counterpart of the northeast optical jet. Low surface brightness regions just outside the bright shell in the north and west are also shown to have strong line emission. The strong Fe emission is exterior to that of other elements in

the east, as previously noted, but is generally coincident elsewhere. The projected interior has relatively little emission traced by high line equivalent widths.
Author
X Ray Astronomy; Supernova Remnants; Cassiopeia A; Ejecta; Emission Spectra

20020087571 NASA, Washington, DC USA
Crab Pulsar
Oct. 02, 2002; In English; 1 hr., 48 min. playing time, in color, no sound
Report No.(s): NONP-NASA-VT-2002135371; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

Two of NASA's greatest observatories, the Chandra X-Ray Observatory and the Hubble Space Telescope have produced this new action movie of the Crab Pulsar. The Crab Pulsar was first observed by Chinese astronomers in 1050 A.D. and has since become one of the most studied objects in the sky. by combining the power of both Chandra and Hubble, the movie, made from multiple observations from several months, reveals features never seen in still images. By understanding the Crab Pulsar, astronomers hope to unlock the secrets of how similar objects across the universe are powered.
CASI
Pulsars; X Ray Astrophysics Facility; Hubble Space Telescope

20020087572 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Chandra X-Ray Study of Cygnus A, 3, The Cluster of Galaxies
Smith, David A., Maryland Univ., USA; Wilson, Andrew S., Maryland Univ., USA; Arnaud, Keith A., NASA Goddard Space Flight Center, USA; Terashima, Yuichi, Maryland Univ., USA; Young, Andrew J., Maryland Univ., USA; Astrophysical Journal; Jan. 20, 2002; Volume 565, pp. 195-207; In English
Contract(s)/Grant(s): NAS8-1027; Copyright; Avail: Issuing Activity

We present an analysis of the Chandra Advanced CCD Imaging Spectrometer (ACIS) observation of the intracluster gas associated with the cluster of galaxies surrounding Cygnus A. The dominant gaseous structure is a roughly elliptical (presumably prolate spheroidal in three dimensions) feature with semimajor axis approximately equal to 1.(prime)1 (approximately equal to 100 kpc). This structure apparently represents intracluster gas that has been swept up and compressed by a cavity inflated in this gas by relativistic material that has passed through the ends of the radio jets. The X-ray-emitting gas shows this prolate spheroidal morphology to approximately equal to 1.(prime)2 (110 kpc) from the radio galaxy but is spherical on larger scales. The X-ray emission from the intracluster gas extends to at least 8 prime (approximately equal to 720 kpc) from the radio galaxy, and a second, extended source of X-ray emission (probably associated with a second cluster of galaxies) is seen some 12 prime (approximately equal to 1 Mpc) to the northwest of Cygnus A. The X-ray spectrum of the integrated intracluster gas imaged on the S3 chip (dimensions 8 prime x 8 prime = 720 x 720 kpc), excluding the contribution from the radio galaxy and other compact sources of X-ray emission, has a gas temperature, metallicity, and unabsorbed 2-10 keV rest-frame luminosity of 7.7 keV, 0.34 times solar, and 3.5 x 10(exp 44) ergs per second, respectively. We have projected the X-ray spectra taken from 12 elliptical and circular annuli in order to derive a run of temperature, metallicity, density, and pressure as a function of radius. The temperature of the X-ray-emitting gas drops from approximately equal to 8 keV more than 100 kpc from the center to approximately equal to 5 keV some 80 kpc from the center, with the coolest gas immediately adjacent to the radio galaxy. "Belts" of slightly cooler (approximately equal to 4 keV) X-ray-emitting gas run around the minor dimension of the cavity created by the radio source, while the limb-brightened edges of the cavity are slightly hotter (approximately equal to 6 keV), perhaps as a result of heating by a bow shock driven by the probably expanding cavity into the intracluster gas. There is a metallicity gradient in the X-ray-emitting gas, with the highest metallicities (approximately solar) found close to the center, decreasing to approximately 0.3 times solar in the outer parts. We have used the assumption of hydrostatic equilibrium to derive a total cluster mass within 500 kpc of 2.0 x 10(exp 14) solar mass and 2.8 x 10(exp 14) solar mass for constant and centrally decreasing temperature profiles, respectively. The total mass of X-ray-emitting gas within the same radius is 1.1 x 10(exp 13) solar mass. Thus, the gas fraction of the cluster within 500 kpc is 0.055 and 0.039 for the constant and centrally decreasing temperature profiles, respectively.
Author
Cygnus Constellation; X Ray Astronomy; Intergalactic Media; Radio Galaxies; Emittance; X Ray Astrophysics Facility; Galactic Clusters

20020087662 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Chandra X-ray Study of Cygnus A, 2, The Nucleus
Young, Andrew J., Maryland Univ., USA; Wilson, Andrew, Maryland Univ., USA; Terashima, Yuichi, Maryland Univ., USA; Arnaud, Keith A., NASA Goddard Space Flight Center, USA; Smith, David A., Maryland Univ., USA; The Astrophysical Journal;

Jan. 01, 2002; Volume 564, pp. 176-189; In English
Contract(s)/Grant(s): NAG8-1027; NAG8-1755; Copyright; Avail: Issuing Activity

We report Chandra Advanced CCD Imaging Spectrometer and quasi-simultaneous Rossi X-Ray Timing Explorer (RXTE) observations of the nearby, powerful radio galaxy Cygnus A, with the present paper focusing on the properties of the active nucleus. In the Chandra observation, the hard (less than a few keV) X-ray emission is spatially unresolved with a size is approximately 1" (1.5 kpc, H(sub 0) = 50 km/s/Mpc) and coincides with the radio and near-infrared nuclei. In contrast, the soft (less than 2 keV) emission exhibits a bipolar nebulosity that aligns with the optical bipolar continuum and emission-line structures and approximately with the radio jet. In particular, the soft X-ray emission corresponds very well with the [O III] (lambda)5007 and H(alpha) + [N II] lambda(lambda)6548, 6583 nebulosity imaged with Hubble Space Telescope. At the location of the nucleus, there is only weak soft X-ray emission, an effect that may be intrinsic or result from a dust lane that crosses the nucleus perpendicular to the source axis. The spectra of the various X-ray components have been obtained by simultaneous fits to the six detectors. The compact nucleus is detected to 100 keV and is well described by a heavily absorbed power-law spectrum with Gamma(sub h) = 1.52(sup + 0.12, sub -0.12) (similar to other 0.12 narrow-line radio galaxies) and equivalent hydrogen column N(sub H)(nuc) = 2.0(sup +0.1, sub -0.1) x 10(exp 23)/sq cm. This 0.2 column is compatible with the dust obscuration to the near-infrared source for a normal gas-to-dust ratio. The soft (less than 2 keV) emission from the nucleus may be described by a power-law spectrum with the same index (i.e., Gamma(sub l) = Gamma(sub h), although direct fits suggest a slightly larger value for Gamma(sub l). Narrow emission lines from highly ionized neon and silicon, as well as a "neutral" Fe K(alpha) line, are detected in the nucleus and its vicinity (r approximately less than 2 kpc). The equivalent width (EW) of the Fe K(alpha) line (182(sup +40, sub -54) eV) is in good agreement with theoretical predictions for the EW versus N(sub H)(nuc) relationship in various geometries. An Fe K edge is also seen. The RXTE observations indicate a temperature of kT = 6.9(sup +0., sub -1.0) keV for the cluster gas (discussed in Paper III of this series) and cluster emission lines of Fe K(alpha) and Fe K(beta) and/or Ni K(alpha). We consider the possibility that the extended soft X-ray emission is electron-scattered nuclear radiation. Given that 1% of the unabsorbed 2 - 10 keV nuclear radiation would have to be scattered, the necessary gas column [N(sub H)(Scattering) approx. = 3.5 x 10(exp 22)/sq cm] would absorb the X-rays rather than scatter them if the gas is cold. Thus, the scattering plasma must be highly ionized. If this ionization is achieved through photoionization by the nucleus, the ionization parameter zeta greater than 1 ergs cm/s and the electron density n(sub e) approx. = 6 cc given the observed distance of the soft X-ray emission from the nucleus. The electron column density inferred from the X-ray observations is much too low to account for the extended optical scattered light, strongly suggesting that the polarized optical light is scattered by dust. The presence of highly ionized Ne lines in the soft X-ray spectrum requires 20 ergs cm/s approximately less than zeta approximately less than 300 ergs cm/s these lines may originate closer to the nucleus than the extended soft continuum or in a lower density gas. A collisionally ionized thermal model of the extended soft X-rays cannot be ruled out but is unattractive in view of the low metal abundance required (Z = 0.03 Z(mass)). The hard X-ray to far-infrared ratio for the nucleus of Cygnus A is similar to that seen in Seyfert 1 and unobscured radio galaxies. by means of the correlation between hard X-ray luminosity and nuclear optical absolute magnitude for these classes of object, we estimate M(sub B) = -22.4 for Cygnus A, near the .borderline between Seyfert galaxies and QSOs.
Author
Electron Density (Concentration); Electron Radiation; Emission Spectra; Hydrogen; Ionized Gases; Polarized Light; Radio Galaxies; Seyfert Galaxies

20020087723 Stanford Linear Accelerator Center, Stanford, CA USA
Observation of X-Ray Variability in the BL Lac Object 1ES1959+65
Giebels, B.; Feb. 07, 2002; 23p; In English
Report No.(s): DE2002-799005; SLAC-PUB-9140; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper reports X-ray spectral observations of a relatively nearby (z = 0.048) BL Lacertae (BL Lac) object IES1959+65 which is a potential TeV emitter. The observations include 31 short pointings made by the Unconventional Stellar Aspect (USA) Experiment on board the Advanced Research and Global Observation Satellite (ARGOS), and 17 pointings by the PCA on board the Rossi X-ray Timing Explorer (RXTE). Most of these observations were spaced by less than 1 day. IES1959+65 was detected by the ARGOS USA detector in the range 1-16 keV, and by the PCA in the 2-16 keV range but at different times. During the closely spaced RXTE observations beginning on 2000 July 28, an ending of one flare and a start of another are visible, associated with spectral changes, where the photon index ranges between approx. 1.4 and 1.7, and the spectrum is harder when the source is brighter. This implies that IES1959+65 is an XBL-type blazar, with the X--ray emission likely to originate via the synchrotron process. The USA observations reveal another flare that peaked on 2000 November 14 and doubled the flux within a few days, again associated with spectral changes of the same form.
NTIS
BL Lacertae Objects; X Ray Astronomy; X Rays

20020087868 Fermi National Accelerator Lab., Batavia, IL USA
Finding Clusters of Galaxies in the Sloan Digital Sky Survey using Voronoi Tessellation
Kim, R. S. J.; Sep. 27, 2001; 2p; In English
Report No.(s): DE2001-786821; FERMILAB-CONF-01/278-A; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Sloan Digital Sky Survey has obtained 450 square degrees of photometric scan data, in five bands (u, g, r, I, z,), which we use to identify clusters of galaxies. We illustrate how we do star-galaxy separation, and present a simple and elegant method of detecting over-densities in the galaxy distribution, using the Voronoi Tessellation.
NTIS
Galaxies; Star Clusters; Sky Surveys (Astronomy); Galactic Clusters

90
ASTROPHYSICS

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

20020087581 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Seyfert-Starburst Connection in X-rays, 2, Results and Implications
Levenson, N. A., Johns Hopkins Univ., USA; Weaver, K. A., NASA Goddard Space Flight Center, USA; Heckman, T. M., Johns Hopkins Univ., USA; Astrophysical Journal; Mar. 20, 2001; Volume 550, pp. 230-242; In English
Contract(s)/Grant(s): NAG5-6917; NAG5-6400; Copyright; Avail: Issuing Activity

We present the results of X-ray imaging and spectroscopic analysis of a sample of Seyfert 2 galaxies that contain starbursts, based on their optical and UV characteristics. These composite galaxies exhibit extended, soft, thermal X-ray emission, which we attribute to their starburst components. Comparing their X-ray and far-infrared properties with ordinary Seyfert and starburst galaxies, we identify the spectral characteristics of their various intrinsic emission sources. The observed far-infrared emission of the composite galaxies may be associated almost exclusively with star formation, rather than the active nucleus. The ratio of the hard X-ray luminosity to the far-infrared and [O III] (lambda)5007 luminosity distinguishes most of these composite galaxies from ”pure” Seyfert 2 galaxies, while their total observed hard X-ray luminosity distinguishes them from ”pure” starbursts. The hard nuclear X-ray source is generally heavily absorbed (N(sub H) greater than 10(exp 23)/sq cm) in the composite galaxies. Based on these results, we suggest that the interstellar medium of the nuclear starburst is a significant source of absorption. The majority of the sample are located in groups or are interacting with other galaxies, which may trigger the starburst or allow rapid mass infall to the central black hole or both. We conclude that starbursts are energetically important in a significant fraction of active galaxies and that starbursts and active galactic nuclei may be part of a common evolutionary sequence.
Author
Seyfert Galaxies; Starburst Galaxies; X Ray Imagery; Spectroscopic Analysis; Optical Properties; Ultraviolet Imagery; Active Galactic Nuclei

20020087587 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Seyfert-Starburst Connection in X-rays, 1, The Data
Levenson, N. A., Johns Hopkins Univ., USA; Weaver, K. A., NASA Goddard Space Flight Center, USA; Heckman, T. M., Johns Hopkins Univ., USA; Astrophysical Journal; April 2002; Volume 133, No. 2, pp. 133-269; In English
Contract(s)/Grant(s): NAG5-6917; NAG5-6400; NAGW-2166; Copyright; Avail: Issuing Activity

We analyze X-ray spectra and images of a sample of Seyfert 2 galaxies that unambiguously contain starbursts, based on their optical and UV characteristics. Although all sample members contain active galactic nuclei (AGNs), supermassive black holes or other related processes at the galactic centers alone cannot account for the total X-ray emission in all instances. Eleven of the 12 observed galaxies are significantly resolved with the ROSAT High Resolution Imager, while six of the eight sources observed with the lower resolution Position Sensitive Proportional Counter also appear extended on larger scales. The X-ray emission is extended on physical scales of 10 kpc and greater, which we attribute to starburst-driven outflows and supernova heating of the interstellar medium. Spectrally, a physically motivated composite model of the X-ray emission that includes a heavily absorbed (N(sub H) greater than 10(exp 23)/sq cm) nuclear component (the AGN), power-law-like scattered AGN flux, and a thermal starburst describes this sample well. Half the sample exhibit iron K(alpha) lines, which are typical of AGNs.
Author
X Ray Spectra; Ultraviolet Spectra; Active Galactic Nuclei; Interstellar Matter; Seyfert Galaxies; Starburst Galaxies

20020087850 Stanford Linear Accelerator Center, Stanford, CA USA
Gauged Supergravities and de Sitter Space and Cosmology
Shmakova, M.; Oct. 11, 2001; 30p; In English
Report No.(s): DE2002-798887; SLAC-PUB-9016; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Supergravity; Cosmology

20020087873 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
MAXIMA and MAXIPOL experiments
Richards, P. L.; Abroe, M.; Ade, P.; Balbi, A.; Bock, J.; Sep. 20, 2001; 6p; In English
Report No.(s): DE2001-788082; LBNL-48948; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Bolometers; Anisotropy

20020087887 Fermi National Accelerator Lab., Batavia, IL USA
Applying chimera virtual data concepts to cluster finding in the Sloan Sky Survey
Annis, J.; Aug. 13, 2002; 15p; In English
Report No.(s): DE2002-798733; FERMILAB-CONF-02-180-A; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The GriPhyN project is one of several major efforts working to enable large-scale data intensive computation as a routine scientific tool. One of GriPhyN's scientific collaboration partners is the Sloan Digital Sky Survey (SDSS), a digital imaging survey that will, by the end of 2005, have mapped a quarter of the sky in five colors with a sensitivity of two orders of magnitudes greater than previous large sky surveys. The availability of this data online is particularly useful if astronomers can apply computationally intensive analysis. We consider here the example of identifying clusters of galaxies, which are the largest gravitationally dominated structures in the universe.
NTIS
Galaxies; Sky Surveys (Astronomy); Digital Techniques

20020089462 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Telescope Scientist on the Advanced X-ray Astrophysics Observatory ***Annual Report, 1 Oct. 2001 - 30 Sep. 2002***
VanSpeybroeck, L., Smithsonian Astrophysical Observatory, USA; November 2002; 26p; In English
Contract(s)/Grant(s): NAG8-1607; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This period included many scientific observations made with the Chandra Observatory. The results, as is well known, are spectacular. Fortunately, the High Resolution Mirror Assembly (HRMA) performance continues to be essentially identical to that predicted from ground calibration data. The Telescope Scientist Team has improved the mirror model to provide a more accurate description to the Chandra observers and enable them to reduce the systematic errors and uncertainties in their data reduction. We also have made considerable progress in improving the scattering model. There also has been progress in the scientific program. At this time 58 distant clusters of galaxies have been observed. We are performing a systematic analysis of this rather large data set for the purpose of determining absolute distances utilizing the Sunyaev Zel'dovich effect. These observations also have been used to study the evolution of the cluster baryon mass function and the cosmological constraints which result from this evolution. Derived from text
X Ray Astrophysics Facility; Observatories; Telescopes; Cosmology; Astronomical Models; X Ray Optics

20020090115 Centre National de la Recherche Scientifique, France
Incompatible Trace Elements in SNCs and Li Isotopes Systematics in a Shergottite
Barrat, J. A., Centre National de la Recherche Scientifique, France; Beck, P., Ecole Normale Superieure, France; Chaussidon, M., Centre de Recherches Petrographiques et Geochimiques, France; Gillet, Ph., Ecole Normale Superieure, France; Jambon, A., Paris VI Univ., France; Goepel, C., Institut de Physique et Chimie des Materiaux de Strasbourg, France; Slautter, V., National Museum of Natural History, France; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 7-8; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In this paper, we report on two aspects of our recent investigations on Martian meteorites: 1/ Li and incompatible trace element abundances in shergottites and nakhlites and 2/ the Li isotopes systematics during the crystallization of the North West Africa 480 shergottite (NWA 480). Li is seen by many workers as a key element for tracing fluids during the genesis of nakhlites and shergottites.
Author
Shergottites; Trace Elements; SNC Meteorites; Lithium Isotopes; Mars Surface

20020090116 New Mexico Univ., Albuquerque, NM USA
Exploring Trace Element and Isotopic Mixing Relationships in the Martian Meteorite Suite
Borg, Lars E., New Mexico Univ., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 9-10; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Variations in the incompatible trace element and isotopic systematics of the martian meteorites are consistent with mixing of compositionally distinct materials. One end of the mixing array is defined by a component characterized by a strongly light-rare-earth-element depleted pattern, a low SR-87/SR-86 ratio, and a high epsilon (sub Nd)(sup 143) value. In many ways this component is comparable to the Earth's depleted mantle. The second component is characterized by a light-rare-earth-element enriched pattern, a high SR-87/SR-86 ratio, and a low epsilon (sub Nd)(sup 143) value. This component could be analogous to the Earth's crust, or a late stage liquid trapped in the cumulate pile of a magma ocean. The nature of this "enriched" component ultimately underscores whether the compositional variations observed in the martian meteorites reflect differentiation in the crust (i.e. assimilation fractional crystallization) or are inherited from their source regions at the time of melting. Below, fundamental mixing relationships are reviewed and a mechanism to produce the compositional variations observed in the martian meteorites is proposed.
Derived from text
SNC Meteorites; Isotope Ratios; Strontium; Trace Elements; Mars Surface; Planetary Geology

20020090117 Rutgers Univ., Dept. of Geological Sciences, Piscataway, NJ USA
What Should We Looking for in Martian Meteorites? Is Evidence of Crustal Process or Mantle Process More Important...and to Whom?
Delaney, Jeremy S., Rutgers Univ., USA; Dyar, M. D., Mount Holyoke Coll., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 11-12; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The "sampling" of Mars, both remotely and by meteorites, provides evidence for a range of reducing and oxidizing environments. Processes that modified the crust and mantle on Mars are clearly as diverse as those on the Earth with regard to oxygen fugacity. Increasingly compelling evidence for the presence of water in the near surface regime provides a potentially oxidizing near-surface environment, especially when coupled with increasing hydrogen loss from the planet through time. Dewatering of the mantle and the purported absence of global crust-mantle recycling perhaps accounts for the apparent reducing regime that dominates the source regions of many of the meteorite samples when compared to samples of the Earth's mantle.
Derived from text
Dewatering; Mars (Planet); SNC Meteorites; Planetary Crusts; Earth Mantle

20020090119 Mount Holyoke Coll., Dept. of Earth and Environment, South Hadley, MA USA
Moessbauer Spectroscopy of SNC Meteorites
Darby, M., Mount Holyoke Coll., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 15-16; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

With the inclusion of Moessbauer spectrometers in the instrument payloads of both MER landers in the upcoming Athena mission, it is timely to re-examine Moessbauer data on SNC meteorites and fill the gaps in our state of knowledge. Much of this work was done by Roger Burns ten years ago on whole rock samples, but the research effort was cut short in 1993. In this project, we are summarizing existing Moessbauer spectra of SNC meteorites and showcasing new results from a state-of-the-art spectrometer customized to accommodate smaller (less than 10 mg) samples. The results demonstrate the problems inherent in drawing conclusions about individual phases chemistry on the basis of Moessbauer spectra of whole rock samples.
Derived from text
Meteoritic Composition; Mossbauer Effect; SNC Meteorites; Spectroscopy; Mineralogy

20020090120 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA

Petrogenesis of Olivine-Phyric Shergottites Sayh Al Uhaymir 005 and Elephant Moraine A79001 Lithology A

Goodrich, Cyrene Anne, Hawaii Univ., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 17-18; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Martian meteorites Sayh al Uhaymir (SaU) 005 and lithology A of EETA79001 (EET-A) belong to a newly emerging group of olivine-phyric shergottites. Previous models for the origin of such shergottites have focused on mixing between basaltic shergottite-like magmas and lherzolitic shergottite-like material. Results of this work, however, suggest that SaU 005 and EET-A formed from olivine-saturated magmas that may have been parental to basaltic shergottites.

Derived from text

Lithology; Olivine; Petrogenesis; Shergottites; Glacial Drift

20020090121 Planetary Science Inst., Tucson, AZ USA

Mars Meteorite Statistics and the Martian Uplands

Hartmann, W. K., Planetary Science Inst., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 19; In English; Also announced as 20020090114; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A significant fraction of Mars, perhaps 30-50%, is covered by heavily cratered uplands. The high crater densities constrain their ages to be greater than 2 Gy or even 3 Gy. A somewhat smaller fraction is covered by young lava plains with crater retention ages less than 1.5 Gy, and even less than 0.5 Gy over wide areas of Tharsis, Amazonis, and Elysium. These young ages for basaltic lava plains agree with ages of Martian basaltic meteorites. The problem is that all but one of the 4 to 8 sample sites of SNCs lie in the age range of 0.2 to 1.3 Gy, and the other one is a sample of primordial crust of 4.5 Gy age. These data suggest that the Martian uplands do not efficiently launch meteorites. MGS and Odyssey data imply that the upper latitude Hesperian/Noachian Martian uplands, older than 2 to 3 Gy, are impregnated with near-surface ice. Furthermore, direct geometric considerations of crater areal coverage show that they have been pulverized into megaregolith, although that material itself may be recemented by salts, carbonates, and ice. Thus, the Martian uplands probably do not launch meteorites as effectively as the young basaltic plains, and those that are launched may be rich in rock types that are unfamiliar as meteorites. These considerations should affect future meteorite collection strategies.

Author

Mars (Planet); SNC Meteorites; Mars Craters; Mars Surface; Geochronology

20020090123 Lamont-Doherty Geological Observatory, Palisades, NY USA

SNC Meteorites and Their Source Composition(s)

Longhi, John, Lamont-Doherty Geological Observatory, USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 33-34; In English; Also announced as 20020090114; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Detailed chemical and isotopic measurements reveal complexities in planetary differentiation that will make any reconstruction of the SNC source region difficult. Recent age determinations of shergottites have resolved a long-standing uncertainty in their crystallization ages in favor of ages in the range of 200 to 400 Ma. These young ages, together with 1.3 Ga ages of the Nahklites and Chassigny, require that the SNC source regions maintained more pronounced depletions of incompatible elements than the terrestrial MORB source since primordial differentiation (4.525 Ga) and that the parent magmas of the classical shergottites (Shergotty, Zagami) assimilated a long term light-REE enriched component (crust). The isotopic evidence indicates little or no mixing between differentiated and primitive mantle or between differentiated mantle and crust during martian history. Estimated SNC parent magma compositions have lower Al2O3 concentrations than terrestrial MORB and OIB. These low Al2O3 contents are consistent with highly depleted source regions as inferred from the isotopic data. New modeling of polybaric melting reveals that the extent of the depletion in terms of major elements is greater than expected for basalt extraction. There are two general scenarios consistent with the major elements: one is that the portion of the martian mantle from which the SNC magmas are derived is a magma ocean cumulate; the other is that initial melts in a polybaric fractional fusion event were never aggregated with later melts (possibly the inial melts were too dense). Loss of the initial melts is also consistent with the extremely high Sm/Nd ratios inferred for the parent magmas of the Antarctic shergottites.

Author

Crystallization; SNC Meteorites; Meteoritic Composition; Mars (Planet); Planetary Mantles

20020090132 National Museum of Natural History, Paris, France

Is Olivine Speedometer a Reliable Tool to Constrain Thermal Story of SNC Meteorite?

Sautter, V., National Museum of Natural History, France; Barrat, J. A., Centre National de la Recherche Scientifique, France; Jambon, A., Paris VI Univ., France; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 51; In English; Also announced as 20020090114; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Several quantitative studies on thermal stories of SNC meteorites have been carried out to infer burial depth. Two approaches are generally used: (i) indirect estimation based on textural observation compared with products from controlled cooling crystallization experiment (ii) direct quantitative cooling rate calculation from diffusion zoning in mineral. The first method, applied on basaltic shergottite, is largely based on textures and compositions of pyroxene and/or maskelinite. The second one, performed on picritic shergottite (EET79001 and Dar al Gani 476) and the nakhlite NWA 817, uses zoning of olivine to extract cooling rate. At the onset of cooling, olivine was homogeneous and was then modified by atomic diffusion due to contact with Fe-rich surrounding melt when olivine was incorporated as a xenocryst. It had long been argued that olivine speedometer, giving absolute cooling rate, was the reliable method compared to the first one which bears large uncertainties. Unfortunately any contribution using olivine as a speedometer in meteorites are negligent (or at least optimistic) about the assignment of uncertainties to cooling rate estimate. In such studies numerical procedures, where diffusion equation is solved by finite difference approximation, are generally preferred to analytical one. However error propagation becomes obvious when using analytical methods in as much they allow the dependence of cooling rate results on input parameter to be clearly seen. For instance temperature to and diffusion data (E the activation energy and Do the preexponential term of diffusion coefficient D expressed through the Arrhenius law) are first order parameters in cooling rate equation. Small errors on temperature and diffusion data are magnified due to the logarithmic relation ship between input T and cooling rate S.

Author

Minerals; Olivine; SNC Meteorites; Speed Indicators; Temperature Distribution; Approximation

20020090134 Tokyo Metropolitan Univ., Dept. of Chemistry, Hachiouji, Japan

Chemical Composition of Newly Collected Antarctic Nakhlites, Y000593 and Y000749

Shirai, N., Tokyo Metropolitan Univ., Japan; Oura, Y., Tokyo Metropolitan Univ., Japan; Ebihara, M., Tokyo Metropolitan Univ., Japan; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 55-56; In English; Also announced as 20020090114; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Y000593 and a possibly paired meteorite Y000749 are grouped into nakhlites, a group of SNC meteorites, by their noble gas compositions. They are the first nakhlite recovered on Antarctica. So far about 30 SNC meteorites (shergottite, nakhlite and chassignite) have been identified, most of which are classified into shergottites. Nakhlites are rare, to which 6 meteorites including Y000593 and Y000749 belong. In this study, we have analyzed Y000593, Y000749 and Nakhla for their bulk chemical compositions by nuclear analytical methods. At the Antarctic meteorite symposium at NIPR of this year, we I reported some preliminary results. We have being continuing a suit of analyses and their results are presented in this workshop.

Author

Antarctic Regions; Chemical Composition; Nakhlites; Rare Gases; SNC Meteorites

20020090135 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA

Some Puzzles About What Noble Gas Components Were Mixed into the Nakhlites, and How

Swindle, T. D., Arizona Univ., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 57-58; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Nakhlites, the intermediate-aged (approximately 1300 Ma) Martian meteorites, are similar to one another in noble gas characteristics, as well as mineralogy, but distinct from other Martian meteorites. There are also are subtle differences among the well-studied nakhlites (Nakhla, Lafayette, and Governador Va ladares), which may be important in understanding the processes affecting Martian volatiles. This abstract will summarize some noble gases properties of Martian meteorites, particularly nakhlites, and then highlight five unanswered questions. to first order, Xe in these meteorites appears to be a mixture of an interior component, seen mostly clearly in Chassigny, and an atmospheric component seen mostly clearly in shergottites like EETA 79001. Nakhlites are rich in the atmospheric component (Nakhla being the richest), but the component appears to be elementally fractionated, with a higher Xe/Kr ratio than the (atmospheric) component seen in EETA 79001. Nakhlite Ar has been studied most in the context of Ar- Ar age experiments. All three appear to be about 1300 Ma old, but with some disturbances to the system, most noticeable in Nakhla. Shergottites all appear to have either incorporated variable amounts of two different Ar components

(interior and atmosphere?), to have incorporated different components from one another, or to have incompletely degassed upon formation.
Author
Nakhlites; Rare Gases; SNC Meteorites; Geochronology; Mineralogy; Mars Atmosphere

20020090139 Max-Planck-Inst. fuer Chemie, Mainz, Germany
New Aspects in the Isotope Systematics of Shergotites
Jagoutz, E., Max-Planck-Inst. fuer Chemie, Germany; Dreibus, G., Max-Planck-Inst. fuer Chemie, Germany; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 25-26; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Ten years ago we had 7 SNC meteorites while today we have 26 SNC meteorites. The newly found SNC's are essentially duplicates of the previously ones with some slight variations in their chemical composition. It seems that there are only a limited number of lithologies present on the SNC parent body, and we have already sampled the prominent lithologies. For many years the 'ages' of SNC meteorites have been under discussion. The 150 Ma to 500 Ma mineral ages for shergotites will be called the young or 180 Ma event, and will be the main focus in this contribution. Nyquist argued that the 180 Ma event might represent the age of crystallization. Indeed we have good evidence that some mineral equilibration took place at this time since in some cases Rb-SR and Sm-Nd systematics give the same age. However, the conclusion that shergotites are magmatic rocks that were erupted at this time is not substantiated by data. To the contrary there is good evidence that a chemical fractionation, which is typical for magmatic rocks (Rb- SR fractionation), was not associated with the young disturbance. Instead we find chemical fractionation patterns (Sm-Nd fractionation) that are not observed in any basalts.
Author
Chemical Composition; SNC Meteorites; Radioactive Isotopes; Shergottites; Geochronology

20020090140 NASA Johnson Space Center, Houston, TX USA
SNC Meteorites and Martian Reservoirs
Jones, J. H., NASA Johnson Space Center, USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 27-28; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Jones first suggested that the inverse covariation of initial epsilon (Nd-143) and SR-87/SR-86 of the shergottites could be explained by interaction between mantle-derived magmas with another isotopic reservoir(s) (i.e., assimilation or contamination). In that model, magmas were generated in a source region that was isotopically similar to the Nakhla source and the second reservoir(s) was presumed to be crust. The text also permitted the second reservoir to be another type of mantle, but I can confirm that a second mantle reservoir was never seriously considered by that author. Other features of this model were that (i) it occurred at a particular time, 180 m.y. ago, and (ii) the interacting reservoirs had been separated at approximately 4.5 b.y. In a later paper Jones explored this mixing model more quantitatively and concluded that magmas from a Nakhla-like source region at 180 m.y. would fall on or near an isotopic Nd-SR-Pb hyperplane defined by the shergottites. This criterion was a necessary prerequisite for the parent magma(s) of the shergottites to have initially been Nakhla-like isotopically. At this juncture, it is perhaps worthwhile to note that this mixing model was not presented to explain geochemical variations but as a justification for a 180 m.y. crystallization age for the shergottites and a 1.3 b.y. crystallization age for the nakhlites. In the mid-1980's crystallization ages estimated for Nakhla ranged from approximately 1.3 b.y to 4.5 b.y. Similarly, preferred crystallization ages for the shergottites ranged from 360 m.y., to 1.3 b.y., to 4.5 b.y. In all these models, the 180 m.y. event seen in the shergottites was deemed to be metamorphic. The fit between the Nakhla-like source region and the shergottite hyperplane was a validation both of the 1.3 b.y. igneous age of Nakhla and the 180 m.y. igneous age of the shergottites.
Author
Geochemistry; Mars (Planet); Metamorphism (Geology); SNC Meteorites; Geochronology; Planetary Mantles; Reservoirs

20020090253 Colorado Univ., Lab. for Atmospheric and Space Physics, Boulder, CO USA
COLLIDE-2: Collisions Into Dust Experiment-2 ***Final Report, Jan. 1999 - 15 Nov. 2002***
Colwell, Joshua E., Colorado Univ., USA; Nov. 15, 2002; 35p; In English
Contract(s)/Grant(s): NAG3-2267; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Collisions Into Dust Experimental (COLLIDE-2) was the second flight of the COLLIDE payload. The payload performs six low-velocity impact experiments to study the collisions that are prevalent in planetary ring systems and in the early stages of planet formation. Each impact experiment is into a target of granular material, and the impacts occur at speeds between 1 and 100 cm/s in microgravity and in a vacuum. The experiments are recorded on digital videotape which is later analyzed. During the

period of performance a plan was developed to address some of the technical issues that prevented the first flight of COLLIDE from being a complete success, and also to maximize the scientific return based on the science results from the first flight. The experiment was modified following a series of reviews of the design plan, and underwent extensive testing. The data from the experiment show that the primary goal of identifying transition regimes for low-velocity impacts based on cratering versus accretion was achieved. Following a brief period of storage, the experiment flew regimes for low-velocity impacts based on cratering versus accretion was achieved. as a Hitchhiker payload on the MACH-1 Hitchhiker bridge on STS-108 in December 2001. These data have been analyzed and submitted for publication. That manuscript is attached to this report. The experiment was retrieved in January 2002, and all six impact experiments functioned nominally. Preliminary results were reported at the Lunar and Planetary Science Conference.
Author
Spaceborne Experiments; Collisions; Impact; Low Speed

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20020087565 Arizona State Univ., Dept. of Geological Sciences, Tempe, AZ USA
Small Impacts on Mars: Atmospheric Effects ***Final Report, 15 Aug. 1999 - 14 Aug. 2002***
Greeley, Ronald, Arizona State Univ., USA; Nemtchinov, Ivan V., Academy of Sciences (USSR), USSR; Oct. 28, 2002; 21p; In English
Contract(s)/Grant(s): NAG5-8721
Report No.(s): ASU-PVA-6561/TE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objectives of this investigation were to study the interaction of the atmosphere with the surface of Mars through the impact of small objects that would generate dust and set the dust into motion in the atmosphere. The approach involved numerical simulations of impacts and experiments under controlled conditions. Attachment: Atmospheric disturbances and radiation impulses caused by large-meteoroid impact in the surface of Mars.
Author
Atmospheric Effects; Mars Surface; Dust

20020087578 Massachusetts Inst. of Tech., Center for Space Research, Cambridge, MA USA
Investigation of Venus Surface Properties ***Final Report, Jun. 1995 - Dec. 2001***
Ford, Peter G., Massachusetts Inst. of Tech., USA; Sep. 18, 2002; 4p; In English
Contract(s)/Grant(s): NAGW-4351; NAG5-4047; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Strong localized radar echoes have been observed at decimeter wavelengths from the highlands of Venus since the earliest radar maps were obtained over 30 years ago. These echoes are some five to ten times stronger than those from the presumably basaltic rocks seen at lower altitudes elsewhere on Venus. Observations of thermal emission from the visible disk of Venus at wavelengths corresponding to those used in the radar mapping confirm that the regions of high reflectivity also exhibit low emissivity, as expected from considerations of detailed thermodynamic balance. Two possibilities have been put forward to explain this unexpected aspect of the Venus highlands: 1) surface materials of high effective dielectric constant, probably associated with finite electrical conductivity, and 2) volume scattering associated with multiple scattering from a layer of very-low-loss material containing voids and extending down a few hundred wavelengths beneath the surface. Analogs to these two mechanisms are found elsewhere in the solar system, and each is capable of explaining the basic observations. as of the early 1990's. In 1993, however, it became possible to carry out a bistatic observation of the anomalous highland regions using the Magellan spacecraft, then in orbit about Venus. In this experiment the on-board telemetry transmitter was aimed at the planet's surface with its linear S-band polarization vector oriented at 45 deg to the spacecraft-Venus-Earth scattering plane. The pointing of the transmitting antenna was adjusted so that the spacecraft-to-illuminated-surface incidence angle equalled the Earth-to-Venus-surface incidence angle. In this way, the experiment emphasized the specular scattering component. A full Stokes-Vector analysis of the reflected signal as received on Earth was carried out as the illuminated region scanned across the highland regions of Venus. From the observed position angle of the echo, it was possible to calculate the Fresnel reflectivity of a number of regions on Venus, including the high-altitude Maxwell Montes, and to show unequivocally that the complex dielectric constant of that anomalous area was 100 +/- 50i, as compared to 4.0 (real) for the typical lowland area. Thus this experiment was

able to rule out definitively an hypothesis of volume scattering as the explanation for the anomalous scattering in the Venus highlands.
Author
Radar Echoes; Venus Surface; Scattering; Volume; Echoes

20020087612 Arizona State Univ., Dept. of Geological Sciences, Tempe, AZ USA
Mars Global Surveyor Data Analysis Program. Origins of Small Volcanic Cones: Eruption Mechanisms and Implications for Water on Mars ***Final Report, 15 Aug. 2001 - 14 Aug. 2002***
Fagents, Sarah A., Arizona State Univ., USA; Greeley, Ronald, Arizona State Univ., USA; Thordarson, Thorvaldur, Hawaii Univ., USA; [2002]; 5p; In English
Contract(s)/Grant(s): NAG5-11199
Report No.(s): ASU-PVA-6588/TE; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The goal of the proposed work was to determine the origins of small volcanic cones observed in Mars Global Surveyor (MGS) data, and their implications for regolith ice stores and magma volatile contents. For this 1-year study, our approach involved a combination of: Quantitative morphologic analysis and interpretation of Mars Orbiter Camera (MOC) and Mars Orbiter Laser Altimeter (MOLA) data; Numerical modeling of eruption processes responsible for producing the observed features; Fieldwork on terrestrial analogs in Iceland. Following this approach, this study succeeded in furthering our understanding of (i) the spatial and temporal distribution of near-surface water ice, as defined by the distribution and sizes of rootless volcanic cones (”pseudocraters”), and (ii) the properties, eruption conditions, and volatile contents of magmas producing primary vent cones.
Derived from text
Mars (Planet); Planetary Geology; Volcanoes; Spatial Distribution; Ice; Magma

20020087613 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
An Improved 360 Degree and Order Model of Venus Topography
Rappaport, Nicole J., Jet Propulsion Lab., California Inst. of Tech., USA; Konopliv, Alex S., Jet Propulsion Lab., California Inst. of Tech., USA; Kucinskas, Algis B., Jet Propulsion Lab., California Inst. of Tech., USA; Ford, Peter G., Massachusetts Inst. of Tech., USA; Icarus; 1999; ISSN 0019-1035; Volume 139, pp. 19-31; In English; Original contains color illustrations
Contract(s)/Grant(s): JPL-960510; NAG5-4047; RTOP 344-30-53-02; Copyright; Avail: Issuing Activity
We present an improved 360 degree and order spherical harmonic solution for Venus’ topography. The new model uses the most recent set of Venus altimetry data with spacecraft positions derived from a recent high resolution gravity model. Geometric analysis indicates that the offset between the center of mass and center of figure of Venus is about 10 times smaller than that for the Earth, the Moon, or Mars. Statistical analyses confirm that the RMS topography follows a power law over the central part of the spectrum. Compared to the previous topography model, the new model is more highly correlated with Venus’ harmonic gravity field.
Author
Venus (Planet); Planetary Gravitation; Topography; Altimetry; Radar Astronomy

20020087630 Massachusetts Inst. of Tech., Center for Space Research, Cambridge, MA USA
Electrical Properties of the Venus Surface from Bistatic Radar Observations
Pettengill, Gordon H., Massachusetts Inst. of Tech., USA; Ford, Peter G., Massachusetts Inst. of Tech., USA; Simpson, Richard A., Stanford Univ., USA; Science; Jun. 14, 1996; Volume 272, pp. 1628-1631; In English; Copyright; Avail: Issuing Activity
A bistatic radar experiment in 1994, involving reception on Earth of a specularly reflected, linearly polarized 13-centimeter-wavelength signal transmitted from the Magellan spacecraft in orbit around Venus, has established that the surface materials viewed at low and intermediate altitudes on Venus have a relative dielectric permittivity of 4.0 +/- 0.5. However, bistatic results for the Maxwell Montes highlands imply an electrically lossy surface with an imaginary dielectric permittivity of -i 100 +/- 50, probably associated with a specific conductivity of about 13 mhos per meter. Candidates for highlands surface composition include ferroelectrics, a thin frost of elemental tellurium, or a plating of magnetite or pyrites.
Author
Venus Surface; Dielectric Properties; Highlands; Planetary Geology

20020087631 Defence Science and Technology Organisation, Microwave Radar Div., Salisbury, Australia
Arecibo Radar Mapping of the Lunar Poles: A Search for Ice Deposits
Stacy, N. J. S., Defence Science and Technology Organisation, Australia; Campbell, D. B., Cornell Univ., USA; Ford, P. G., Massachusetts Inst. of Tech., USA; Science; Jun. 06, 1997; Volume 276, pp. 1527-1530; In English; Copyright; Avail: Issuing Activity

The Arecibo 12.6-centimeter wavelength radar system was used to image the polar regions of the moon at a resolution of 125 meters in a search for ice deposits in areas of possible permanent shadow from the sun. No areas greater than 1 square kilometer were found with high radar backscatter cross sections and high circular polarization ratios, properties suggestive of the presence of ice. A number of areas smaller than 1 square kilometer were found with these properties, but optical images from spacecraft missions have shown some of these features to be in sunlight. Arecibo radar images of Sinus Iridum at latitude 47 deg N also showed a number of small features with similar properties. The coincidence of some of these features with the radar-facing slopes of craters and their presence in sunlit areas suggests that very rough surfaces rather than ice deposits are responsible for their unusual radar properties.
Author
Circular Polarization; Craters; Deposits; Ice; Images; Lunar Maps; Mapping; Radar Maps; Slopes

20020088723 California Inst. of Tech., Div. of Geological and Planetary Sciences, Pasadena, CA USA
A Sublimation Model for the Martian Polar Swiss-Cheese Features. Observational and Modeling Studies of the South Polar Residual Cap ***Final Report, 15 Aug. 2001 - 14 Aug. 2002***
Byrne, Shane, California Inst. of Tech., USA; Ingersoll, Andrew P., California Inst. of Tech., USA; Nov. 04, 2002; 18p; In English
Contract(s)/Grant(s): NAG5-11214
Report No.(s): API.00005-1-NASA.000088; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In their pioneering work Leighton and Murray argued that the Mars atmosphere, which is 95 percent CO2 today, is controlled by vapor equilibrium with a much larger polar reservoir of solid CO2. Here we argue that the polar reservoir is small and cannot function as a long-term buffer to the more massive atmosphere. Our work is based on modeling the circular depressions (Swiss-cheese features) in the south polar cap. We argue that a solid CO2 layer approximately 8 meters thick is being etched away to reveal water ice underneath. Preliminary results from the THEMIS (Thermal Emission Imaging System) instrument seem to confirm our model.
Author
Carbon Dioxide; Mars Atmosphere; Mars Surface; Atmospheric Models; Planetary Geology; Gas-Solid Interfaces; Ice; Polar Caps

20020089861 University of Central Florida, Orlando, FL USA
Investigations of Martian Impact Crater Morphologies and Morphometries ***Final Report, 1 May 1999 - 30 Apr. 2002***
Barlow, Nadine G., University of Central Florida, USA; [2002]; 6p; In English
Contract(s)/Grant(s): NAG5-8265; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
We have made substantial progress towards completion of the original objectives and are continuing to include new data from the Mars Global Surveyor MOC and TES instruments as they become available (the MOLA instrument has ceased operation as of 2002). The project funding has been used to provide salary support to the PI and several undergraduate students, cover publication charges for two papers, reimburse travel expenses to conferences and workshops incurred by the PI and students, and cover a number of other expenses such as software upgrades and production costs of slides and color prints. This study is revising the PI's Catalog of Large Martian Impact Craters with information obtained from MGS and is utilizing data in the revised Catalog to investigate which planetary factors (such as location, elevation, terrain type, etc.) primarily affect the formation of specific ejecta morphologies and morphometries.
Author
Mars Surface; Mars Craters; Terrain; Mars Global Surveyor

20020089864 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Insights into Corona Formation through Statistical Analyses
Glaze, L. S., Proxemy Research, Inc., USA; Stofan, E. R., Proxemy Research, Inc., USA; Smrekar, S. E., Jet Propulsion Lab., California Inst. of Tech., USA; Baloga, S. M., Proxemy Research, Inc., USA; Jun. 21, 2002; 17p; In English
Contract(s)/Grant(s): NASW-00013; NAG5-10530; RTOP 344-30-43-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Statistical analysis of an expanded database of coronae on Venus indicates that the populations of Type 1 (with fracture annuli) and 2 (without fracture annuli) corona diameters are statistically indistinguishable, and therefore we have no basis for assuming different formation mechanisms. Analysis of the topography and diameters of coronae shows that coronae that are depressions, rimmed depressions, and domes tend to be significantly smaller than those that are plateaus, rimmed plateaus, or domes with surrounding rims. This is consistent with the model of Smrekar and Stofan and inconsistent with predictions of the spreading drop model of Koch and Manga. The diameter range for domes, the initial stage of corona formation, provides a broad constraint on

the buoyancy of corona-forming plumes. Coronae are only slightly more likely to be topographically raised than depressions, with Type 1 coronae most frequently occurring as rimmed depressions and Type 2 coronae most frequently occuring with flat interiors and raised rims. Most Type 1 coronae are located along chasmata systems or fracture belts, while Type 2 coronas are found predominantly as isolated features in the plains. Coronae at hotspot rises tend to be significantly larger than coronae in other settings, consistent with a hotter upper mantle at hotspot rises and their active state.
Author
Annuli; Coronas; Data Bases; Landforms; Statistical Analysis; Topography; Venus (Planet)

20020090114 Lunar and Planetary Inst., Houston, TX USA
Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites
Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002]; ISSN 0161-5297; 72p; In English, 11-12 Sep. 2002, Houston, TX, USA; Also announced as 20020090115 through 20020090142
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1134; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This volume contains abstracts that have been accepted for presentation at the conference on Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of Martian Meteorites, September 11-12, 2002, in Houston, Texas. Administration and publications support for this meeting were provided by the staff of the Publications and Program Services Department at the Lunar and Planetary Institute.
Author
Petrology; SNC Meteorites; Mars Surface; Chemical Composition; Conferences; Planetary Evolution; Isotopes

20020090118 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Crust-Mantle Reservoirs of Radiogenic Isotopes of Mars and Earth: Where Can We See a Mixing?
Dreibus, G., Max-Planck-Inst. fuer Chemie, Germany; Jagoutz, E., Max-Planck-Inst. fuer Chemie, Germany; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 13-14; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The Earth is still a dynamic planet, with mantle convection sufficient to drive the tectonic plates and outer core convection strong enough to produce a magnetic field. Mars started its geological life almost as the Earth and had in the past a liquid core, able to generate a strong magnetic field. But today, Mars has lost this internal magnetic dynamo and its mantle is probably slowly convecting. The study of radiogenic isotopes in the Martian meteorites (SNC), reveals that their parent body ”must be frozen” in its planetary evolution.
Author
Planetary Evolution; Radiogenic Materials; Mars Surface; Planetary Mantles; Isotope Ratios; Earth Crust

20020090122 Lunar and Planetary Inst., Houston, TX USA
Martian Basalt Oxygen Fugacity and Geochemistry: Implications for a Heterogeneous Martian Mantle
Herd, C. D. K., Lunar and Planetary Inst., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 21-22; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The oxygen fugacity (fO2) of the martian basalts (a.k.a. basaltic shergottites) has recently been recognized as important in understanding their petrogeneses. The correlation between oxygen fugacity and certain geochemical parameters (initial SR and Nd isotopic compositions, La/Yb ratios) indicates the presence of long-term incompatible-element enriched and depleted reservoirs, which are oxidized and reduced, respectively. Oxygen fugacity variations in the martian basalts have been modeled based on assimilation of oxidized crustal (”crust-like”) material by reduced, mantle-derived magmas. However, there remains the possibility that the oxygen fugacity of the martian basalts is controlled by the nature of their source regions. Here I review existing oxygen fugacity data for the martian meteorites, present some speculative estimates for newer martian basalts, and explore the heterogeneous mantle model in more detail.
Author
Basalt; Geochemistry; Mars (Planet); Oxygen; Planetary Mantles; Planetary Structure

20020090124 Brown Univ., Dept. of Geological Sciences, Providence, RI USA
Oxygen Fugacity Recorded Pigeonite: Indications of a Heterogeneous Martian Magma Source Region?
McCanta, M. C., Brown Univ., USA; Rutherford, M. J., Brown Univ., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 35-36; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Oxygen fugacity (fO2) is a key physical parameter which influences the crystallization sequences of magmas, as well as the composition of the resulting minerals. On a planet-wide basis, the distribution of elements between the metallic core and the silicate portion of the planet is influenced by the fO2 at the time of differentiation. Additionally, if the intrinsic fO2 of a planet is known, the processes which may change that value can be investigated. Although magmatic fO2 can reflect the degree of oxidation of the magma source region, it can also provide insight into processes, such as metasomatism, degassing, or assimilation, which may have operated on and in the magma as it moved to the surface. Recent work on the basaltic shergottites has provided new measurements of the fO2 recorded in the pyroxenes of these meteorites. These pyroxenes exhibit an fO2 range of approximately 3-4 orders of magnitude. Several processes have been proposed to explain the origin of these differences, the majority of which rely on assimilation. New data, however, is consistent with intrinsic fO2 differences in the magma source region being responsible for the measured SNC fO2 variations. More detailed analyses of natural SNC pyroxenes are needed in order to better understand the source of the fO2 range recorded in the basaltic shergottites.
Author
Crystallization; Heterogeneity; Magma; Mars (Planet); Oxygen; Pyroxenes; Metamorphism (Geology)

20020090125 NASA Johnson Space Center, Houston, TX USA
Geochemistry of Martian Meteorites and the Petrologic Evolution of Mars
Mittlefehldt, D. W., NASA Johnson Space Center, USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 37-38; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Mafic igneous rocks serve as probes of the interiors of their parent bodies - the compositions of the magmas contain an imprint of the source region composition and mineralogy, the melting and crystallization processes, and mixing and assimilation. Although complicated by their multifarious history, it is possible to constrain the petrologic evolution of an igneous province through compositional study of the rocks. Incompatible trace elements provide one means of doing this. I will use incompatible element ratios of martian meteorites to constrain the early petrologic evolution of Mars. Incompatible elements are strongly partitioned into the melt phase during igneous processes. The degree of incompatibility will differ depending on the mineral phases in equilibrium with the melt. Most martian meteorites contain some cumulus grains, but nevertheless, incompatible element ratios of bulk meteorites will be close to those of their parent magmas. ALH 84001 is an exception, and it will not be discussed. The martian meteorites will be considered in two groups; a 1.3 Ga group composed of the clinopyroxenites and dunite, and a younger group composed of all others.
Author
Geochemistry; Petrology; Planetary Geology; SNC Meteorites; Planetary Evolution; Mars Surface

20020090126 Max-Planck-Inst. fuer Chemie, Mainz, Germany
Silicon in Mars' Core: A Prediction Based on Mars Model Using Nitrogen and Oxygen Isotopes in SNC Meteorites
Mohapatra, R. K., Max-Planck-Inst. fuer Chemie, Germany; Murty, S. V. S., Physical Research Lab., India; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 39-40; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Chemical and (oxygen) isotopic compositions of SNC meteorites have been used by a number of workers to infer the nature of precursor materials for the accretion of Mars. The idea that chondritic materials played a key role in the formation of Mars has been the central assumption in these works. Wanke and Dreibus have proposed a mixture of two types of chondritic materials, differing in oxygen fugacity but having CI type bulk chemical composition for the nonvolatile elements, for Mars' precursor. But a number of studies based on high pressure and temperature melting experiments do not favor a CI type bulk planet composition for Mars, as it predicts a bulk planet Fe/Si ratio much higher than that reported from the recent Pathfinder data. Oxygen forms the bulk of Mars (approximately 40% by wt.) and might provide clues to the type of materials that formed Mars. But models based on the oxygen isotopic compositions of SNC meteorites predict three different mixtures of precursor materials for Mars: 90% H + 10% CM, 85% H + 11% CV + 4% CI and 45% EH + 55% H. As each of these models has been shown to be consistent with the bulk geophysical properties (such as mean density, and moment of inertia factor) of Mars, the nature of the material that accreted to form Mars remains ambiguous.
Author
Mathematical Models; Silicon; SNC Meteorites; Mars (Planet); Planetary Geology; Nitrogen Isotopes; Oxygen Isotopes; Planetary Cores

20020090127 NASA Johnson Space Center, Houston, TX USA

Ree in Shergottite Augites and Whole Rocks

Musselwhite, D. S., NASA Johnson Space Center, USA; Wadhwa, M., Field Museum of Natural History, USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 41-42; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Redox variations have been reported among the shergottites. Eu and Gd partitioning experiments designed for the LEW86010 angrite, to infer a range of fo2 for the shergottites have been used. Fo2 using equilibria between Fe-Ti oxides have been inferred. There is fairly good agreement between the Fe-Ti oxide determinations and the estimates from Eu anomalies in terms of which meteorites are more or less oxidized. The Eu anomaly technique and the Fe-Ti oxide technique both essentially show the same trend, with Shergotty and Zagami being the most oxidized and QUE94201 and DaG 476 being the most reduced. Thus, the variation in fo2 appears to be both real and substantive. However, although the redox trends indicated by the two techniques are similar, there is as much as a two log unit offset between the results. One explanation for this offset is that the Eu calibration used for the shergottites was actually designed for the LEW86010 angrite, a silica-undersaturated basalt whose pyroxene (diopside) compositions are rather extreme. to correct this, a set of experiments on the redox relationship of Eu partitioning relative to Sm and Gd for pyroxene and melt compositions more relevant to Martian meteorites were conducted. We have taken the experimentally determined relationship between D (sup Augite/melt) (Sm,Eu,Gd) and fO2 and applied it to augite Eu and Gd data for the basaltic Shergottites of as well as previously unreported augite Sm data.

Derived from text

Rare Earth Elements; Meteoritic Composition; Shergottites; Igneous Rocks; Mars Surface

20020090128 NASA Johnson Space Center, Houston, TX USA

An ”Andestic” Component in Shergottites with Restored LREE Abundances?

Nyquist, L. E., NASA Johnson Space Center, USA; Shih, C.-Y., Lockheed Martin Space Mission Systems and Services, USA; Wiesmann, H., Lockheed Martin Space Mission Systems and Services, USA; Barrat, J. A., Angers Univ., France; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 43-44; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The shergottite Martian meteorites present a variety of oft-confusing petrologic features. In particular, represented among this subgroup are basalts with very depleted LREE abundances, as well as those with nearly chondritic overall REE abundances. The LREE-depleted basalts appear to more closely record the REE and isotopic features of their mantle source regions. Those basalts with more nearly chondritic REE abundances appear to contain an extra component often referred to as a ”crustal” component. The addition of the crustal component tends to restore the overall REE abundance pattern towards chondritic relative abundances. Here we suggest that the crustal component could derive from ”andesitic” rocks observed remotely to occur on the Martian surface, and which were analysed at the Pathfinder site.

Author

Abundance; Mars Surface; Shergottites; SNC Meteorites; Planetary Crusts; Rare Earth Elements; Andesite

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Evolution of Martian Atmospheric, Crustal, and Mantle Xenon Components in Basaltic Shergottites

Ocker, K. D., Tennessee Univ., USA; Holland, G., Manchester Univ., UK; Gilmour, J. D., Manchester Univ., UK; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 45-46; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

As part of an ongoing study of the shergottites, we have measured the isotopic signature and concentration of xenon in mineral separates of Shergotty and EET79001 Lithology-B. Similarities between the meteorites include the enhanced concentration of martian atmospheric xenon in opaque and maskelynite minerals relative to pyroxene. The interior component appears to be present in all minerals but is best defined in pyroxene separates. This component consists of isotopically solar xenon with a significant contribution from fission xenon and is similar to those observed in Chassigny, ALH84001 and Nakhla. The proportion of fission xenon in the pyroxene separate of EET79001 is lower than that in Shergotty. Pyroxene separates from Shergotty also have a well defined Xe-129/Xe-132 ratio higher than solar. One explanation for these variations and which we were seeking the effects of in this study, is that they reflect the degree of incorporation of crustal material into the parent melt of the shergottites.

Derived from text

Basalt; Mars Atmosphere; Shergottites; Xenon; Planetary Evolution; Meteoritic Composition; Mars Surface; Planetary Mantles

20020090130 Minnesota Univ., School of Physics and Astronomy, Minneapolis, MN USA

Noble Gases in the Terrestrial Planets, with Focus on What the SNC Meteorites Tell Us About Mars

Pepin, R. O., Minnesota Univ., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 47-48; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Noble gases in the solar wind and giant-planet atmospheres are generally assumed to be the best ”perhaps the only” available proxies for isotopic distributions in the early solar nebula. Both, however, may be isotopically fractionated to some degree from their source composition, the wind in processes that transport solar plasma to and release it from the corona, and giant-planet Ar, Kr and Xe by trapping in icy planetesimals if these were indeed the principal suppliers of heavy noble gases to their present atmospheres. Noble gas isotopic ratios in the solar wind are reasonably well established from lunar and asteroidal regolith studies and the Galileo Probe mass spectrometer has given us our first look at compositions in Jupiter’s atmosphere. Modern theories of atmospheric evolution on the terrestrial planets are focused on the nebula as the primary supplier of primordial planetary volatiles, either directly -i.e., in ways that do not fractionate isotopes (by adsorption on planetary embryos or ”ingassing” from dense, gravitationally condensed atmospheres)- or by accretion of cometary ices carrying noble gases that could have been either isotopically solar or mildly fractionated during trapping from the ambient nebula. The observation that nonradiogenic Ne, Ar, Kr and Xe in Earth’s current atmosphere are all isotopically heavier than their solar counterparts is an important clue to the nature of the processes that subsequently acted on these primordial planetary reservoirs. This is also the case on Mars, except for Kr which is isotopically near-solar (and therefore an interesting challenge for evolutionary modeling), and on Venus as well, as far as one can tell from the limited data on hand.

Derived from text

Protoplanets; Rare Gases; SNC Meteorites; Terrestrial Planets; Mars (Planet); Planetary Atmospheres

20020090131 NASA Johnson Space Center, Houston, TX USA

Shergottite Impact Melt Glasses Contain Soil from Martian Uplands

Rao, M. N., Lockheed Martin Corp., USA; McKay, D. S., NASA Johnson Space Center, USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 49-50; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Martian meteorite (shergottite) impact melt glasses that contain high concentrations of martian atmospheric noble gases and show significant variations in SR-87/SR-86 isotopic ratios are likely to contain Martian surface fines mixed with coarser regolith materials. The mixed soil constituents were molten due to shock at the time of meteoroid impact near the Martian surface and the molten glass got incorporated into the voids and cracks in some shergottite meteorites. Earlier, Rao et al. found large enrichments of sulfur (sulfate) during an electron-microprobe study of several impact melt glass veins and pods in EET79001,LithC thin sections. As sulfur is very abundant in Martian soil, these S excesses were attributed to the mixing of a soil component containing aqueously altered secondary minerals with the LithC precursor materials prior to impact melt generation. Recently, we studied additional impact melt glasses in two basaltic shergottites, Zagami and Shergotty using procedures similar to those described by Rao et al. Significant S enrichments in Zagami and Shergotty impact melt glass veins similar to the EET79001, LithC glasses were found. In addition, we noticed the depletion of the mafic component accompanied by the enrichment of felsic component in these impact melt glass veins relative to the bulk host rock in the shergottites. to explain these observations, we present a model based on comminution of basaltic rocks due to meteroid bombardment on martian regolith and mechanical fractionation leading to enrichment of felsics and depletion of mafics in the fine grained dust which is locally mobilized as a result of saltation and deflation due to the pervasive aeolian activity on Mars.

Author

Glass; Impact Melts; Shergottites; SNC Meteorites; Soils; Veins (Petrology); Mars Surface

20020090133 Max-Planck-Inst. fuer Chemie, Mainz, Germany

Nitrogen and Noble Gases in Mineral Separates from Zagami

Schwenzer, S. P., Max-Planck-Inst. fuer Chemie, Germany; Mohapatra, R. K., Max-Planck-Inst. fuer Chemie, Germany; Herrmann, S., Max-Planck-Inst. fuer Chemie, Germany; Ott, U., Max-Planck-Inst. fuer Chemie, Germany; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 53-54; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Isotopic compositions of nitrogen and noble gases have played a key role in understanding SNC meteorites and Mars. For example nitrogen and argon data from the glass of EET 79001 were one of the convincing evidences that linked these meteorites to Mars. Similarly, the observation of components with largely different isotopic compositions (of both nitrogen and noble gases in these meteorites has led to the realization that the martian atmosphere (as measured by Viking) is quite different from the martian

interior (as pictured from data from these meteorites). But at the same time we have not yet been able to clearly define the (interior) mantle end member and reduce the uncertainties presented by the Viking data for the martian atmosphere. Similarly we do not know for sure the Ne-20/Ne-22 signature of Mars. It is clear that many of these ambiguities as to the indigenous martian components result from interferences from cosmogenic contributions and terrestrial contamination, which are impossible to avoid. But they can be minimized by step temperature heating, and selection of mineral phases rather than bulk samples. We have initiated a simultaneous nitrogen and noble gas isotopic study of mineral separates and a few bulk samples from martian meteorites with the newly set up experimental facility at Mainz. Here we report data for maskelynite and pyroxene separates from Zagami.
Author
Isotopes; Mineralogy; Nitrogen; SNC Meteorites; Rare Gases; Argon; Mars Surface; Cosmology

20020090136 NASA Johnson Space Center, Houston, TX USA
Element-Element Correlations Among Martian Meteorite Bulk Compositions: Peculiarities Explained(?) by Mixing, with Implications for the Composition of Mars
Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 59-60; In English; Also announced as 20020090114
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Correlations of elements abundances among the Martian meteorites have been used to infer the bulk composition of the Martian mantle, and thence the broad petrogenesis of the planet. It has been assumed that the correlations represent igneous fractionations. However, the correlations are also consistent with mixing, broadly similar to that inferred from radio-isotope data. If the correlations represent mixing of geochemical components, it is not clear that they represent Mars' mantle or bulk composition.
Author
Abundance; Geochemistry; Planetary Mantles; SNC Meteorites; Petrogenesis; Chemical Composition; Mars Surface

20020090138 Brown Univ., Dept. of Geological Sciences, Providence, RI USA
Origin of the Martian Crust and Mantle
Hess, P. C., Brown Univ., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 23-24; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The existence of a planet-wide early magma ocean on Mars is supported by a growing base of petrochemical and geophysical observations 1) The parent liquids to the SNC meteorites are significantly depleted in Al2O3 and CaO relative to terrestrial basalts. Only terrestrial komatiites, the products of more than 30% melting of the Archean mantle and boninites, wet melts of the mantle wedge in island arc regions, have similar low Al2O3 and CaO contents. Mare basalts and picrite glasses on the Moon have similar geochemical depletions, and the major element compositions of very low Ti mare basalts bear a striking resemblance to the Shergotty parent magmas. What these terrestrial and lunar magmas have in common is that the parent magmas last equilibrated with a mantle severely depleted in magmaphile elements. The boninites and mare basalts, in particular, last coexisted with a mantle residue of olivine and orthopyroxene. In the lunar case the mantle was a product of crystallization from a magma ocean whereas the harzburgite parent mantle for boninites was a residuum to previous melting events that eliminated diopside from the mantle. 2) W-182 and Nd-142 anomalies date the fractionation of the core and mantle, respectively, within about 50- 100 million years of the origin of the solar system. The large heavily crated Martian crust and the absence of large scale recycling suggests strongly that the crust was also a product of this ancient global differentiation and has experienced only modest volcanic activity, particularly in the southern hemisphere, in subsequent epochs. Whole rock Rb-SR systematics appear to record this planet wide differentiation at about 4.5 Ga 3) The Nd-143 composition of the Martian mantle is significantly more depleted than the terrestrial mantle and even the cumulate source regions of mare basalts on the Moon. Only Archean lithosphere on earth has the extreme positive and negative epsilon values so characteristic of the Martian mantle. Continental lithosphere, by definition, is stable and has withstood the homogenizing effects of mantle convection. The extreme epsilon values reflect ancient depletion events and subsequent metasomatic perturbations. The data is consistent with the early differentiation of a Martian magma ocean producing a buoyant crust, dense core and a complementary stratified cumulate mantle. The stratified cumulate is likely to be gravitationally unstable, at least, in the shallowmost stratigraphic levels where more iron-rich cumulates overlie dense magnesian cumulates. Under these unstable conditions, solid state differentiation would have carried dense, iron-rich and relatively cool cumulates into the Martian interior ultimately resulting in a lower mantle that is denser and compositional more evolved than the upper mantle. This lower mantle would also contain varying amounts of heat producing radioactive elements.
Author
Mars Surface; Metamorphism (Geology); Planetary Crusts; Geophysics; Planetary Geology; Planetary Mantles

20020090141 Lunar and Planetary Inst., Houston, TX USA

Melting the Martian Mantle: Shergottite Formation and Implications for Present Day Mantle Convection on Mars

Kiefer, Walter S., Lunar and Planetary Inst., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 29-30; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The shergottites are basaltic meteorites from Mars, many of which have igneous crystallization ages of about 180 million years ago. The observed density of small impact craters in MOC images of Olympus Mons and Elysium Planitia indicates that some volcanic flows in these regions are just 10 to 30 million years old. The existence of young volcanism on Mars implies that adiabatic decompression melting and hence mantle convection has remained an important process on Mars to the present day. Numerical simulations of mantle convection and magma production set important constraints on the current properties of the mantle of Mars, particularly the minimum abundance of radioactive elements that has been retained in the mantle.

Author

Mars Surface; Planetary Geology; Planetary Mantles; Shergottites; Mars Volcanoes; Melting; Convection

20020090142 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA

QUE 94201: Reconsidering Its Origins as a Bulk from a Volcanic Region of Mars

Kring, D. A., Arizona Univ., USA; Unmixing the SNCs: Chemical, Isotopic, and Petrologic Components of the Martian Meteorites; [2002], pp. 31-32; In English; Also announced as 20020090114; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Shergottites from Mars, like basalts on Earth, are important because they provide an opportunity to determine the chemical and thermal evolution of the planet's mantle, relationships between the crust and mantle, and the role of crustal assimilation in the petrogenetic processes that produce surface lavas. Attempts to utilize these rocks, however, have been frustrated because they are cumulate rocks rather than bulk melt samples that lie on liquid lines of descent. to overcome this problem, estimates of bulk melt compositions have been made by trying to identify and subtract the compositions of cumulate minerals, analyzing trapped melt inclusions, interpreting phase equilibria, and using minor element compositions in pyroxene with equilibrium coefficients. Unfortunately, these attempts have produced contradictory results.

Author

Mars Surface; Mars Volcanoes; Planetary Evolution; Planetary Geology; Planetary Mantles; Chemical Evolution; Meteorites

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Feeling Gravity's Pull: Gravity Modeling. The Gravity Field of Mars

Lemoine, Frank, NASA Goddard Space Flight Center, USA; Smith, David, NASA Goddard Space Flight Center, USA; Rowlands, David, NASA Goddard Space Flight Center, USA; Zuber, Maria, Massachusetts Inst. of Tech., USA; Neumann, G., Massachusetts Inst. of Tech., USA; Chinn, Douglas, Raytheon Information Technology and Scientific Services, USA; Pavlis, D., Raytheon Information Technology and Scientific Services, USA; 2000 NCCS Highlights: Enabling NASA Earth and Space Sciences; 2000, pp. 76-81; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Most people take the constant presence of gravitys pull for granted. However, the Earth's gravitational strength actually varies from location to location. This variation occurs because mass, which influences an object's gravitational pull, is not evenly distributed within the planet. Changes in topography, such as glacial movement, an earthquake, or a rise in the ocean level, can subtly affect the gravity field. An accurate measurement of the Earth's gravity field helps us understand the distribution of mass beneath the surface. This insight can assist us in locating petroleum, mineral deposits, ground water, and other valuable substances. Gravity mapping can also help notice or verify changes in sea surface height and other ocean characteristics. Such changes may indicate climate change from polar ice melting and other phenomena. In addition, gravity mapping can indicate how land moves under the surface after earthquakes and other plate tectonic processes. Finally, changes in the Earth's gravity field might indicate a shift in water distribution that could affect agriculture, water supplies for population centers, and long-term weather prediction. Scientists can map out the Earth's gravity field by watching satellite orbits. When a satellite shifts in vertical position, it might be passing over an area where gravity changes in strength. Gravity is only one factor that may shape a satellite's orbital path. to derive a gravity measurement from satellite movement, scientists must remove other factors that might affect a satellite's position: 1. Drag from atmospheric friction. 2. Pressure from solar radiation as it heads toward Earth and. as it is reflected off the surface of the Earth 3. Gravitational pull from the Sun, the Moon, and other planets in the Solar System. 4. The effect of tides. 5. Relativistic effects. Scientists must also correct for the satellite tracking process. For example, the tracking signal must be corrected for refraction through the atmosphere of the Earth. Supercomputers can calculate the effect of gravity for specific locations in space following a mathematical process known as spherical harmonics, which quantifies the gravity field of a planetary body. The process is based on Laplace's fundamental differential equation of gravity. The accuracy of a spherical harmonic solution is rated

by its degree and order. Minute variations in gravity are measured against the geoid, a surface of constant gravity acceleration at mean sea level. The geoid reference gravity model strength includes the central body gravitational attraction (9.8 m/sq s) and a geopotential variation in latitude partially caused by the rotation of the Earth. The rotational effect modifies the shape of the geoid to be more like an ellipsoid, rather than a perfect, circle. Variations of gravity strength from the ellipsoidal reference model are measured in units called milli-Galileos (mGals). One mGal equals 10(exp -5) m/sq s. Research projects have also measured the gravity fields of other planetary bodies, as noted in the user profile that follows. From this information, we may make inferences about our own planet's internal structure and evolution. Moreover, mapping the gravity fields of other planets can help scientists plot the most fuel-efficient course for spacecraft expeditions to those planets.
Author
Gravitational Effects; Gravitational Fields; Satellite Tracking; Earth Gravitation

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SOLAR PHYSICS

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

20020087567 NASA Goddard Space Flight Center, Greenbelt, MD USA
Iron Charge Distribution as an Identifier of Interplanetary Coronal Mass Ejections
Lepri, S. T., Michigan Univ., USA; Zurbuchen, T. H., Michigan Univ., USA; Fisk, L. A., Michigan Univ., USA; Richardson, I. G., NASA Goddard Space Flight Center, USA; Cane, H. V., NASA Goddard Space Flight Center, USA; Gloeckler, G., Michigan Univ., USA; Journal of Geophysical Research; December 2001; ISSN 0148-0227; Volume 106, No. A12, pp. 29,231-29,238; In English
Contract(s)/Grant(s): NAG5-2810; NAG5-7111; NCC5-180
Report No.(s): Paper-2002JA000014; Copyright; Avail: Issuing Activity

We present solar wind Fe charge state data measured on the Advanced Composition Explorer (ACE) from early 1998 to the middle of 2000. Average Fe charge states in the solar wind are typically around 9 to 11. However, deviations from these average charge states occur, including intervals with a large fraction of Fe(sup greater or = 16+) which are consistently associated with interplanetary coronal mass ejections (ICMEs). by studying the Fe charge state distribution we are able to extract coronal electron temperatures often exceeding 2 x 10(exp 6) kelvins. We also discuss the temporal trends of these events, indicating the more frequent appearance of periods with high Fe charge states as solar activity increases.
Author
Iron; Charge Distribution; Charged Particles; Coronal Mass Ejection; Wind Measurement

20020087665 National Center for Atmospheric Research, Boulder, CO USA
He I 584 A Line in the Solar Spectrum
Pietarila, A.; 2002; 124p; In English
Report No.(s): PB2003-100560; NCAR/CR-174; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis tries to look into the formation of the neutral helium resonance line in the solar EUV spectrum. A time dependent approach is taken when dealing with the helium emission. In the beginning, the idea was to analyze some observations and put helium into context with other lines. In the end, it proved to be a difficult task, and the scope of this thesis broadened. First a brief review of the Sun and its atmosphere is given in chapter 1. The existing observational facts and models for the helium line formation will are discussed in chapters 2 and 3. Chapter 4 focuses on time series observations done with the SUMER instrument. In chapter 5 two of the models for helium line formation reviewed earlier are explored. Finally, chapter 6 draws conclusions from the observations and calculations.
NTIS
Helium; Helium Isotopes; Neutral Gases; Extreme Ultraviolet Radiation

20020087931 NASA Goddard Space Flight Center, Greenbelt, MD USA
Sources of Geomagnetic Activity during Nearly Three Solar Cycles (1972-2000)
Richardson, I. G., NASA Goddard Space Flight Center, USA; Cane, H. V., NASA Goddard Space Flight Center, USA; Cliver, E. W., Air Force Research Lab., USA; January 2002; 14p; In English
Contract(s)/Grant(s): NCC5-609; NCC5-180; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

We examine the contributions of the principal solar wind components (corotating highspeed streams, slow solar wind, and transient structures, i.e., interplanetary coronal mass ejections (CMEs), shocks, and postshock flows) to averages of the aa geomagnetic index and the interplanetary magnetic field (IMF) strength in 1972-2000 during nearly three solar cycles. A prime motivation is to understand the influence of solar cycle variations in solar wind structure on long-term (e.g., approximately annual) averages of these parameters. We show that high-speed streams account for approximately two-thirds of long-term aa averages at solar minimum, while at solar maximum, structures associated with transients make the largest contribution (approx. 50%), though contributions from streams and slow solar wind continue to be present. Similarly, high-speed streams are the principal contributor (approx. 55%) to solar minimum averages of the IMF, while transient-related structures are the leading contributor (approx. 40%) at solar maximum. These differences between solar maximum and minimum reflect the changing structure of the near-ecliptic solar wind during the solar cycle. For minimum periods, the Earth is embedded in high-speed streams approx. 55% of the time versus approx. 35% for slow solar wind and approx. 10% for CME-associated structures, while at solar maximum, typical percentages are as follows: high-speed streams approx. 35%, slow solar wind approx. 30%, and CME-associated approx. 35%. These compositions show little cycle-to-cycle variation, at least for the interval considered in this paper. Despite the change in the occurrences of different types of solar wind over the solar cycle (and less significant changes from cycle to cycle), overall, variations in the averages of the aa index and IMF closely follow those in corotating streams. Considering solar cycle averages, we show that high-speed streams account for approx. 44%, approx. 48%, and approx. 40% of the solar wind composition, aa, and the IMF strength, respectively, with corresponding figures of approx. 22%, approx. 32%, and approx. 25% for CME-related structures, and approx. 33%, approx. 19%, and approx. 33% for slow solar wind.
Author
Geomagnetism; Solar Activity Effects; Solar Cycles; Solar Wind; Interplanetary Magnetic Fields

20020088125 NASA Goddard Space Flight Center, Greenbelt, MD USA
Long-term Trends in Interplanetary Magnetic Field Strength and Solar Wind Structure during the 20th Century
Richardson, I. G., NASA Goddard Space Flight Center, USA; Cliver, E. W., Air Force Research Lab., USA; Cane, H. V., NASA Goddard Space Flight Center, USA; January 2002; 7p; In English
Contract(s)/Grant(s): NCC5-609; NCC5-180; NSF ATM-9912341; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Lockwood et al have recently reported an approximately 40% increase in the radial component of the interplanetary magnetic field (IMF) at Earth between 1964 and 1996. We argue that this increase does not constitute a secular trend but is largely the consequence of lower than average fields during solar cycle 20 (1964-1976) in comparison with surrounding cycles. For times after 1976 the average IMF strength has actually decreased slightly. Examination of the cosmic ray intensity, an indirect measure of the IMF strength, over the last five solar cycles (19-23) also indicates that cycle averages of the IMF strength have been relatively constant since approximately 1954. We also consider the origin of the well-documented increase in the geomagnetic alphaalpha index that occurred primarily during the first half of the twentieth century. We surmise that the coronal mass ejection (CME) rate for recent solar cycles was approximately twice as high as that for solar cycles 100 years ago. However, this change in the CME rate and the accompanying increase in 27-day recurrent storm activity reported by others are unable to account completely for the increase in alphaalpha. Rather, the CMEs and recurrent high-speed streams at the beginning of the twentieth century must have been embedded in a background of slow solar wind that was less geoeffective (having, for example, lower IMF strength and/or flow speed) than its modern counterpart.
Author
Solar Cycles; Interplanetary Magnetic Fields; Solar Magnetic Field; Magnetic Effects; Cosmic Rays; Solar Wind; Trend Analysis

20020090260 NASA Goddard Space Flight Center, Greenbelt, MD USA
Under the Weather: Space Weather. The Magnetic Field of the Heliosphere
Roberts, Aaron, NASA Goddard Space Flight Center, USA; Goldstein, Melvyn, NASA Goddard Space Flight Center, USA; 2000 NCCS Highlights: Enabling NASA Earth and Space Sciences; 2000, pp. 66-71; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Normally, only people in the far north can enjoy the dancing beauty of the aurora borealis; however, an intense collision of charged solar particles with the Earth's magnetic field can magnify the Northern Lights so much that they are visible in the southern USA. Behind the light show lies enough flux of energetic particles carried by solar wind to render our planet uninhabitable. The Earth's magnetic field, also known as the magnetosphere, is the only thing that shields us from the Sun. Even the magnetosphere cannot fully guard us from the wrath of the Sun. In March 1989, a powerful solar flare hit Earth with such energy that it burned out transformers in Quebec's electrical grid, plunging Quebec and the eastern USA into darkness for more than 9 hours. Northern lights and energy grid overloads are not the only ways that a solar wind can affect us. A solar storm in July 1999 interrupted radio

broadcasts. Solar activity can disorient radars and satellite sensors, break up cell phone connections, and threaten the safety of astronauts. A large bombardment of solar particles can even reduce the amount of ozone in the upper atmosphere. Magnetohydrodynamics (MHD), the study of magnetic fields in magnetized plasmas, can help scientists predict, and therefore prepare for, the harmful side effects of solar weather in the magnetosphere.
Author
Charged Particles; Collisions; Disorientation; Energetic Particles; Geomagnetism; Magnetohydrodynamics; Solar Activity; Solar Flares; Solar Storms

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see 52 Aerospace Medicine. For theory see 73 Nuclear Physics.

20020087577 NASA Goddard Space Flight Center, Greenbelt, MD USA
Discovery of Nearly Coherent Oscillations with a Frequency of approximately 567 Hz During Type I X-ray Bursts of the X-ray Transient and Eclipsing Binary X1658-298
Wijnands, Rudy, Massachusetts Inst. of Tech., USA; Strohmayer, Tod, NASA Goddard Space Flight Center, USA; Franco, Lucia M., Chicago Univ., USA; Astrophysical Journal; Mar. 01, 2001; Volume 549, pp. L71-L75; In English
Contract(s)/Grant(s): NAS8-39073; PF9-10010; Copyright; Avail: Issuing Activity

We report the discovery of nearly coherent oscillations with a frequency of approximately 567 Hz during type I X-ray bursts from the X-ray transient and eclipsing binary X1658-298. If these oscillations are directly related to the neutron star rotation, then the spin period of the neutron star in X1658-298 is approximately 1.8 ms. The oscillations can be present during the rise or decay phase of the bursts. Oscillations during the decay phase of the bursts show an increase in frequency of approximately 0.5-1 Hz. However, in one particular burst the oscillations reappear at the end of the decay phase at about 571.5 Hz. This represents an increase in oscillation frequency of about 5 Hz, which is the largest frequency change seen so far in a burst oscillation. It is unclear if such a large change can be accommodated by present models used to explain the frequency evolution of the oscillations. The oscillations at 571.5 Hz are unusually soft compared to the oscillations found at 567 Hz. We also observed several bursts during which the oscillations are detected at much lower significance or not at all. Most of these bursts happen during periods of X-ray dipping behavior, suggesting that the X-ray dipping might decrease the amplitude of the oscillations (although several complications exist with this simple picture). We discuss our discovery in the framework of the neutron star spin interpretation.
Author
Eclipsing Binary Stars; Oscillations; X Ray Binaries; Frequencies; Gamma Ray Bursts; Coherent Radiation

20020087586 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Obscuring Starburst of NGC 6221 and Implications for the Hard X-Ray Background
Levenson, N. A., Johns Hopkins Univ., USA; CidFernandes, R., Jr., Johns Hopkins Univ., USA; Weaver, K. A., NASA Goddard Space Flight Center, USA; Heckman, T. M., Johns Hopkins Univ., USA; Storchi-Bergmann, T., Instituto de Fisica, Brazil; Astrophysical Journal; Aug. 10, 2001; Volume 557, pp. 54-66; In English
Contract(s)/Grant(s): NAS5-26555; NAG5-6917; NAG5-6400; GF-1001-99; NSF AST-96-13615; Copyright; Avail: Issuing Activity

We present NGC 6221 as a case study of ”X-ray-loud composite galaxies,” which appear similar to starbursts at optical wavelengths and resemble traditional active galactic nuclei in X-rays. The net optical spectrum of NGC 6221 is properly characterized as a starburst galaxy, but in X-rays, NGC 6221 is similar to Seyfert 1 galaxies, exhibiting a power-law continuum spectrum, a broad Fe K(alpha) line, and continuum variability on timescales of days and years. High-resolution images reveal that the detected active nucleus is relatively weak, not only at optical, but also at near-infrared wavelengths. An obscuring starburst, in which the interstellar gas and dust associated with the starburst conceal the active nucleus, accounts for these peculiar features. We demonstrate quantitatively that obscuration by column density N(sub H) = 10(exp 22)/sq cm combined with relatively weak intrinsic nuclear activity can produce an optical spectrum that is characteristic of the surrounding starburst alone. While optical surveys would not identify the active nuclei that make these galaxies significant X-ray sources, such galaxies may, in fact, be important contributors to the X-ray background.
Author
Starburst Galaxies; X Ray Sources; Spectra; Seyfert Galaxies; Light (Visible Radiation); Background Radiation

20020090254 California Univ., Dept. of Physics, Davis, CA USA
X-ray Properties of Deep Radio-Selected Quasars ***Final Report, Period ending 14 Mar. 2002***
Becker, Robert, California Univ., USA; [2002]; 2p; In English
Contract(s)/Grant(s): NAG5-8391; NAG5-9947; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report summarizes the research supported by the ADP grant entitled 'X-ray Properties of Deep Radio-Selected Quasars'. The primary effort consisted of correlating the ROSAT All-Sky Survey catalog with the April 1997 release of the FIRST (Faint Images of the Radio Sky at Twenty centimeters) radio catalog. We found that a matching radius of 60 sec excluded most false matches while retaining most of the true radio-X-ray sources. The correlation of the approx. 80,000 source RASS and approx. 268,000 FIRST catalogs matched 2,588 FIRST sources with 1,649 RASS sources out of a possible 5,520 RASS sources residing in the FIRST survey area. This number is much higher than expected from our previous experience of correlating the RASS with radio surveys and indicates we detected new classes of objects not seen in the correlations with less sensitive radio surveys.
Derived from text
Quasars; X Ray Sources; X Ray Astronomy; Radio Astronomy; Sky Surveys (Astronomy)

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20020088669 NASA, Washington, DC USA
Looking Backward, Looking Forward: Forty Years of US Human Spaceflight Symposium
Garber, Stephen J., Editor, NASA, USA; 2002; 242p; In English; Also announced as 20020088670 through 20020088685
Report No.(s): NASA/SP-2002-4107; NAS 1.21:4107; LC-2002014550; ISBN 0-16-067595-2; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Human spaceflight is the driver for most activities that the National Aeronautics and Space Administration (NASA) undertakes. While NASA certainly has a rich aviation research heritage and has also done pathbreaking scientific and applications work using robotic spacecraft, human spaceflight is a difficult and expensive endeavor that engenders great popular enthusiasm and support for NASA. Much of this public interest sterns from pushing boundaries of adventure, by exploring the unique and challenging physical environment of space. Humans can also perform tasks in space that machines cannot. We can think, analyze, and make judgment calls based on experience and intuition in real time. In little more than forty years, we have gone from thinking, planning, and hoping that humans will enter space to having rotating crews of astronauts and cosmonauts permanently living aboard an International Space Station (ISS). We have moved from the Cold War, which set the historical context for superpower competition in space during the 1960s, to Joint ISS missions involving over a dozen cooperating nations. Not only have humans proved that it is possible to survive in the harsh physical environment of space, but astronauts and cosmonauts have conducted important scientific and engineering feats in space. We've discovered that microgravity is a unique laboratory setting that is potentially useful for scientists in a broad array of disciplines such as pharmacology, materials science, and physics, as well as more obvious fields such as astronomy. The pool of people who have flown in space has also broadened tremendously in the past forty years. We have moved from a group of seven handpicked men that were trained as military test pilots to men and women of many national and professional backgrounds. Diversity has become an avowed goal of most federal agencies, including NASA, so that people of many ethnicities and personal backgrounds not only fly in space but serve in key roles on the ground. Older astronauts in their sixties and even seventies have flown in space. Beyond pilots and commanders, NASA now trains scientists and engineers as payload specialists to fly in space. Even more than the payload specialists who are not "career astronauts," NASA has tried to bring other civilians, such as teachers, into space. The issues of diversity in general and of civilians in space in particular have ebbed and flowed in importance over time but continue to be relevant. In recent history, the subject of paying tourists in space has come to the forefront.
Derived from text
Afterbodies; Cosmonauts; Engineers; International Relations; Microgravity; Pharmacology; Robotics; Space Commercialization

20020089863 NASA Johnson Space Center, Houston, TX USA

Space Transportation Systems, Aeronautics and Space Technology, Space and Terrestrial Applications, and Space Sciences ***Annual Report***

November 1980; 76p; In English

Report No.(s): JSC-16993; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report is prepared on an annual basis for the purposes of highlighting the fiscal year research and technology (R&T) activities. Its intent is to better inform the R&T Program Managers of significant accomplishments that promise practical and beneficial program application. The report is not inclusive of all R&T activities. The document is organized into two distinct sections: (1) a general summary of the major R&T activities in each program area, and (2) a description of significant individual completed activities and their results. This document will be updated November 1 of each year.

Derived from text

Aeronautical Engineering; Space Transportation System; Technology Utilization; Aerospace Environments; Space Shuttles

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